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NUTRITION AND HUMAN NEEDS

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HEARINGS

BEFORE THE

SELECT COMMITTEE ON
RITION AND HUMAN NEEDS

OF THE

UNITED STATES SENATE

NINETIETH CONGRESS

SECOND SESSION

AND

NINETY-FIRST CONGRESS

FIRST SESSION

ON

NUTRITION AND HUMAN NEEDS

PART 3—THE NATIONAL NUTRITION SURVEY

WASHINGTON, D.C., JANUARY 22, 23, 27, AND 28, 1969



Printed for the use of the Select Committee on Nutrition and Human Needs

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NUTRITION AND HUMAN NEEDS

WEDNESDAY, JANUARY 22, 1969

U.S. SENATE,
SELECT COMMITTEE ON NUTRITION AND HUMAN NEEDS,
Washington, D.C.

The committee met at 10 a.m., pursuant to recess, in room G–308, New Senate Office Building, Senator George McGovern (chairman of the committee) presiding.

Present: Senators McGovern, Ellender, Talmadge, Yarborough, Kennedy, Javits, Percy, Goodell, Cook, and Dole.

Also present: William C. Smith, staff director and general counsel; Kenneth Schlossberg, professional staff member; Bertram G. Waters III, American Political Science Association Fellow; and Clarence V. McKee, professional staff member for the minority.

The CHAIRMAN. The committee will be in order.

STATEMENT OF HON. GEORGE McGOVERN, A U.S. SENATOR FROM THE STATE OF SOUTH DAKOTA, AND CHAIRMAN OF THE COMMITTEE

This morning the committee will hear testimony from Dr. Arnold Schaefer, the chief of the nutrition program who has been in charge of the National Nutrition Survey which is under way in the Department of Health, Education and Welfare, the first survey of that kind ever conducted in the United States.

Dr. Schaefer, before you begin, I would like to say that I have read your statement and have been shocked by it. I am one of those who has believed for sometime that serious malnutrition is inexcusable in a country as rich as the United States, but I must say that some of the results that you are reporting this morning in the prepared statement you submit to us are worse than I had expected.

For example, it had been my understanding that rickets and goiter, which you have found to an alarming degree, had largely been ended in this country years ago and I was surprised to find the prevalence that you indicate in your preliminary survey.

I hope you will forgive occasional questions as we move along through this statement. It is a rather lengthy statement.

As I understand, it is prepared largely in scientific terms and I think at some points it may be important for us to try to translate that into the human dimensions at least as to the statistics that you are reporting.

For instance, you are reporting one-third of children under 6 years of age had hemoglobin levels, which, as I understand it, is the index of anemia, in an unacceptable range for children under 6.

The same group reflected inadequate vitamin A, which is associated with night blindness. I think these are shocking figures but their meaning may be lost unless a person understands that preschool children, those who you are referring to as 6 years of age or under, can be handicapped for life both mentally and physically by such malnutrition and that irreversible brain and body damage can have occurred before the child ever begins school if these statistics as you report here prevail.

So, I am hopeful that we will not only understand the statistical findings of this summary but that we will also come to realize as your testimony proceeds what this means in terms of human cost to our society.

Without objection we shall print a summary of Dr. Schaefer's findings in the record at this point.

Dr. Schaefer's report presents preliminary findings on malnutrition among 12,000 individuals living in low-income areas in Texas, Louisiana, New York and Kentucky. The nutritional status of the families and individuals examined, was evaluated through clinical and dental examinations, biochemical measurements and food intake studies.

Discussing the Survey's findings Dr. Schaefer reports: "The preliminary data clearly indicate an alarming prevalence of those characteristics that are associated with undernourished groups. Even though these findings come from a small sub-sample of the total National Nutrition Survey, it is unreasonable in an affluent society to discover such signs as those seen to date."

"In general," Dr. Schaefer states, "the most widespread nutritional problem is one of multiple nutrient deficiency of a combination of one or more nutrients such as protein, vitamins, minerals and calories. It is important to bear in mind and perhaps shocking to realize that the problems in the poverty groups in the United States seem to be very similar to those we have encountered in the developing countries."

Among the Nutrition Survey's specific findings, Dr. Schaefer cited the following:

Growth Retardation.—"In the sample we have studied thus far, the children between 1 and 3 years of age fall below the average height reported for children in the U.S.A. . . . 3.5% of these children have retarded bone growth.

Marasmus and Kwashiorkor.—"To date in our studies we have found 7 cases which the physician diagnoses as severe malnutrition using such terms as kwashiorkor (severe protein and multiple nutrient deficiency) and marasmus, primarily a choloric deficiency. We did not expect to find such cases in the United States. . . . In many of the developing areas where we have worked, Africa, Latin America, and Asia, these severe cases of malnutrition only rarely are found; they either are hospitalized or have died."

Anemia.—"¼ of the children under 6 years of age had hemoglobin levels in the unacceptable range. . . . The cutoff level for hemoglobin was set at that level considered by physicians to need treatment. . . . 15% of the population (studied) had hemoglobin levels less than acceptable which means that they are candidates for medical treatment. . . . In the impoverished population this problem may actually be on the increase."

Goiter.—"5% of the total population examined to date exhibits an enlarged thyroid gland associated with low iodine intake. The World Health Organization classified an area as having endemic goiter when five percent of the population has enlarged thyroid glands. . . . In Texas 40% of the local markets failed to even stock iodized salt even though there was no price differential."

Dental problems.—"18% of all subjects 10 years of age and over reported it was difficult and painful to bite or chew food. 96% of the sample had an average of 10 teeth either decayed, filled or missing, with 5 of these needing immediate attention . . . only 15 out of each 100 decayed teeth had been filled."

Vitamin A deficiency.—33% of the population less than 6 years of age were at unacceptable levels. These findings are characteristic of those reported from areas of the world where Vitamin A deficiency is a major problem. . . . In population studies it has been suggested that where five percent or more of the sample has values within the less than acceptable range, this constitutes evidence of vitamin A deficiency within the population. This is also the level at which

night blindness appears. . . . In advanced vitamin A deficiency permanent blindness occurs. We did not find such cases. However, here our concern is the fact that we have such a large proportion, 13% of the entire population studied, that had levels which we consider places them in a high risk category. We do not know how long these people have had these low levels or whether their vitamin intake is now being increased or decreased. We can't afford the risk that any of these persons will develop the severe deficiency."

Vitamin C deficiency.—"Serum vitamin C levels were less than acceptable in 12% to 16% of all age groups. 4% of the total age group had scorbutic type gums. These findings suggest that the intake of food supplying vitamin C is reduced among all ages. Preliminary dietary intakes tend to confirm this. Once again, the percentage of individuals with unacceptable serum levels is characteristic of reports from poorly-nourished populations. This is added evidence of malnutrition within the group studied thus far."

Vitamin D deficiency.—"3.7% of the 0 to 6 year-old subjects show evidence of vitamin D deficiency: 18 cases of rickets have been diagnosed . . . The fact that we have discovered cases of rickets again alerts us to the reality that we cannot ignore public health nutrition programs once they have started. This disease was virtually eradicated over thirty years ago through the simple mechanism of fortifying milk with vitamin D at no cost to the consumer. We are currently collecting data on costs between non-fortified and fortified milk. This information has still not yet been tabulated; but I can assure you gentlemen that if you will check the price of vitamin D milk and other milk in the Washington area, you will be surprised at the price differential."

In addition, the National Nutrition Survey has found:

"4 to 5% of the subjects exhibit either or both winged scapula and potbelly. These findings are associated with protein and calorie malnutrition."

"8 cases of Bitot's Spots (frequently attributed to vitamin A deficiency) have been noted and confirmed."

"Other changes in hair, skin and lips which may be indicative of poor nutrition have been noted."

Discussing the Survey's findings, Dr. Schaefer said, "Our studies to date clearly indicate that there is malnutrition, and in our opinion, it occurs in an unexpectedly large proportion of our sample population."

The CHAIRMAN. You may proceed now, Dr. Schaefer.

Senator ELLENDER. May I say a few words?

The CHAIRMAN. Senator Ellender from Louisiana.

STATEMENT BY HON. ALLEN J. ELLENDER, A U.S. SENATOR FROM THE STATE OF LOUISIANA

Senator ELLENDER. Mr. Chairman, I read that report and if I am to understand it you came to no conclusion here, have you?

Dr. SCHAEFER. I should certainly state and I will trust that all concerned realize that this is a status report.

Senator ELLENDER. A what?

Dr. SCHAEFER. A status report.

Senator ELLENDER. Which means?

Dr. SCHAEFER. We are reporting our findings based on a small percentage of the National Nutrition Survey and, thus, as far as specific conclusions and recommendations, these are being qualified.

We are reporting highlights of the findings that we have to date. These, certainly, I trust, will lead to alerting us to problems that are occurring, and in a way these are conclusions that there are problems in the areas on the basis of our data today, sir.

Senator ELLENDER. How long do you expect it will take, to formulate definite conclusions? As I understand, in many of the States you haven't even started yet.

Dr. SCHAEFER. That is correct, sir.

Senator ELLENDER. And in others you have done just a very little except I think in one State; in Texas, as I remember.

Dr. SCHAEFER. Correct, sir.

Senator ELLENDER. And in the rest of them you are just starting.

Dr. SCHAEFER. Our procedure will be as we finish each State, the States themselves will in conjunction with us be preparing final reports. Thus we will have continuous progress reports coming in on a State basis and at the same time we will be summarizing our data on the basis of the characteristics of the population irrespective of State boundaries so we get more or less a national picture, but I do wish to point out, Mr. Chairman and other members, that this is a progress report and by no means are we at this stage projecting this for the entire population. These are trends that we are finding.

Senator ELLENDER. What gave rise to this study? Who promoted it?

Dr. SCHAEFER. Well, basically, sir; this was in the Health Amendments of 1967 which directed the Secretary of HEW to conduct a national nutrition survey to determine the prevalence, location, and magnitude, of hunger and malnutrition. It was on this legislative mandate that the Secretary designated our group to fulfill this mission.

Senator ELLENDER. When was this started, Doctor?

Dr. SCHAEFER. The amendment was passed——

Senator ELLENDER. I mean your work.

Dr. SCHAEFER. December 1967 and we were negotiating with the States and laying the plans in January 1968.

The CHAIRMAN. Does any other Senator care to make any opening statement?

Dr. Schaefer, you may proceed.

STATEMENT OF DR. ARNOLD E. SCHAEFER, CHIEF, NUTRITION PROGRAM, ACCOMPANIED BY DR. OGDEN C. JOHNSON, CHIEF, DOMESTIC UNIT, NUTRITION PROGRAM; AND IRVING LEWIS, DEPUTY ADMINISTRATOR, HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION, DIVISION OF CHRONIC DISEASE PROGRAMS, REGIONAL MEDICAL PROGRAMS SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. SCHAEFER. Senator McGovern, I would like to introduce the two people at the table with me. Dr. Ogden Johnson on my right is chief of our domestic program. Mr. Irving Lewis on my left is Deputy Administrator of the Health Services and Mental Health Administration under whose auspices our office functions.

Mr. Chairman, I welcome this opportunity to appear before this committee to present a status progress report on the national nutrition survey. At the present time field activities are in progress or completed in four States. It is not possible to make correlations and projections from this preliminary data; these can be made only after results are compiled for the total survey. However, we are finding definite signs of malnutrition in these early results.

The national nutrition survey is the first nationwide comprehensive survey developed to assess the nutritional status of the population of the United States of America.

Therefore, it is appropriate to review the rationale of the various components of such a study. Nutrition cannot be divorced from health. Adequate nutrition implies the physiological utilization of essential nutrients in the correct amounts and balance to promote optimum physical and mental function from preconception to death.

Thus, a comprehensive nutritional status study must be designed to reflect the relationship between food intake, utilization, and the total health status. The first indications of malnutrition are manifested by such symptoms as:

1. Lower serum and urinary excretion levels of essential nutrients,
2. Retardation of growth, and
3. Less efficient physiological performance.

After the early symptoms there will appear various clinical or physical signs such as changes in the hair, skin, eyes, physical structure of the body, and it is only after prolonged malnutrition that the advanced signs—such as the classical deficiency diseases—will appear.

Extensive research and our experience in 33 international surveys support this thesis. A comprehensive and meaningful nutritional status study must be designed to detect the early "risk" signals as well as to identify overt signs and symptoms of malnutrition. The national nutrition survey has been planned to achieve this.

THE NATIONAL NUTRITION SURVEY

I appreciate your chairman's permission to show a short film that is based on one of the initial State surveys; Texas. The film illustrates the procedures that have been incorporated into the study and also gives some preliminary indications of the kinds and types of nutrition problems that we are finding.

This film was produced primarily for training and information for the States that would subsequently follow the first survey which was done in Texas.

Therefore, it was desirable to include examples of advanced clinical and dental lesions that are associated with malnutrition. I wish to point out that some of these examples were photographed during the process of the survey. However, others were taken from our previous surveys in other countries and are used primarily for teaching and training purposes.

Will you please show the film.

Senator ELLENDER. Are you saying in other countries?

Dr. SCHAEFER. Yes.

Senator ELLENDER. What countries have you picked? India?

Dr. SCHAEFER. No, sir; we have not.

Senator ELLENDER. Burma?

Dr. SCHAEFER. Yes; Burma, the Far East.

Senator ELLENDER. You don't want to compare that with ours, do you?

Dr. SCHAEFER. No; we aren't. We are just merely using this as a procedure for recognizing these lesions. May we have the film please?

The CHAIRMAN. If I may make a suggestion, I think maybe the Senators should go down and sit in the auditorium, should we not, Dr. Schaefer, in order to see the film?

Dr. SCHAEFER. Right.

(At this point a film was shown; the following is the commentary:)

MALNUTRITION: WHAT IS THE PREVALENCE IN THE UNITED STATES? A SEARCH FOR THE ANSWER

THE STATE NUTRITION SURVEY—THE STORY OF THE TEXAS NUTRITION SURVEY TEAM IN THE FIELD

This 16mm, narrated, color film describes the development and operation of a state nutrition survey, and some of its preliminary findings. The training of personnel, selection of survey samples, mapping, home interviews, the comprehensive clinical examination, and other aspects of the survey were filmed in actual localities under training and field conditions during the progress of the survey.

Texas was the first state to complete survey field team activities as a participant in the National Nutrition Survey effort requested of the Secretary of Health, Education, and Welfare under the Partnership For Health Amendments of 1967. The purpose of the National Nutrition Survey is to determine the prevalence of malnutrition and related health problems in the United States.

Film produced at the Medical Illustration Department, the University of Texas Medical Branch, Galveston, Texas.

Sequence No. 1. (*Introduction*)

Under the Partnership for Health Amendments of 1967, the Congress requested that the Secretary of Health, Education, and Welfare conduct a comprehensive national nutrition survey to determine the prevalence of malnutrition and related health problems in the United States among low income population areas.

The National Nutrition Program Office of the Pulbic Health Service was designated to plan, develop, and carry out this request. The methodologies, procedures, and standards published in the *Manual for Nutrition Surveys* are being used as guidelines in this national survey effort.

Individual states are conducting the survey within their states on a contract basis at the request and under the statewide coordination of their health departments, with supportive planning and development, professional assistance, and funding emanating from the National Nutrition Program Office.

The states of Texas and Louisiana were the first to participate in the National Nutrition Survey, with Texas completing its field examination activity in late November of 1968.

The Texas Survey was co-sponsored by the State Health Department in Austin, and the University of Texas Medical Branch at Galveston. It was developed as a research project by the Medical School which supplied all members of the field team as well as one of the survey's Co-directors, a veteran of 13 of the 33 U.S. Public Health international nutrition surveys, and the nutritional study of the Blackfeet and Ft. Belknap Indian Reservations in Montana. As the survey's other co-director, the State Commissioner of Health appointed his Chief of Comprehensive Health Planning who had wide experience in Public Health and Preventive Medicine.

During the summer and fall of 1968, the survey was conducted in 26 Texas counties, located in all major regions of the state, and including samples of urban, suburban, and rural communities.

Sequence No. 2 (*Enumeration Districts*)

The method of choosing the sample for nutrition surveys in each State was determined initially by the National Center for Health Statistics in Washington. As the first step in Texas, the 26 counties were selected at random. Then within each county, in proportion to the number of census districts which in 1960 had reported low-income families, a second random selection was made of enumeration districts. A total of 103 enumeration districts were selected. From each one a segment of 60 housing units was randomly selected. Finally, on the basis of a random start, an average of 20 households in each enumeration district were thus chosen to be invited to participate in the survey. This sample normally constituted one day's work for the examining team.

Sequence No. 3 (*Personnel and Logistics*)

In order to complete the field team activities in the Texas Survey in approximately 3 months time, 2 field teams of 20 members each were recruited and

trained in a 10-day orientation period at the Medical School. Employing a nucleus of professional personnel with experience in the international surveys, the director chose the remainder from medical student applicants and college students with interest in careers in nursing, nutrition, social work, medical statistics and other allied health sciences.

Sequence No. 4 (Orientation)

In Texas it was essential that all aspects of the field examination be conducted in Spanish as well as in English. Registration personnel and interviewers in critical areas were required to speak Spanish fluently, and all material issued to the medical historians was prepared in Spanish with translations of each questionnaire.

Assisting in the training was a member of the medical school staff who formerly served as chief of medical statistics in all 33 counties studied in previous international surveys, the education and training officer from the National Nutrition Program Office, and consultants in Nutrition from the State Department of Health and from Tulane University School of Medicine. The Director of the Dietary staff held prolonged discussions on the use of food measures, coding practices and the techniques of household and individual interviews for the members of the team. It was decided to obtain Household dietary information on one-half of the family units and to do individual intake studies on children aged 10 to 15, pregnant women and nursing mothers, children under 3 years of age, and individuals aged 60 or over.

Height, weight and measurements to determine growth patterns and skin-fold thickness fell within the province of the Anthropometry team. Since almost all data in this survey were to be coded directly onto computer forms to be used in the Optical Mark Page Reader Machine, detailed instruction was necessary on the handling of the forms and on the technique of marking them with speed and accuracy. In Anthropometry and in the Dental examination, recorders were used, and numbers or letters were called out and repeated for verification before transcribing.

Responsibility for assembling of equipment and for personnel, transportation, housing of the field team and development of schedules was delegated to the Team Administrative Officer. During the final days of orientation the official survey vehicles were leased from regional Government Service Administration pools, and the panel trucks were packed for each team with duplicate equipment.

The route of the survey was carefully plotted, ever mindful of the problem of logistics and the pace of travel. Over 7000 miles were to be covered during the summer months, and an additional 1000 miles or more in the fall, as the team set up operations in 26 counties, 52 towns, and 103 enumeration districts.

Sequence No. 5 (Mapping)

The survey mappers arrive in the enumeration district normally two weeks in advance of the clinical team. The area is identified and a cluster of 60 dwellings is charted. Street names and addresses are indicated, or in the absence of names and numbers, a table is made to describe the houses: "White with green shutters," "unpainted with cyclone fence," and so forth. In many counties Enumeration Districts are located in rural areas, as here. In some cities whole blocks of houses have disappeared since the 1960 census to make way for freeways, parking lots, supermarkets or new housing developments. Some of the poorer homes have been abandoned, with weeds grown high in the yards. Elsewhere, at the edge of small towns and cities alike, attractive new brick homes proclaim an influx of middle income families into a former low income area. This development will be noted for the home interviewers who may encounter some difficulty in persuading households that malnutrition can and may occur in any income group, and that participation in the survey will not label them as deprived or poverty-stricken.

Sequence No. 6 (Advance Team Coordinators)

Community coordinators make arrangements for the home interviewing procedure, the determination of a facility to be used by the field examination team, and the recruiting of local community support of the survey. Team members trained for this assignment follow the mappers into the enumeration district. They visit local governmental officials, the County Medical Society, and public health doctors and nurses whenever possible. Invaluable support and cooperation is also received from local school administrative leaders and members of their staffs. Informational letters had been sent in advance to appropriate individuals

and agencies in the community, requesting their endorsement and support of the survey. Permission is obtained for the use of public schools as examining centers; facilities are inspected and notes are made for utilization of the space available. The field laboratory needs running water and nearby bathroom facilities for collection of urine specimens from the participants. The dentist and clinician require hand-washing facilities. Plugs are needed for the portable X-ray, for lamps, for the Vision Screener. The team needs tables and chairs to set up working areas: 15 to 20 desks or tables; 30 to 50 chairs, depending upon the work load anticipated. The school cafeteria, library, or home economics suite provides ample working room. A kitchen or teachers' lounge, or a science class room will make an excellent laboratory.

Most of all, the Nutrition Survey team needs local acceptance, cooperation, and moral support.

Sequence No. 7 (Home Interviewing)

The Home Interviewers arrive in the enumeration district four to five days in advance of the field examination team. They visit the homes of the 20 families selected to be contacted. Initially, they inform the family about the survey and invite them to participate. At times the interview takes place outside of the home. In some localities the school nurse, with the permission and support of the school superintendent, introduces the home interviewer to the family and encourages their participation in the survey. In other areas visiting teachers from the local schools, O.E.O. workers, principals of schools, ministers, and other persons well known and trusted in the community agree to assist the Home Interviewers. Otherwise, doors may likely be shut in their faces as they are mistaken for salesmen or bill collectors.

Often the living room of a small dwelling is crowded as the family gathers around the visitors, but there are questions to be asked and information to be recorded. First, the household information form which records the members of the household, their ages and occupations, and level of education. And Socio-Cultural Data—the number of rooms in the house, facilities for sleeping, cooking, bathing; the usual language spoken; the background of the head of the family; if the family regularly listens to a radio; watches TV—or reads a newspaper. In all, 22 personal questions are asked and the answers transferred on the spot into coded numbers.

Sequence No. 8 (Arrival of the Field Team)

The Field Examination Team arrives in the survey area. They orient themselves to the new surroundings, and note the location of launderettes, sandwich shops, and soda fountains.

Advanced arrangements had been made for the establishment of team headquarters at a motel or college dormitory near the examination center.

Prior to the setting up of the examination center, a last minute follow-up visitation is made with the local superintendent of schools, and final arrangements agreed upon for the use of school facilities. The examination site is briefly visited and studied, and the survey team director is informed that all is in readiness for the arrival of the clinical team. Meanwhile, the Registration Clerk and the Field Code Clerk pick up and examine the contents of the brown envelope which has been left behind by the Home Interviewers. The household forms determine the participant load for the following day; the day's examination schedule; the appointment slips for the driver; road maps and maps of the enumeration districts; the reports from the Advance Coordinating Team; description of the location of the school; and the names of local citizens who will assist the survey.

The driver takes the maps and sets out to check the location of the houses which are circled in the enumeration district. Most of the households can't come to the examination center until after the father gets home from work at night, and it is difficult to find the addresses in the dark.

Sequence No. 9 (Pricing)

During the field operation of the Nutrition Survey, members of the dietary group make a study of food availability and a comparison of prices in supermarkets and in neighborhood stores within the Enumeration District. From a food price list of staples and of items with rapid turnover in low, middle and high income stores, a market basket of 26 frequently used foods is drawn for comparison of costs. In each location the lowest price available for foods of comparable quantity and quality is used. The cost varies as much as $2.00 per basket. Some articles of food cost less in the supermarkets, some less in the smaller store. There

are wide ranges, according to the location, for both perishable items and for staples such as bacon, rice, sugar, shortening, flour and coffee. In each store the dietitian also checks with the manager on the sale of iodized and uniodized salt—which cost the same. Where iodine is lacking in the family diet the clinical team may find enlargement of the thyroid gland—or goiters. This is an important health problem the world over.

In many areas where preserving and canning of food is still popular there is a superstition, just as in East Texas, that iodized salt will "spoil the pickles."

Sequence No. 10 (*Clinical Team Arrives and Sets Up Examination Center*)

By early afternoon the field team members are ready to leave for the school. There is a bit of scurrying around for brief cases, tote bags, cameras, white coats, record folders and other equipment for the day's work at the Examination Center. On their way to the examination site in the Rio Grande Region, the team members had the unique opportunity to observe migrant workers in the fields. Later on that evening, they would personally meet many of these people at the clinical center. Once the survey is under way, the team allows half an hour to unload the truck and set up the working stations, moving chairs and tables to conform to the designated flow plan and arranging waiting areas for the families as they arrive for registration.

The team director checks the stations, lending a hand when needed, discussing the schedule, taking note of supplies to be ordered, and hoping, like the rest of his crew, for 20 families out of 20.

Sequence No. 11 (*Picking Up A Family*)

About half of the families seen on the Texas Survey are Mexican-American and about a third Negro-American. In the Spanish-surname group there is great reluctance to participate in the survey without attendance by the father. In this situation, a Latin family is picked up by the same team member who served as the Home Interviewer. He is completely bilingual, and the participants feel secure with him. Also, they have here, as elsewhere, great respect for the government car.

Sequence No. 12 (*Team Flow*)

The family begins the clinical examination at the Registration desk. After being greeted by the clerk, the forms are prepared with the location number, family number, individual number and age recorded in the proper spaces. The examinations are marked on the front of the participants envelope so that each can be checked off as completed. An important procedure at Registration is the recording of the name of the family doctor or clinic, and acquiring signature of a parent or guardian of children giving permission for them to be tested. The members of the household are cooperative and find the examinations interesting.

The mother of a large family is sent directly to the Medical History station to give data on herself and on all children up to the age of 10 or 12. A reproductive history is taken of all females of child-bearing age. Information is recorded relative to the age of onset of periods, the number of pregnancies, miscarriages, stillbirths, and/or live births. The age of the first child. The age of the last. The record number of pregnancies recorded for a mother is 23, with birth being given to 3 sets of twins.

Special Histories are taken on all children age 5 and younger. Questions on these pertain to infectious diseases, immunizations, birth defects, and accidental injury, including burns and swallowed drugs and poisons. For the teenager the history usually reveals no operations, no serious illnesses, no hospitalization within the previous year.

The Blood Pressure is recorded by trained personnel. Also at this station, the hearing is checked with the Tracor Screening audiometer. Four frequencies are employed at 4 decibel levels each. The Vision Screener is a popular device on the survey for testing distance vision. It is non-verbal test, scored by punching *Yes* or *No* according to the direction of the arms of the E's. The clinical examination, directed toward nutritional lesions, is conducted by a physician, as shown here, or by a medical student with special training and under the physician's supervision. This is a quickly performed, specialized, examination which had been developed in the international surveys. (The patient sits on the edge of a table so that the reflexes and the response to the tuning fork may be checked with ease. Absence of the knee and ankle jerks and loss of vibratory sense may indicate Vitamine B_1 deficiency. Although this child appears to be healthy and well-nourished, the clinicians express concern about the appearance of the tongue and mouth. As

illustrated in the following sequences, a smooth, pale, slick tongue suggests deficiency of iron or of one of the B vitamins. If there are cracks in the corner of the mouth and a sore, red tongue, these lesions are indicative of a lack of riboflavin (Vitamin B_2 as it used to be called). A lack of Vitamin C will show up in the gums, which are swollen, red-lined, and bleed on pressure. The color and texture of the hair may suggest deficiency of protein and/or calories. Dry, sparse, stiff, easily pluckable hair and, in extreme cases, decolorization is indicative of severe protein-calorie deficit even though the patient may appear plump because of swelling of the tissues. Lack of Vitamin A may cause rough, dry skin above the elbows or on the back or thighs, or little bumps which feel like coarse sandpaper—known medically as follicular hyperkeratosis.

The clinical sign of Vitamin D deficiency called rickets are noted in the child who has beaded ribs, bowed legs, enlargement of the wrists and "bossing" or knobbing of the skull. An enlargement of the thyroid gland occasionally occurs in all members of a family. More often, though, only one or more individuals in the household will be affected when there is lack of sufficient iodine in the food or water.

These are the principal nutritional lesions encountered in surveys in this country. Here is a view of the most poorly nourished infant examined by the team. Most children with such evident malnutrition develop diarrhea, or an intercurrent infection, and are brought to hospitals for treatment. Note the lack of subcutaneous fat, the so-called winged shoulder blades, the muscle atrophy. These are typical of the condition called marasmus, the progressive emaciation of the body.

After the clinical examination the patients next visit the dentist. The dental examination has been worked out carefully and coordinated at the national level by consultants from the U.S. Public Health Service Dental Branch, who have had extensive experience in the international surveys, as well as in domestic studies. The first question asked at this station "When is the last time that you saw a dentist?" all too often brings out the answer: "never." Results of the dental examinations are consistently discouraging. Over 80% of all persons examined are in urgent need of dental care including extractions for decayed teeth. There is widespread peri-dontal disease. One person in five over the age of 17 has lost the upper teeth, the lowers, or all the teeth. In one county, many participants were examined who had lost permanent teeth by the age of 12. Two high school students were seen with dentures. The school principal reports that the younger children rarely have three cents for the daily subsidized ration of milk available at school.

Nearly 18% of all persons examined by the dentist report that they have trouble in biting or chewing either hard foods or anything that they try to eat.

Nevertheless, in spite of bad teeth and poor oral hygiene, and admitting that there is no toothbrush in the house, the patients appreciate dental examination, for they find that, as elsewhere on the survey team, there is warm sympathy and understanding and a desire to help.

The information form on food habits is designed to collect information on households and selected individuals who may be more vulnerable to nutritional stress. Household information includes information relative to food intake patterns, food purchasing and preparation, sources of food, frequency of preparation of various articles of the diet and a recall of food and beverages consumed the day prior to the interview. Food models are employed to enable respondents to make an accurate estimate of amounts of food consumed. Teenagers report a high intake of snack foods and soft drinks. Approximately 10% of the adolescents report regular consumption of non-food items, particularly of lump laundry starch—and of dirt, clay and papers. Data are being analyzed to relate intake of meat, fresh vegetables, and fruits in the diet to the specific family income.

A check made of utilization of commodities and food stamps reveals that less than 10% of the families seen on the survey were recipient of these programs. The anthropometry measurements are made with care and precision, utilizing kilogram scales and height board calibrated in centimeters. Calipers measure the width of joints and the distance between joints. The knee height is measured using a special bench. Great care is taken to be precise in taking the skin-fold thicknesses on the arm and back, one of the most difficult of all measurements. These measurements are used to determine the amounts of body fat.

The data in this area will be used in the assessment of physical growth and development.

The Socio-Economic form is designed to assess the monthly and annual income, the source of cash funds for the family, the number of individuals in the household, and the number of wage earners.

In the Rio Grande Valley many migrant workers are seen who have returned to their homes for the winter and to enroll the children in school. The majority of these are dependent upon the summer's earnings, odd jobs, or unemployment pay to tide them through the winter. These are not the poorest participants in the area, however. Only 50% of the males and 13% of the females report having full time employment, although 80% of eligible adult males have been gainfully employed to some degree in the last month and in the previous year. Many families have members who are retired senior citizens or students, or have an unemployed female housewife as the head of the household.

A single posterior-anterior x-ray is taken of the hand and wrist of all subjects except the smallest children. A daily test film is sent to the Radiology Department of the University of Texas Medical Branch, and the films follow in lots of 100 for film development. Interpretation of findings with regard to bone age and bone loss are to be included in the final report. Data regarding bone age will be correlated with other data including the findings of the Anthropometrist.

At the last station, all subjects except the smallest infants give a specimen of urine and have blood samples drawn. Very little resistance is found to the taking of blood, and more than 10,000 tubes are collected in the course of the survey.

Preliminary analysis of the urine for protein, blood, sugar and ketones is carried out while the patients are still in the laboratory. Approximately 90 persons were discovered whose urine specimens were suspicious of diabetes, in addition to those who were already aware of the disease. These patients are given referrals to their family doctors or health clinics.

Blood and urine are stored immediately under refrigeration and prepared for shipping either later that night or early the next morning, depending upon the airline or other transportation schedules.

Samples of tap water are also obtained in each Examining Center and shipped to the Galveston Laboratory for analysis of trace metals.

An important member of the Survey Team is the Field Code Clerk, who is responsible for collection of all participant forms, checking of errors and daily statistical tabulations. The Code Clerk also helps with directing families through the clinic, handling accounts, chauffeuring participants, and assisting at the Registration Desk. Like many other members of the team, the Code Clerk is a "Jack of all trades."

Sequence No. 13 (Storing equipment for travel, exit from Center)

Now the day's work is over and the team prepares to pack up the equipment. The dentist and his assistant place the instruments carefully in their wooden storage container.

The Anthropometry team stores the scales and takes down the height board. The benches and measuring boards are placed in their box, and the calipers are laid away in their foam-lined case.

Out go the portable refrigerator, the x-ray equipment, the registration box, the lab equipment, the packages from Dietary, and finally, the team members.

In the Rio Grande Valley region, the survey team was asked to spend two extra days examining groups of poor families in addition to those selected in the random sample. These participants were drawn from lists proposed by the school nurses and teachers, and by welfare workers. They live in houses crowded together but with bougainvillea in blossom to brighten the exterior of their homes. One family has converted a truck and a chicken house into dwelling areas, while the father constructs a small frame house in front, plank by plank, between odd jobs. They projected a sense of dignity and pride which was inspirational to the members of the team.

Sequence No. 14 (Biochemistry)

In the laboratory at the Medical Branch the blood and urine samples arrive. One can expect that considerable variation will occur among each of the 26 nutrients as data are examined for age, sex, and location characteristics. Overall the data do reveal that, for each of the nutrients, from one to 22 percent of the subjects had values that fell below biochemical nutritional acceptable standards as established by the Interdepartmental Committee on Nutrition for National Defense. Between one and 10 percent of the individuals had "low" levels of

hemoglobin plasma carotene, plasma vitamin C, and urinary thiamin; while up to one in five had low levels of hematocrit, Vitamin A, and urinary riboflavin. These data are highly suggestive that a public health problem does exist in this segment of the states population.

Sequence No. 15 (Statistics)

Now the time has arrived for a Report on the first phase of the survey, and the compilation of data in the statistical laboratory.

Before final analysis can be started, all of the results must be transferred to punch cards for later computer use. The coded data forms go directly into the Optical Scanner—which punches the data automatically onto the cards. Information from the household information cards, the Socio-Economic sheets, and the Dietary Recalls must be transferred by a key punch operator.

Once data are recorded on the punch cards, the final programming can start. The cards are sorted and resorted as the analysis proceeds. Over a period of months each section chief works to prepare the final charts and graphs and to assist the co-directors in arriving at the final conclusions.

But initial data are assembled for a progress report, and the Chief of Anthropometry charts the findings on height and weight, comparing the results from this survey with standards for men and women and boys and girls as the first step of evaluation. Later subsample groups will be analyzed according to the locations, and the other measurements will be added.

Sequence No. 16 (Presentation of Preliminary Report)

The Preliminary Report has been prepared and a progress report is released to the communications media. The Co-Director of the Survey in Austin presents to the Commissioner of Health the data which have been compiled thus far on 3700 persons from over 1100 families. These families represent a cross-section of cultural, ethnic, urban, and rural groups in the population of Texas. Later, 750 additional subjects in over 140 households will be added from the team's survey in the Rio Grande Valley.

Sequence No. 17 (Conclusion)

The survey is over, the first of many that will follow as a part of the National Nutrition Survey effort. Objective, comprehensive, and authentic data has been scientifically and meticulously compiled. It will form the basis for the development of effective preventive and corrective programs at all levels, local, state, and federal, that hopefully may lead to the elimination of malnutrition and related health problems as a blight on the American scene.

The CHAIRMAN. Dr. Schaefer, would you like to proceed then with your testimony?

Dr. SCHAEFER. The film we have just seen outlines the procedures that are used to collect the nutritional status data in each of the 10 States that constitute the first phase of the national nutrition survey. These States are Texas, Louisiana, New York—including an additional survey of New York City—Kentucky, Michigan, California, Washington, South Carolina, West Virginia, and Massachusetts.

The progress of each State survey is as follows:

In Texas, field activities were completed in late November 1968. Compilation and interpretation of data is now well underway.

Louisiana is approximately 85 to 90 percent complete with some data available. Activities are scheduled for completion in February 1969.

In New York State field activities are nearly 50 percent complete. Weather conditions dictate the completion time.

Kentucky—field activities began in November 1968.

In Michigan and New York City, field activities will begin in February 1969.

In California and Washington, the sample is being selected this week and contracts are being negotiated following that.

In West Virginia and Massachusetts, the samples have been selected and dates set for negotiating contracts.

In South Carolina an initial contact and one briefing conference has been held.

These 10 States were selected to represent broad geographic representations, rural and urban populations, and the diversity of economic, ethnic, and sociocultural patterns within the United States. Other factors such as concentration of migrant labor, infant and maternal mortality rates, and the variation in types of food distribution and welfare programs were also considered.

The data from each of the survey States will be necessary before definitive correlations and conclusions can be applied to those people in the United States who have similar socioeconomic and ethnic characteristics.

The CHAIRMAN. Dr. Schaefer, if I may interrupt there, when you complete the survey of the 10 selected States is that a large enough sampling in your judgment to give us reliable conclusions about the nutritional situation in the country as a whole?

Dr. SCHAEFER. This would be our first phase of the study, and I hope the point was made in the film also, that we are only studying the lower quartile of income areas. We will not have information regarding the other population in the higher income groups; namely, the other three-fourths of the population in the United States, and I think, if one looks at the map, we have a void in the Midwest and there are certain areas that will require special additional studies.

Senator, certainly our group would not conclude that these 10 States would be absolutely sufficient to give us all the answers that we need.

The CHAIRMAN. The people we saw being examined in the film and others that you will examine clinically are people from the lower one-fourth of the economic level in the country?

Dr. SCHAEFER. Correct. Our sample was selected on a random basis from those enumeration districts having the highest percentage of families with low income.

DEFINITION OF TERMS

I would like to review the definition of "nutrition" and "malnutrition" again because the data we are presenting or conclusions we are drawing from our data are based on this.

Nutrition is the science of food and its relationship to health. It is the physiological utilization of all the essential nutrients in proper amounts and balance to promote optimum physical and mental function by an individual from birth to death.

MALNUTRITION

This is a generic term encompassing undernutrition, insufficient food, overnutrition, characterized by obesity, and nutrient imbalance. It is an impairment of health and physiological function resulting from the failure of an individual to obtain all the essential nutrients in proper amount and balance.

Malnutrition is a spectrum of clearly definable medical entities and may be diagnosed by physical examination, physical anthropometry—measurement of body, height, weight, various circumferences of parts of the body and so forth, biochemical, and X-ray tests.

There is no symptom for malnutrition as a single disease.

The guidelines and procedures that have been used in the survey are appended to our written report. The procedures were developed from accepted national and international standards. The guidelines for interpretation of the data were based on those in the Manual for Nutrition Surveys, 1963, published by the Interdepartmental Committee on Nutrition for National Defense (ICNND). And we will make copies available for each member of your committee.

NATIONAL NUTRITION SURVEY SAMPLE

To date 12,000 individuals have been studied. Preliminary data processing has begun on 60 to 70 percent of this group. Again I reiterate that this makes it a status report and a preliminary report. The trends we present today may continue as further data become available. This we do not know.

However, assumptions should not be made that this will occur. These preliminary data should be viewed as describing only a subsample of the total national survey.

The national nutrition survey was designed so that the first phase would place priority on low-income groups and areas. A random selection was made from Bureau of Census enumeration districts where the largest percentage of families were living in poverty.

The universe from which the sample was drawn represented 25 percent of the State's population from the lowest income quartile again based on 1960 census data. This resulted in a selection of approximately 100 enumeration districts per State with 20 households selected from each enumeration district. This would then yield 6,000 to 8,000 individuals from 2,000 households per State.

The estimated sample size for the 10 States will include approximately 70,000 individuals. To date, the majority of families falling within the sampling technique have had annual incomes less than $3,000, as shown on the slide or in your figure 1.[1] Approximately 80 percent have incomes of less than $5,000.

We do not have the complete summary of the per capita income status but certain meaningful data are available:

1. Forty-nine percent of the households with income less than $1,200 were a one-person family.

2. Over 50 percent of the families had annual incomes less than $3,000. One-half of these had four or more family members.

3. Equally impressive is that incomes ranged from $180 per annum to $42,000 per annum.

Obviously, correlations of nutritional status and economic status must await more refined analysis even though early trends suggest that the economic status may be an important underlying factor in the families' nutritional patterns and problems.

These income figures represent only cash income. Final data analyses will take into consideration factors other than cash, for example, commodities, free school lunches, home-produced food, and so forth, to make more meaningful correlation between nutrition and economic status.

[1] Figure 1 will be found in Dr. Schaefer's prepared statement, p. 732.

In addition to income, some other characteristics of our sample to date are:

1. Fifty-five percent of the sample examined has been Negro.

2. Twenty-five percent of the families have been Spanish-American: Forty-one percent of this group spoke Spanish as the principal—and most frequently—the only language.

3. Age distribution of some groups particularly vulnerable to nutritional stress are:

Children 0–6 years constituted 19 percent of the total group. Children 10–16 years constituted 25 percent of the total group. Adults 60 years and older constituted 13 percent of the total group.

4. Only 50 percent of the male respondents reported that they worked full-time in the month and year preceding their examination at the clinic.

PRELIMINARY FINDINGS

It is possible to identify biochemical and physical variations between what we call well-nourished and poorly nourished groups. Primarily, one should not find signs of malnutrition in a well-fed population except in the presence of a disease state which could precipitate nutritional stress.

The preliminary data clearly indicates a high prevalence of those characteristics that are normally associated with undernourished groups. Even though these findings come from a small subsample of the total National Nutrition Survey, this illustrates the magnitude of our risk population.

CLINICAL

The purpose of the clinical assessment component of a nutrition survey is to detect physical signs and symptoms of deviation from health due to malnutrition and include a medical history, physical examination, and various anthropometric measurements such as height and weight for age, and bone X-ray measurements.

The physical examination evaluates long-term nutritional history. The medical history is designed to obtain prevalent disease patterns such as infections or parasitic infestations which influence absorption and metabolism of nutrients.

Clinical assessments show that children in undernourished populations are retarded in physical growth, their mean height per age is 5 to 15 percent less than that observed in well-nourished populations.

In addition, a significant proportion will exhibit clinical signs of malnutrition. This will vary from less than 1 percent to 5 percent in this type of study.

When one recalls that clinical symptoms are apt to appear only after prolonged inadequate nutrition, the preliminary findings from the National Nutrition Survey are of greater concern. For example, we have found to date:

a. Three and seven-tenths percent of the zero- to 6-year-old subjects show evidence of vitamin D deficiency: 18 cases of rickets have been diagnosed. Rickets is a condition caused by a deficiency of vitamin D, especially in infants and children. Disturbance of normal bone growth and development occurs. Rickets is characterized as you saw on the film, by bowed legs and enlargement of the ends and sides of the bones.

Vitamin D fortified milk is the major food source. It also must be recognized that vitamin D can be formed in the skin upon exposure to sunlight.

The CHAIRMAN. Dr. Schaefer, in that connection do you know how it was originally arranged to have milk fortified with vitamin D? My understanding is that this does not result in an increase in price to the consumer. Is that correct, and if so, how was that arranged?

Dr. SCHAEFER. Correct, Senator McGovern. At the time that the patent was awarded for the fortification of milk to the University of Wisconsin, which really established the Wisconsin Alumni Research Foundation, it carried with it the precise specifications on how to enrich milk and with an agreement by industry, by the users of the patent, that there would be no increase in the price of milk passed on to the consumer.

I think this is one of the outstanding examples of research, public health service working with agriculture and industry to really eliminate a scourge at that time, and the cost is basically negligible as far as using irradiation of milk or adding vitamin D as such to milk.

That patent has expired.

Secondly, I think we have quit talking about the necessity to feed children vitamin D fortified milk. There is a breakdown somewhere in our education program with the consumer, lack of dialog, to stress the need for continuing the philosophy of having vitamin D added to milk at the same cost to the consumer. We currently do not know how prevalent it is that vitamin D milk is more expensive.

It is obvious if one looks at the price of vitamin D fortified milk in this area that there is a price differential. In our survey we are collecting specific information, in the areas that we are working, as to whether there is a price differential.

The CHAIRMAN. My understanding is that some cities require that all milk sold be fortified with vitamin D. Is that correct?

Dr. SCHAEFER. We know that many of the States and cities can legislate their own standards and controls. In general if it goes in interstate commerce, then it comes under the aegis of the Food and Drug.

However, there is no mandate stating that milk should be enriched on a Federal standard basis with vitamin D.

The CHAIRMAN. Do you attach a sufficiently high priority to the fortification of foods, not only the vitamin D additives, but other food supplements, so that you think this committee ought to give some attention to that problem, with the possibility of recommendations either for administrative efforts or legislation to improve the fortification process?

Dr. SCHAEFER. I certainly do, Senator. Historically the Food Nutrition Board of the National Academy of Sciences has been the key advising group regarding food enrichment, establishing policies and standards, and this has resulted in establishing what we would consider good guidelines for enrichment of cereals, with iron and other nutrients that we will be talking about later also, the fortification of milk which they have urged, and it has been adopted by Federal agencies that vitamin D can only be added to milk.

This is one vitamin that if it is added to too many foods one would lose control and you can actually get toxicity problems, so it is neces-

sary to look at the entire food pattern, food likes, and determine which foods will reach the majority of the population in need.

I think this is indeed a fruitful area that requires additional study and it is the least costly of all the procedures.

The CHAIRMAN. You mentioned elsewhere in your statement the growing problem of goiter in this country stemming from the lack of iodized salt. Why isn't that salt iodized as a matter of course? Why do we need any other kind? What is the reason for the recurrence of this problem?

Dr. SCHAEFER. I am not sure I can give you the reason why goiter has recurred. If one recalls that certain belts or areas within the United States occur in which goiter is much more prevalent. This is primarily from the Great Lakes area and sections that go all the way down our country, and then areas in the far northwest, where the soil is low in iodine and the water therefore is also low and so is the food. There the only solution is to insure the use of iodized salt.

As I mention later, you will find no animal feed or no animal salt mixture that does not contain iodine in these areas, but for man we somehow assume that he knew that he ought to be buying iodized salt and it would be made available.

Adding iodine to salt is an extremely low cost item. We have made an estimate that it would cost less than a quarter of a cent per person per year to furnish the iodine in the salt. Again this was left up to the individual States to set standards and guidelines and I think all of us can be blamed.

We assumed that we eradicated goiter, virtually eradicated—30 years ago, it virtually disappeared. Nutrition is unique in that you can eradicate a nutritional disease in one generation and then forget about it, and have it reappear later. There certainly has been a breakdown in communication.

Senator ELLENDER. How was that eradication completed 30 years ago?

Dr. SCHAEFER. By an aggressive program to add iodine to salt and this included the utmost cooperation with industry, marketing, and urging people to consume iodized salt.

Senator JAVITS. Isn't this noniodized salt still sold?

Dr. SCHAEFER. Senator, there is more uniodized salt sold in the United States than iodized.

Senator JAVITS. Can you see any reason why the Pure Food and Drug people should not make it mandatory to make iodized salt?

Dr. SCHAEFER. They have established guidelines but there has been no mandatory requirement. There are individual cases, of course, where one may be allergic to iodine, and people are allergic to most other things so that there is a need under certain conditions for noniodized salt.

However, this number is far lower than the vast majority that require it.

Senator JAVITS. Would you classify noniodized salt, except when specially prescribed, as deleterious to health? You see, you have a constitutional question. Unless you can do that as a scientist you probably couldn't enforce it even by statute.

Dr. SCHAEFER. Of course this is the point. There are other foods that supply iodine; marine or fish foods are excellent sources. For one to state that it would be absolutely deleterious to use uniodized salt in an area where the water or other foods have sufficient iodine would not be correct, but I think one can certainly prescribe this procedure in the mapped goiter areas of the United States.

Senator JAVITS. Are there any precedents for this where we have prescribed mandatorily any such action in other food fields?

Dr. SCHAEFER. I am not the best qualified man to answer your question. I am not in Food and Drug.

Senator JAVITS. I am on the Labor Committee and we handle, of course, the Pure Food and Drug Administration in health jurisdiction. I am very interested, and if you have any ideas regarding the Federal authority or the Federal law we certainly want to look into it. I can assure you, Doctor, that we will put the machinery in motion to find out more about this, especially since, as you have turned up, it has a real effect upon a very important strain of a very serious illness.

Thank you very much, Mr. Chairman.

Senator ELLENDER. You said that certain belts were established wherein goiter didn't exist, due to the fact that either the food or the water contained iodine.

Dr. SCHAEFER. The goiter belt I described are areas where the soil and water are lacking in iodine.

Senator ELLENDER. Have those belts been ascertained?

Dr. SCHAEFER. Yes, they were ascertained back in the 1920's, sir, and then the real public health and educational program, iodization of salt was launched in the early 30's.

Senator ELLENDER. Was that done in connection with eradication of that disease which was started 30 years ago?

Dr. SCHAEFER. Yes, sir. The United States was one of the first countries to launch a comprehensive program to combat endemic goiter and at that time the incidence, of course, was much higher. It was around 35 to 40 percent.

Currently in our survey we are finding approximately 5 percent.

However, 5 percent is defined by the World Health Organization as endemic goiter areas.

Worldwide, of course, goiter is probably the No. 1 problem of malnutrition that afflicts over 200 million people.

Senator ELLENDER. May I ask another question?

The CHAIRMAN. Yes.

Senator ELLENDER. Awhile ago I think you stated in your sampling in Texas the income was from $180 per year to $42,000? Did I understand that correctly?

Dr. SCHAEFER. Correct, sir.

Senator ELLENDER. Now, are you able to separate the children in those families where the income is very low from the children where the income is very high and make a distinction as to existence of malnutrition?

Dr. SCHAEFER. At this stage in our analysis of the data, Senator, we have not made that separation because we still have considerable computer programing work to do. We certainly will be able to break this out according to the income groups and this will be one of our high priorities.

Senator ELLENDER. I presume that in the end with this data you are now gathering you might be able to find out the real cause of it.

Dr. SCHAEFER. We certainly trust and hope so.

Senator ELLENDER. And you feel that the data that you are now gathering will be such that you can tell the cause of malnutrition?

Dr. SCHAEFER. We certainly trust we can, sir, correct.

Senator JAVITS. Mr. Chairman, may I ask the doctor to have something in mind as he testifies, as he could be of inestimable help to us.

The problem really divides itself into three parts. You have the first part, which is what we can do something about—are the food distribution programs of the United States adequate to those who, if they didn't get this food distribution in some form, could not make the grade for an average standard of health?

The second problem is—is this attributable not to any economic deficiency, but solely to the fact that people just eat wrong?

Now, we can't lead them around by the hand, or if they won't go to the dentist, or they won't go to the doctor, or they won't eat what is good for them.

What can you do about it? I think that is a legitimate argument against too much Government control.

The third point is: Are there any iodized salt, chemical, or medical deficiencies which we could repair within the government by setting up an apparatus and which, thus far, have escaped us? I don't know if your clinical survey can help us; but, as we have plowed some of this ground in my own committee, and now in this new special committee, those seem to be the real issues. Since you have made a survey, perhaps you might keep our problem in the back of your mind and provide as much help as possible.

Thank you, Mr. Chairman.

Dr. SCHAEFER. I appreciate those suggestions. Basically we have and will furnish you the findings and the attack on the problems. Our sincere hope was, of course, that we could identify what role food donation programs would have on nutritional health.

To date we just do not have sufficient data yet.

Second, we are taking data on food customs and habits that dictate why people won't eat certain foods, and equally important, and I hope if I forget you will remind me, in some of these areas we think solutions can be approached from a food enrichment standpoint.

Senator JAVITS. Thank you, sir.

Senator ELLENDER. I raised the question about the amounts received by these families because it strikes me that if you can take children from families where the pay is $10,000 or $15,000 and find conditions there that are similar to families receiving $1,300, why, it might give us some clues to the fundamental causes. That is why I asked if the data that you are now gathering will be able to give you information so that you can decide or determine what caused, let's say, malnutrition in a family where the income is $42,000, whereas in others it is $3,000 or another $180, as you just said, a year.

It would seem to me that it is important and essential that you be able to present that to the Government and to the people.

The CHAIRMAN. Dr. Schaefer, in connection with that point that Senator Ellender is making, it seems to me that what he is getting at is this: To what extent would you say the hunger and malnutrition

that you found to date is as a consequence of inadequate income as over against ignorance of nutritional standards on the part of the people that you have surveyed?

Dr. SCHAEFER. Senator, I don't wish to try to duck that question except to indicate that from the experience of our team members and the data we have to date these two factors are closely interrelated.

The lack of knowledge on the part of the mother in the family, primarily the mother, on what to purchase or what to feed her preschool children or the other members of her family is interwoven with a squeeze on the food budget.

We are confident that the data basically will show that the prevalence of these findings is going to be much greater in the low-income families.

However, again I wish to state that we have not had sufficient time nor data on higher income groups to make any sort of a logical comparison and we trust that as we get more data in from other income areas we will be able to make this breakdown. We will be able to make breakdowns as to the quarter of the population that we are studying.

The CHAIRMAN. I am a little confused by the economic level that you referred to here awhile ago. I had thought you said you did not make any tests on people who were above the lower one-quarter of the population in income.

Dr. SCHAEFER. This is a point that I trust I can adequately explain. The random selection of our sample population was based on enumeration districts.

Now, this is a district that one census taker handles. It has a specified geographic area. The Census Bureau furnished us a printout of those enumeration districts, ranking them according to the largest percent of people in poverty. Ranking continued until we accounted for 25 percent of the total population within the State.

For example, we had a judge living in one of these enumeration districts. We have had teachers, lawyers, and of course, the majority were in the lower income bracket.

In Texas 54 percent of our families had incomes of less than $3,000, so let's say the vast majority are in the low-income area, but again our sample was based on the 1960 census and we have had enumeration districts that have now turned into either a model city or redevelopment area where higher income groups have moved into the areas.

Dr. Johnson, would you want to add something?

Dr. JOHNSON. I think one other point is that this is an area sampling, as Dr. Schaefer has pointed out, and that in many, particularly rural areas, the enumeration district covers all segments of the population and therefore, we will anticipate finding these people. From our standpoint we are interested in those environmental factors that would also play a role, the types of stores, the medical services available, the types of programs that are available, so that even in the upper income groups that we are looking at we will have groups that come out of the same environment to see what effect this factor has, and I think this is important if we are going to determine which of the very many things that could affect poor nutrition are, in effect, most operative in these low-income groups.

Senator JAVITS. Will the Chair yield.

The CHAIRMAN. Yes.

Senator JAVITS. But aside from the random sampling which takes a district and the high quotient of under-poverty income families, aren't you going to be able to tell us when you get your job done that x percentage of the families you interviewed which make up this finding are families which actually, not just theoretically, have incomes under the poverty level?

Dr. SCHAEFER. Correct.

Senator JAVITS. Are you able to tell us now as you testify?

Dr. SCHAEFER. No; because in our first data analysis printouts all we have is family income. This is not adjusted for size of the family, and any change in cost of living, such as, in rural areas, in different parts of the United States. This is being cranked into our guidelines for assessing what we call the poverty index.

Senator JAVITS. Therefore, at this time we have to depend upon a fair scatter shot that this is a heavily impacted poverty area, as you say, over 50 percent?

Dr. SCHAEFER. Right.

Senator JAVITS. That is the best you have for us now.

Dr. SCHAEFER. This is the best we have for you today.

Senator ELLENDER. In that connection I presume that you will be able to also state whether or not, as you said a while ago, an area has sufficient medical facilities for the inhabitants and whether or not they have these health centers. I think they are scattered all over the country and it might be well to bring that factor in.

Dr. SCHAEFER. Right. We are getting information on this and I would prefer that this kind of specific information be left to the two colleagues who will be following me and who will address themselves specifically to the problems in the two States that we have nearly finished.

The CHAIRMAN. Dr. Schaefer, you gave us definitions of some of the terms. You defined "hunger." You also defined "malnutrition." Can you tell us on the basis of the preliminary findings what proportion of the people you studied so far are suffering from hunger, when hunger is defined, as it is in your statement, to mean lack of adequate food?

Dr. SCHAEFER. I can show this with one of the slides. Concerning the nutrients that we analyzed to date approximately anywhere from 15 to 20 percent of the people are nutritional risks and to us this is an index of malnutrition.

The CHAIRMAN. Is it an index of hunger? You used those two terms. I think sometimes we get confused as to the difference between hunger and malnutrition. How many of those people that you have surveyed are hungry? What percentage?

Dr. SCHAEFER. Senator, we have in our study considered that it was virtually impossible to record the symptom of hunger. This is more a psychological, and at certain times a physiological reaction, subjective in assessment. It is something one cannot measure.

In other words, it is a subjective index and, therefore, on our basis we prefer to use the term "hidden hunger" as being all-inclusive of those individuals that may be walking around unaware that they are a high risk, that may be anemic, and in need of treatment.

We have found it impossible to actually record by interview or by impression the usual connotation of hunger, which is a psychological

reaction and usually occurs in every individual three times a day, that is, the sensation of hunger.

The CHAIRMAN. Yes, but you defined hunger as undernutrition or insufficient supply of food. Can't you measure that from the basis of your survey?

Dr. SCHAEFER. Correct, sir; and on the basis of these findings we are saying that anywhere from 15 percent, up to 20 percent of the population is malnourished as regards the particular nutrients, and one is just as important as the other.

These we consider are in the classification of malnutrition or hunger.

The CHAIRMAN. So it would be correct to say, on the basis of the 12,000 people you have examined so far, that approximately 20 percent are hungry or undernourished?

Dr. SCHAEFER. With the connotation of our definition, this indicates malnutrition.

Senator DOLE. Would that include the group we term as "overstuffed and underfed"? Would these be in that group?

Dr. SCHAEFER. No; this is referring to the low-unacceptable biochemical parameters. If we go into obesity we would probably have a higher figure. We will have those figures.

Senator JAVITS. If the Senator would yield, can you relate the 20 percent to income levels? In other words, have you gone far enough to say that you now have to cut the 20 percent to roughly 54 percent of 20 percent in order to get the possible number of people who, because of deficiency in income, are unable to have adequate nutrition?

Dr. SCHAEFER. Honestly, we have not. However, if I could get into the biochemical evidence I can show you, Senator, that we have broken this down by age groups and I think this is quite revealing, that of the 20 percent overall maximum figure we are talking about you will find, in the tables, that anemia and vitamin A problems are concentrated primarily in the preschool child, where a third of these are malnourished and in 25 percent of the 6- to 10-year-olds. The prevalence then tapers down by age group. This is the only breakdown we have made to date.

Senator JAVITS. So that just to try to extrapolate your figures, you say 20 percent of all you surveyed are subject to malnutrition. Roughly half of all you have surveyed live in families under the $3,000 level, which would cut that figure to 10 percent. If you wanted to apply it to children you would scale that down to 30 percent of the 10 percent so that, roughly speaking, 3 percent of everybody that you interviewed represent children who are in that state of "malnutrition," as Senator McGovern uses the term, to which you could apply your technical definition of hunger or sufficient malnutrition.

Would that be a fair extrapolation? I am just trying to get whatever ultimates we can.

Dr. SCHAEFER. Senator, honestly we have steered clear of making any broad extrapolations because we realize that our sample is biased and that we have only been to a few States and cannot make a broad generalization.

It is our intent, and the way our States were selected, to make geographical comparisons as soon as we can finish and get our data analyzed.

Senator JAVITS. But it is not inapposite, Doctor, I gather from you, pursuant to Senator McGovern's questioning, that 10 percent of those

that you examined show a relationship of malnutrition to income, that is, their income is below the poverty level; and they are in a state of such malnutrition as to amount to what you define as "hunger," using our curbstone term; is that right?

Dr. SCHAEFER. Correct.

Senator JAVITS. That much we did determine.

Dr. SCHAEFER. Yes.

Senator JAVITS. Thank you, Doctor.

The CHAIRMAN. Thank you very much, Doctor.

Dr. SCHAEFER. This represents a trend and a status of our findings today; yes, sir.

Senator JAVITS. Thank you, Doctor.

Dr. SCHAEFER. Senator McGovern, I think in lieu of the fact I have already discussed goiter and iodine, if you are following my speech I will jump to the middle of the page under growth retardation because I think this is one of the key things we are interested in.

As you know, we are interested in determining if the children in our survey population show evidence of growth retardation. The length of most children at birth is similar in both poorly nourished and well nourished populations.

Variations in growth begin to appear shortly thereafter—6 to 9 months. In the sample we have studied thus far, the average height for children between 1 and 3 years of age falls below the average height reported for children in the United States.

Could I have the next slide?

(Graphs and charts are to be found in Dr. Schaefer's prepared statement, pages 734–739.)

This actually illustrates the growth of boys and I trust you can see the red line at the bottom. This is the growth curve of the children we have studied. The middle heavy line is the average growth curve of the U.S. standard.

In other words, had we had normal growth that red line would have laid directly on top of the dark line. It virtually covers the thin black line which is the lower 16th quartile of the curve.

Now, a significant number of this group with below average height were more than 10 percent below the average height for their age. The same trend was noted for girls, and may we have the next slide.

In confirming evidence of growth retardation we had the opportunity of taking the wrist bone X-ray which you saw illustrated in the film. These data are being analyzed specifically for objective evidence of growth retardation.

However, we have only analyzed 120 of the first X-rays in 1- to 3-year-old children. This data indicates that approximately 3½ percent of the children in this age group studied have evidence of growth retardation.

Senator ELLENDER. Caused by malnutrition?

Dr. SCHAEFER. Yes. This relates bone growth to chronological age and has nothing to do with genetics as such and is probably the one best objective test that we can use.

Senator ELLENDER. All of those have been taken that you speak of in Texas?

Dr. SCHAEFER. I am not certain because the analysis is being done by the group at the University of Michigan. All they receive is the identifi-

cation number, age, and sex. We were only able to negotiate this contract right after the first of this year, and these are the first 120 that have been evaluated. I am sorry I can't tell you at this stage where they came from, Senator Ellender.

Senator ELLENDER. The reason why I ask that is I think there is a difference in height and size of the Mexicans and Americans.

Dr. SCHAEFER. Yes.

Senator ELLENDER. That is why I ask the question.

Dr. SCHAEFER. This ethnic difference is being studied. However, one looks at, primarily, differences in our Negro bone growth of the children at this age and the Caucasian and this separation is made.

Standards are available for these ethnic groups.

The CHAIRMAN. Senator Kennedy.

Senator KENNEDY. I have to go on over to the floor just before 12 and I had just one or two questions and with the permission of the committee I will address them.

First of all, Mr. Chairman, I wanted to indicate how pleased I am to be a member of this committee. This is the first opportunity for me to attend these sessions and I want to say how glad I am to be a member of what I think is really one of the most important committees of the Senate, and an area which I feel is of great significance for all Americans.

I am aware of the background in the establishment of the committee and as I am sure Senator Javits and some of the other members of the Labor Committee remember the visit that was made by the Manpower and Employment Subcommittee down into the delta area a little over a year ago from which Senator Robert Kennedy, and Senator Clark, and Senator Javits came back with the most alarming reports.

Since that period of time, I know many members of this committee and other Members of the Senate themselves have been greatly distressed by some of the observations that were made by that committee and I think all Americans are greatly interested and concerned by your report and by the work of this committee.

I know you have only made some rather preliminary samples, Dr. Schaefer, but I would like to, if I may, just get some kind of ideas as to the magnitude of the problem.

You have given reports of the preliminary kinds of samples that you have made. I know we have been trying to cut various lines and we have different kinds of terms and I know some of those terms have been reviewed by the members of this committee and you have defined them, but I do think it is important, to the extent that we can, even with the preliminary findings that have been made, to get some rather clear idea of the dimensions of this problem both in terms of children as well as grown-ups, as to how many really are on the point of starvation.

Now, I know that within that term there are many other considerations, but I think these are the terms that the American people really understand and I think it would be just helpful to us at this time if you try and give us at least some kind of precise answer as it is possible to do this.

How many do you think—both children and adults I think we are interested in—are actually going to be, either because of their mental or their physical growth, impaired as individuals because of the lack of sufficient food and nutrition and proteins?

Dr. SCHAEFER. Senator, we and our advisory group have placed the scientific interpretation that tissue levels of various nutrients, that were below a certain critical level, indicate malnutrition. These levels were established on many years of experience, advice, and counsel of the scientific community. If an individual was found with a level below "acceptable" this individual is a candidate for medical treatment.

It is on the basis of these findings, basically biochemical findings, that we arrived at, for example, 13 percent were anemic—anemic meaning that that person should require medical prescription and treatment.

We found that 16 percent of our sample had vitamin C level—which is found in citrus fruits and juices—at levels that again we consider are real risks, so low that we would not avoid giving them treatment.

We have other examples, plasma protein. This assessment has a relation to nutritional status, and especially growth of children.

We found that 16 to 17 percent of our population had levels that we consider a risk. We are finding differences in States and differences in population groups.

When one averages this out we consider that there are, conservatively speaking, 15 to 20 percent of our population that are in a health risk status.

Now, this could influence physical performance and mental performance. An anemic child coming to school certainly isn't a candidate for good education.

Senator GOODELL. Will the Senator yield?

Senator KENNEDY. Yes.

Senator GOODELL. Dr. Schaefer, I note in two of the breakdowns you indicated for children under 6 years of age—one was the hemoglobin and the other vitamin A—about one-third were unacceptable. You included them in your total of 16 and 13 percent figures, but it is particularly shocking, I think, when you talk about the children under 6 years of age.

Is that generally true? Have you broken it down for all of them to show a larger percentage of unacceptable levels for children under 6 years of age?

Dr. SCHAEFER. These currently represent all the data we have analyzed and, as I say, our data that has come through indicate that 34 percent, for example, of our children zero to six have what we consider anemia.

The American Academy of Nutrition indicates this should be treated immediately. This is the most vulnerable group and this is the group that we are vitally concerned about because anemia causes listlessness and weakness. It is primarily due, although we are getting additional data, getting more in depth studies, to iron deficiency. Milk is not a good source of iron. It has to be fortified. The key sources of iron in our diet today for this population group comes from the cereals.

Senator GOODELL. I don't want to interrupt Senator Kennedy but the point I was making is I don't see a breakdown for children under 6 years of age for serum vitamin C, or serum protein and serum albumin or urinary riboflavin.

Do you have that breakdown?

Dr. SCHAEFER. I will offer an apology. We just haven't time and haven't had our computers set up to give us a complete breakdown.

Senator GOODELL. The complete breakdown you gave us for children was not 16 or 18 or 13 percent in these vital categories. It was one-third and I am wondering——

Dr. JOHNSON. In vitamin C it does not hold true. There is a chart on vitamins that was included. Vitamin C is one of the nutrients that was included in 13 percent, 15 percent, across the board. We have not had the opportunity to break down either serum or serum protein levels. This is simply in process.

I would say it probably would follow this pattern basically that it would be higher in children.

Senator GOODELL. Thank you, Senator.

Senator KENNNEDY. Doctor, in the report I don't see reference to—you talk about growth retardation and some of the other deficiencies—mental retardation—and I am wondering whether you, first of all, feel that this is certainly one of the effects from the protein deficiency or other kinds of deficiencies and whether you have any kind of statistics on that?

Dr. SCHAEFER. Senator, in this kind of study we are unable to do mental evaluation studies. We have taken the premise that there is sufficient evidence in many of these studies our group actually has supported and helped to organize in other areas of the world to indicate that the risk is so great that if there is growth retardation in this early age group, physical growth, the risk is so great and we think the evidence strong enough to imply a detrimental effect on mental development.

Senator KENNNEDY. In this 15- to 20-percent, health-risk status, could you give us any idea, comparing that with other industrial societies, say for the Western European countries?

Dr. JOHNSON. There is relatively little data available from these countries. There are some studies from some of the southern European countries where they have studied similar populations and they find some of the same things we are seeing.

One of the problems that we have in terms of comparison is that the bulk of the data available is from developing countries of the world where people have been more interested in this kind of problem and, therefore, had more energy.

Senator KENNEDY. Would you try and find what information you have on any comparisons that you could make with the industrialized and developed countries and send it over to the committee?

Senator JAVITS. You want the developing countries too, don't you, Senator?

Senator KENNEDY. I would like to, also, ask about if you do have any comparisons with the developing countries.

Dr. SCHAEFER. This we do, Senator.

Senator KENNEDY. Could you give us any kind?

Dr. SCHAEFER. My general answer is, and, I think, we have indicated this in our testimony, that the findings are as serious in the United States, if not more serious than in many of the countries we have studied.

Senator KENNEDY. Could you give us a number of the countries, who we are better than and who we are worse than?

Dr. SCHAEFER. We studied something like 33 countries since the period of 1956 through this last year. Perhaps one of the best com-

parisons because we are using the same virtually identical methodology is our six Central American countries that we just finished, and to which Dr. McGanity will actually be addressing himself. I hate to take his information for this testimony, but, in general, on the incidence of low serium albumin, low serum plasma proteins, vitamin C, to date the figures that we are finding are the same or in some cases higher than the six Central American countries.

We have a breakdown for each one of these nutrients that we certainly can furnish you, Senator.

(The information requested can be found at the end of Dr. Schaefer's prepared statement, p. 750.)

Senator KENNEDY. I would be interested to the extent that you have it from these developing countries if you could be as precise as possible in presenting the materials at a later time to the committee in comparing the United States with these developing situations, with the criteria which you have described in your testimony so that we are able to make some of the judgments as to just where we are in relationship to both developing nations as well as the industrialized countries because I think this is something which is terribly important.

Let me just in one final question ask did you think when you started off, Dr. Schaefer, that this would be as bad a situation as you have come to realize?

Dr. SCHAEFER. I can say I think our group, myself and our group, took an unbiased view, that we wanted to have a scientific appraisal. My personal impression was that we are finding much more than I anticipated in all sincerity.

Senator KENNEDY. By much more you are talking about really the——

Dr. SCHAEFER. Risk.

Senator KENNEDY. You state it.

Dr. SCHAEFER. The real risk, the populations that are a risk are much greater than I personally would have expected and I think this is true of my staff and our consultant advisory board.

Senator KENNEDY. Thank you very much. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Kennedy, before you leave I just want to express my personal gratification that you are newly assigned to this committee. I think you will be of great help to us, and I also want to welcome Senator Cook of Kentucky and Senator Dole of Kansas, both of whom have been presently assigned to the committee.

We are looking forward to the contribution of these Senators. Senator Cook.

Senator COOK. One thing I would like to straighten out, Dr. Schaefer, before Senator Kennedy leaves. The data that you have given this morning in your report is related to your study in Texas and the other nine States are not yet completed. As a matter of fact, some of them have not yet been started. These percentages could really reflect a tremendous change, for instance, when you get into the more industrialized States of New York, Michigan, and California. Right now these studies are really preliminary in nature; is that not correct?

Dr. SCHAEFER. Correct. I stated this many times even this morning to reemphasize that what we are reporting here is a status report and this is data primarily from the first four States, again the majority

coming from the first two States we virtually finished, Texas and Louisiana.

Senator COOK. And a number of these counties studied in Texas, for instance, maybe even a majority, are rural counties as opposed to urbanized counties.

Dr. SCHAEFER. I would prefer to have Dr. McGanity testify on that because he has a real breakdown, but in general that is right.

The CHAIRMAN. Senator Percy.

Senator PERCY. Dr. Schaefer, we like to think in this country that social and economic conditions are improving all the time. I am particularly interested that you felt that this condition of hunger is worse than you had thought it would be.

Dr. Margaret Mead testified several weeks ago that she felt that our present nutritional programs were less effective than those operating prior to and during World War II. In her judgment, the overall nutritional picture in the United States had actually worsened over the past 30 years.

You have certainly shown some surprising figures here that reveal the horrible effects of nutrition deficiency under nutrition. Based on these figures, do you feel that we are making progress in this field, or do you feel that we are actually losing the fight against malnutrition in the country?

Dr. SCHAEFER. I would like to give you my personal opinion and also ask some of my staff members to see what they say because we certainly talked about this.

There are areas that I think we haven't improved hardly at all and in my testimony I have addressed myself to the anemia problem. I have addressed myself to some of the specifics like vitamin D in milk and the goiter problem, that if anything we are slipping away from where we were.

I think it is fair to say that in general, taking the entire population, the food supply, the availability of nutrients, certainly we made tremendous strides. I personally have the impression that we have not kept up with modern technology in food distribution insofar as passing the key nutritional information on to the consumer.

By and large, it is a commodity-oriented ball game, pricewise, marketwise, and in nutrition we are talking about putting the entire mix together to come up with a good adequate diet, and in this regard I think we have a tougher problem than we had years ago.

We have less people growing vegetables and eating different foods and this is an area that we need to get back on the right track again.

Senator PERCY. I may infer from your testimony that during wartime, when an all-out mobilization occurs such as in World War II, we become more concerned about getting the maximum nutritional value from our limited supply of food. We have to make the best possible use of the food available to meet the urgent need for a healthy population. Without the stimulation of a war effort, people have a tendency to disbelieve the existence of malnutrition in certain segments of society because of the general overabundance. In more normal times we ignore these critical problems.

The question is, What is it going to take other than perhaps a committee of this type or a study such as you are conducting to make us realize the extent to which malnutrition exists in the United States?

Dr. SCHAEFER. Senator Percy, I think this is one reason that our group, and when I say our group, we have some tremendous support from the scientific community, many universities throughout the States, have been really pleased to have this chore or have this assignment. It is not a chore to us. It is a challenge and an assignment to determine what the status is today, to define the problem, because we need this kind of base line to say we are moving forward or we need to get more on education or more on food enrichment or a rejuggling or revamping of welfare or food donation programs.

We need to know these problems, and the key ones, and we are sincerely interested in eliminating that risk population, that population enriched as far as malnutrition. I think all people are interested, but we need to find them.

Senator PERCY. Mr. Chairman, do you have time for one more question?

The CHAIRMAN. Yes.

Senator PERCY. I was very interested in the fact that your report mentioned that this is the first comprehensive survey ever developed to assess the nutritional status of the population in the United States. As a layman I am curious to know why such a vital inquiry has not been initiated previously?

Nutrition is a subject which affects both the general level of health and the economic well-being of the Nation. In this connection, I would like you to also comment on the relationship between malnutrition and job effectiveness. This problem could materially affect the ability of a significant portion of the population to hold a job and become productive members of society. These people add to our growing welfare rolls. As a result, a vicious cycle of dependency is perpetuated.

I wonder whether the problem of adequate nutrition lies at the heart of our welfare situation. If this is true, then the formulation of a considered approach to the problem of under nutrition would also be a step toward reducing our soaring welfare costs.

Dr. SCHAEFER. Senator, I don't know who one could blame except all the scientific community, the health authorities, I suppose Congress and all people in not recognizing or really making an assumption that we are in a land of plenty, we have food abundance, and we assume that in this sort of a situation we will not find malnutrition or problems that are the basic underlying cause to proper physiological and mental development.

I think in a way our group, the group that I represent, has been involved for 14 years overseas precisely doing the same thing to assist these countries to first find their problems and to develop self-help programs based on maximum utilization of their manpower resources, their food resources, and I think the situation is pretty much the same in the United States in the areas that we are now approaching.

I see much similarity, the health problems, the food problems, the family planning, the social and economic problems. It isn't just one, but it is a mix of the entire environment that really affects nutritional status and health status.

Senator GOODELL. Mr. Chairman, may I ask a question?

The CHAIRMAN. Senator Goodell.

Senator GOODELL. I would like to clarify what these percentages represent at this stage. What inputs have you had which are repre-

sented by these percentages that are on the board there in the one-third of the children in vitamin C and hemoglobin, and unacceptable levels? Is this primarily the Texas survey that was finished in November? Are these all of the results that you have gotten in from the various 10 surveys you are doing in the States?

Dr. SCHAEFER. Senator Goodell, we do not have all 10 surveys.

Senator GOODELL. I know you don't, but what do you have?

Dr. SCHAEFER. Offhand, I would say that that slide there does not include all of Texas, that we didn't finish the last area of survey in Texas until the 28th of November, and I trust you will appreciate the logistics in back of getting something on the 200 cards per person on a computer and off, so that represents about 60 percent of our Texas data. We set cutoffs. We were asked by this committee to come in with the status report, and we told Louisiana that as they finished 50 percent of their sample to send us all the data so it could quickly be processed, and Dr. Johnson here has been working closely with the other two States to get preliminary information so we would have some idea of trends.

Dr. Johnson, do you want to be more specific?

Dr. JOHNSON. I think probably about 60 percent of the data is in from Texas, a little over 30 to 35 percent from Louisiana, and the rest divided between Kentucky and New York. We tried to bring all the data together since at this time we don't have some of the more sophisticated breakdowns on characteristics that we will have later, and this was simply to show, as Dr. Schaefer said, a status report at the present time.

Senator GOODELL. These percentages represent various inputs that have come from those four States?

Dr. JOHNSON. Correct.

Senator GOODELL. We had efforts made last year to get data by writing to the county health officers in the various counties around the country. Do you have any comment about the reliability of a survey of this nature in indicating the degree of malnutrition shown in this country?

You will recall it was broadcast rather widely that the county health officers said that there is virtually no starvation in their own areas where there was a high level of poverty.

Dr. SCHAEFER. I think in fairness, Senator Goodell, the county health officers, parish health officers, whatever classification they have, are indeed an overworked facility, and many of them do not have the time nor the backup mechanism to really dig in and define malnutrition, and there is a tremendous variation between States. Some States have excellent health facilities with State and county health commissioners and programs. Others are just short handed and have virtually no mechanism for reporting.

Senator GOODELL. Let me put it simply to you: As a nutritionist, you would not rely upon that kind of data as very dependable?

Dr. SCHAEFER. Only if I knew what States and what areas were actually submitting reports because there are some county health officers working directly with some of the States that are well qualified to do this.

In general, I agree with you. To do this across the board I think is an unfair requirement since malnutrition in most States is not even a reportable disease.

Senator PERCY. Will the gentleman yield on that point?

Senator GOODELL. You wouldn't compare the reliability with the data you are developing, the reliability of the general study made by county health officers in response to a letter?

Dr. SCHAEFER. Yes; I will.

Senator PERCY. There are points here we should develop. What is a county health officer, in your judgment, from what you have seen of them? What is their educational background, their competence to deal with this problem? In all the counties you have gone into, how many actually have competent health officers?

Dr. SCHAEFER. Senator, I would prefer not to sit here in judgment of the medical profession in that area. I think that this could be answered by some of the people you will have here from the various States who are on the local level and are much more qualified to give you precise information. My general impression is that certainly they are an honorable, well qualified profession.

Again, we do know that there are many counties that do not have a health officer, and I think Mr. McGanity can address himself to this, that there are so many counties in Texas, not enough physicians to go around, that one-half to two-thirds of the counties do not have a health officer.

Senator PERCY. Are these persons medical people with proper medical backgrounds?

Dr. JOHNSON. Generally the recommendations are followed that they are physicians. Whether they have training in public health depends in large measure where they are and the standards that are set up. I think in terms of nutrition and other related diseases the quality of the staff is more important and in most of them they are grossly understaffed.

All of the chronic disease programs and other programs take up their time, and little time and little effort, is really available for nutrition.

(Dr. Schaefer submitted more information in response to this matter. It will be found on p. 747.)

Senator PERCY. Senator Goodell observed that many of these health officers reported that malnutrition did not exist in their counties. In the light of your findings of fact, would you consider that these officials were qualified to make medical judgments on this question?

Dr. SCHAEFER. I can say that what they will report, Senator, if they really find it, will be the real overt serious case. In the day when we had pellagra, when we didn't need a medical doctor to recognize pellagra, this was easily recognized. They don't see this kind any more. Therefore, there isn't any. Very rarely will they see what we call beriberi, except in a real chronic alcoholic, and therefore they don't see this coming to them. And in many cases there is not a clear-cut distinction between infectious disease, diarrhea, and malnutrition. The usual diagnosis is diarrhea, with no idea whether the diarrhea came first or the malnutrition came first. All that he can report is growth, if he kept height and weight records. Of course he isn't really giving pediatric service, but he has some idea whether that child is retarded in height for his age. If he had a facility, he could even take a blood sample and have it analyzed.

I think this is where we need to come up with some more simple techniques, like hemoglobin, which is easily done, can be done cheaply,

can be done right in the field. You don't have to have sophisticated laboratory equipment.

This he can do, or he can get information from the other doctors in the area. Many times he hasn't recognized that anemia is a problem of malnutrition. The doctor can prescribe a tablet or an elixir, but the fundamental point is, if our food supply is proper and the mother is feeding the child properly, she shouldn't have to rely on this supplement and if she doesn't even know it or doesn't have funds to buy the supplement, the child becomes and stays an anemic child.

Senator GOODELL. Dr. Schaefer, one general question with reference to your survey. You have taken enumeration districts that show a high level of poverty, and you are coming up with these percentages and, assuming they project on a national basis in the 10 or 15 States, it would be a rather shocking indication of the needs that we have here. It may be the need or availability of food to a large portion of the population or a greater knowledge on the part of people of what is necessary in diet to properly sustain the human body. I suspect it is going to turn out to be a major portion of both those factors, the availability of proper food to certain low-income people, plus the knowledge of what is necessary in a diet.

Are you doing any surveys in nonpoverty districts to get a contrast here of your own group to indicate the difference between poverty districts and nonpoverty districts, or do you project on that?

Dr. SCHAEFER. This is, of course, our hope in the second phase. I would like to turn this over to Dr. Johnson, because we have been working with OEO and other agencies, to quickly try to give this answer, and especially New York City.

Dr. JOHNSON. Yes; we are attempting to expand the sample somewhat. There are, of course, restrictions in terms of time and funds but we are going into the other quartiles using the same random selection so that we have again a selection which is a random sample to obtain the nutritional status of groups in each of the other quartiles of the income breakdowns. We don't really have very much information to go on. One of the problems is we would like to take a large enough sample to find what the prevalence is and if the sample is too small, and you don't find any, you have to assume your sample probably wasn't large enough.

In the long-term planning we feel there is an urgent need to maintain some type of surveillance procedure by which we can follow malnutrition as we do with other diseases.

Dr. Schaefer mentioned there has been a tremendous change in our food supply. We aren't eating the way we did. The manufacturer now is doing much of the processing, he is putting things in or taking things out in some cases in order to process foods.

I think in terms of iodine. A number of years ago a survey was made of the use of iodized salt in the processed foods that are consumed. I think this is important in that many people consume more processed foods than are prepared in the home. Only three of some 50 manufacturers routinely use iodized salt in their ready-to-eat foods. We need some sort of a mechanism to follow all of these segments, and the kind of survey we are doing is a one-time operation to get us on a base, but we need to follow these other groups and changes.

Senator GOODELL. One other final point raised in your testimony: You have indicated that we know a great deal more about the nutrition needs of people in underdeveloped countries than we do about the nutrition needs of our own population in the United States.

You indicate in your testimony that, in 1965, we started fortifying nonfat dry milk with vitamins A and D. These vitamins are apparently eliminated when you convert milk to nonfat dry milk. Vitamins A and D, being very essential, were put back into the nonfat dry milk we were distributing overseas.

You indicate we just did this for our own people, in the distribution of nonfat dry milk, late in 1968. What is the reason for a 3-year lag here in terms of our own people and their needs?

Dr. SCHAEFER. I am not sure I can give you the answer as to why the delay. I think from a health and nutrition standpoint we were anxious, most anxious, and actually while the Senator was in charge of food for peace, we got a start on taking a look at improving the nutritional quality of the food that was being shipped overseas and I think this set a pattern. This involved enrichment of cereals and flour.

The next key issue was our working jointly with UNICEF and the CARE agencies, voluntary agencies, to make every effort that vitamin A be added to milk which was accomplished, as I mentioned, in early 1965.

I think in the United States it was assumed that children would have available fluid milk, and again, fluid milk was what I consider as essential for that growing child, with A and D, not skim milk or other milk without the D.

Senator GOODELL. Of course, we were well aware we were distributing large amounts of nonfat dry milk in our donation programs to people in need in this country at that time. The implication, when you are distributing large amounts of nonfat dry milk is that they are not getting the fluid milk, fresh milk.

Dr. SCHAEFER. Right. I am just pleased that at last we do have it available and it does have A and D.

Senator GOODELL. Let me ask you this for the present and the future. Are there not many other examples of fortification of foods in our overseas program that still are not being implemented in domestic donation programs? Are we still way ahead in a large number of other commodities in terms of fortification for overseas as compared to domestic?

Dr. SCHAEFER. Well, we are insofar as, shall I say, special infant foods. However, here I would wish to throw out the caution whether that food can be introduced into our society, our economy, since, regardless of whether we like it or not, it is labeled as sort of food for poor people. It is, indeed, low-cost food. It is, indeed, equal to milk for children because it has been fortified to a nutritionally adequate level.

Experience has indicated some bad experience in trying to introduce such a food even to any poor or low income or poverty group if it is just put on the market for them.

Now, I think, here in this period with the tremendous marketing capabilities that we have, that there are foods, breakfast cereals and

things, that could very adequately do the job that we are addressing ourselves to. Dr. Johnson is basically in food technology, and has been in this game, and I would defer to him if he wishes to add anything.

Dr. JOHNSON. I think in answer to your question there are a number of things we are doing overseas where we have defined problems and we have a single food that is a good vehicle. One of the problems in the United States in terms of fortifying is that we must identify the food that will reach the population we are trying to reach. Our diet is quite diverse compared to Guatemala where 70 percent of the food intake is corn. If you can fortify corn you can bring in many things.

One of the byproducts from our survey where we are collecting considerable information on the frequency of use by these families of various food items and food groups is to consider which of these would be the most practical vehicle in terms of the populations we are looking at for the fortified mixtures, and, I think, this can be of help to the food industry and will have to be implemented in some cases by legislation since there are some restrictions on what you can and can't add into food, but, I think, that one of the byproducts that we are hoping for is the expansion of fortification directed toward the segments of the population that are in need.

Senator GOODELL. I won't quarrel with your generalization about the U.S. diets, but in various sections of the country the staple diet is perhaps not as diverse as you imply the national population staple diet is. There are many areas where they rely on just a few commodities as a staple and eat it every day. Don't you agree this is true?

Dr. JOHNSON. Yes; I think we are finding this in some groups in Texas and here, I think, the consideration is that those products that are providing them with their major source of food are very good vehicles to put in those nutrients that they are looking for. We are finding that in the urban areas where the availability of many kinds of food leads these people into purchasing a much more diverse diet, that now you have had a low-income population trying to compete in terms of food purchases with a population that can afford to buy many of these things, and here we have a little different problem.

Senator PERCY. Will the Senator yield on that point?

Senator GOODELL. I will be delighted to.

Senator PERCY. Dr. Schaefer, it seems to me that on page 25, you came to a preliminary conclusion when you said the adequacy of this, meaning the food donation, supplement to our inadequate diet is questionable and is being reviewed. As you are aware, we have the food stamp program and the food supplement program, but there have been many questions as to their adequacy. I wonder if we are possibly lulling ourselves into a sense of false security with our present programs by thinking we are accomplishing great things through the moving of food in bulk. I wonder whether or not we are really solving any of our basic problems this way, or are we, instead, barely keeping alive large segments of our population. We should focus our efforts on creating a healthy and productive people. This would be a social investment in America's future. The cost of such a program would be more than offset by the increased productivity on the part of those individuals enjoying, some for the first time. the benefits of a well-balanced diet.

Dr. SCHAEFER. Senator, I think I could speak for virtually every person that has worked on our survey teams and the State groups that

have met with us. I think precisely this is their objective: To try to define these programs, regardless of whether they are welfare or whether they are food donation or food stamp, effectively doing the job, and, I think everybody has gone into this with an open mind. I trust that as soon as we get leads or answers the States themselves will take action, and I trust that we will be successful in indicating what contributions they are making to the economy of that family, but our concern is does this have a health impact, is there actually a contribution to improve and insure the health of these people, and this I can assure you is one of the objectives that we hope to get out of this base line study.

Senator GOODELL. I have used the term, Dr. Schaefer, "investment," we tend to think of these food programs a humanitarian programs. Some of us think that it is repulsive to us in this country, in a wealthy country such as we have, that we should have malnutrition, undernutrition, or starvation, so we are humanitarians. We want to spread our bounty. But in effect isn't it an investment in the society to have a healthy productive people? Aren't we a wealthier nation all over if we make the kind of a basic investment that can be made to create a healthier population, and isn't there a correlation between worker productivity time on the job, ability to produce, and the health of that individual?

Dr. SCHAEFER. I don't think there is any doubt about the many things that we haven't, or are unable, to measure, such as morbidity. This means how many days sick does that individual have to spend because he can't fight off a disease, or that he is anemic, more susceptible to. This certainly has an impact on our productivity and most important is to give each child the opportunity to grow to his maximum physical and mental ability, and if mental retardation or mental development is reduced 10 percent as far as his capability, or 20 percent, what does this do to his total productivity?

There were plenty of studies during the war, World War II, that indicate a malnourished population, an ill-fed one, is one that you have problems with. You are subjected to riots and rebellion. Work output is reduced, and one can demonstrate this under real precise tests in the laboratory, showing mental fatigue, reduction of output, on just caloric restriction, what we call general degrees of starvation.

I think there is no doubt that this is the underlying fact in our productivity in our whole society structure.

Senator GOODELL. Mr. Chairman, I was particularly struck by a sentence on page 12 of the report that children younger than 6 constitute 19 percent of the groups "particularly vulnerable to the nutritional stress." I wonder, as a physician and expert in the nutrition field, Dr. Shaefer, could you explain the results to us of the effects, both physical and mental, of malnutrition at this early age, and if society, the American society, does not see the wisdom of making an adequate investment in that child early enough. Is there the possibility that we could never overcome later the adverse effects of malnutrition in that individual as an adult?

Dr. SCHAEFER. Senator, I think you have already had previous testimony on the impact of malnutrition on mental development. I think there is no doubt that probably the crucial period of development is that 1- to 3-year-old, that, during this period approximately 90 percent of brain growth occurs, the number of brain cells as they develop, and

there is sufficient or substantial evidence that certainly indicates that a retardation in growth, just physical size, head circumference, caused by malnutrition is accompanied by a reduction in mental capacity and mental development.

It is on this basis that we maintain, and I think virtually all the scientific community in nutrition and health work, that it is absolutely imperative that we do our best to insure that that child is properly fed from birth at least through these periods, so that he can at least fight for his own food. This is the key period.

As you know, programs are developed for Headstart. This starts at the 4- or 5-year-old group. We haven't had anywhere near the impact on that 1- to 3-year-old group.

Now, there are programs, granted. There are child and maternal health centers and clinics. Our concern are those that do not have these facilities available. This should have No. 1 priority, developing ways and means of reaching them, those that do not have, and there are plenty of them, access to child and maternal health clinics and other health facilities.

Senator GOODELL. My own experience, limited as it is in the field, indicates it is not just a lack of food, but to a great extent among ADC mothers, for instance, hundreds of whom I have talked with and worked with in the South and West Sides of Chicago, it is absolute lack of knowledge as to what to do with that food. What is the role of public health in nutrition education and how effective are the programs in this area? How many people are affected by these programs and what recommendations do you have for their strengthening and improvement?

Dr. SCHAEFER. This is mighty difficult for me to answer quickly, Senator, because, as you know, there are many agencies. I think one of the problems is there are many agencies within HEW and within Public Health Service that have a little niche of nutrition and one of the key problems as we see it is there isn't a central focal point where one can pull together and organize and develop what we would call a comprehensive program. I know if I say one thing I have other groups sitting in back who will say, "Well, we're doing this; we're doing this," through the Children's Bureau or chronic disease programs.

The solution won't be easy except to point out that nutrition is health and it really is an important part of preventive medicine and I think this is why it has been hard to sell. People are not in general interested in prevention. Secure a new heart, fine, but when it comes to prevention this gets low key attention, and we are getting high key attention here. I think this has helped. This has really helped.

The CHAIRMAN. Dr. Schaefer, I think we are going to have to break here for a recess shortly, but before we do there are just a couple of questions with reference to the timetable of your survey I wanted to ask you.

First of all, do you have the funds that you requested for the next five States that you propose to survey?

Mr. LEWIS. Let's say Secretary Cohen said we were advising the House Appropriations Committee of our intention to reprogram. As far as I am aware, there is no difficulty on that front.

The CHAIRMAN. You don't see any problem in getting them?

Mr. LEWIS. I have not been advised of any difficulty and our plans are, as Secretary Cohen outlined here, to proceed.

The CHAIRMAN. You don't actually have the funds in hand at the present time.

Mr. LEWIS. Well, you see, they are reprograming funds out of existing appropriations, and unless we hear something to the contrary we are just proceeding on the basis as we are now of our discussions with the five States. We have two which we are practically ready to contract for.

The CHAIRMAN. You don't anticipate any delay in moving ahead as a consequence of the funding?

Mr. LEWIS. I don't think so.

The CHAIRMAN. We have had some problems on this score in the past, and I would like to have printed in the record at this point correspondence between Senator Clark and Secretary Cohen last year.

(The materials referred to follow:)

MARCH 26, 1968.

Hon. WILBUR J. COHEN,
Secretary of Health, Education, and Welfare,
Washington, D.C.

DEAR MR. SECRETARY: I am most distressed to learn that funds have not yet been made available for the nationwide survey of the incidence and location of serious hunger, malnutrition and associated health problems in the United States, which was enacted on December 5, 1967 as section 14 of PL 90–174, the Partnership for Health Amendments of 1967.

As you know, last July, the Subcommittee on Employment, Manpower and Poverty conducted hearings on the problem of hunger and malnutrition.

At that time testimony by Federal officials established the need for a malnutrition survey.

The Senate subsequently passed S. 2138, Senator Stennis' bill, to provide emergency aid to alleviate serious hunger and malnutrition. As part of that bill, the Secretary of HEW was directed to conduct a comprehensive study of the incidence and location of serious hunger and malnutrition in the United States. The report of the Committee on Labor and Public Welfare accompanying S. 2138, summed up the need for such a survey in the following words:

"Knowledge of the extent and location of serious problems of hunger and malnutrition in the United States is almost non-existent. The Surgeon General of the United States, for example, testified that the Federal Government does not know the extent of hunger or malnutrition anywhere in the United States. Nor, he said, is it the specific job of any Federal agency to find out."

Subsequently, the amendment was incorporated as section 14 of the Partnership for Health Amendments of 1967. Under the terms of section 14, HEW must report to Congress on or before June 5, 1968.

I suggest that immediate steps be taken to assure the adequate funding of the survey so that the report which is sent to Congress on June 5 of this year will fulfill the intent of the Congress and its Committees.

I am taking the liberty of sending a copy of this letter to the Director of the Bureau of the Budget.

Sincerely yours,

JOSEPH S. CLARK.

THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE,
Washington, D.C., May 1, 1968.

Hon. JOSEPH S. CLARK,
U.S. Senate,
Washington, D.C.

DEAR SENATOR CLARK: I regret the delay in responding to your request on the status of funding for the nationwide survey of the incidence and location of serious hunger and malnutrition and associated health problems.

In your letter you express concern that funds had not yet been made available for this survey. Funds have now been identified and work is underway on the survey.

A careful search had to be made of all Department programs to determine those which were legally authorized to support contract work in the nutrition area. Once this was determined, programs had to be identified which had funds available which could be used to carry out this nutrition project. A total of $750,000 has been made available to support this project in fiscal year 1968 and a similar amount for the necessary continued support in fiscal year 1969.

In order to prepare preliminary findings for the requested report to Congress in June, we have undertaken the following steps:

1. Analysis of Children's Bureau study of Mississippi preschool children.
2. Review of Agriculture Department study of food consumption habits.
3. Public Health Service study of relative health status of counties in the United States.

As to the nationwide survey, negotiations for surveys in Louisiana and Texas have been completed. The interviewers on the Louisiana survey are expected to be in the field by May 15. The Texas survey should be underway about a week later. Monthly reports on key findings will be furnished to us starting June 30, 1968.

Discussions are also underway with four additional States: Kentucky, Massachusetts, Michigan, and New York. A basic support contract has been completed for the processing and analysis of the large volume of data which will be a part of the studies.

Sincerely yours,

WILBUR J. COHEN, *Acting Secretary.*

The CHAIRMAN. What is the plan beyond the 10 States that you have now selected? Do you have a format worked out as to just where the survey will go from there?

Mr. LEWIS. No; we do not.

The CHAIRMAN. You just selected 10 States?

Mr. LEWIS. I think, as Dr. Schaefer probably indicated, it was difficult enough to move it up to the 10 States. I think when we surmount the obstacles of actually running this survey on the 10 States, and have a firm report, we probably will be in a better position to indicate what the second phase will be. And I think Dr. Johnson indicated one of the things we would have to do is continue the monitoring activity, but I don't think we can outline at this point, Senator, where we go beyond 10 States. Unless you want to indicate some personal thoughts, Dr. Schaefer?

Dr. SCHAEFER. Senator, we have had an advisory group way back in December of 1966 in which we brought together a panel of 25 specialists and presented the problem: What are the priorities for a nutrition program in the United States?

At that time an outline was developed of urging to get baselined, really, what we are doing now in 20 States, now with one shift; namely, that first phase should immediately go into actually these 10 States that were finally selected and then to take a look and determine whether we could reduce the cost and the time in going to other States by either redefining our procedures or zeroing in on just the key target groups, the most vulnerable. At the same time it involved a surveillance, a continuing program in some of these key regions or States that would continually give us data, so that we would be able really to report to Congress or the committees and the American public on a routine basis. We have some outlines and plans on this.

The CHAIRMAN. In view of the previous interest that was shown in the State of Mississippi, why didn't you select that as one of the 10 States?

Dr. SCHAEFER. Well, actually, we had certainly hoped to go to Mississipi and our choice was either Mississippi or Louisiana. The ne-

gotiations had gone forward to jointly support from reprogramed funds between HEW and Agriculture. We were then informed that the Children's Bureau was actually planning to do a selected study on preschool children, zero to six, and we were notified that the money was not reprogramed. Of course, this was back in October of 1967 and the amendments to the health act didn't actually pass both the House of Representatives and the Senate until December, so we were merely told that the funds were not going to be reprogramed to enable us to go to Mississippi.

Senator COOK. Will the chairman yield?

The CHAIRMAN. Yes, I yield to the Senator.

Senator COOK. Dr. Schaefer, you did indicate earlier in your remarks that you felt there was a void in the Midwest; did you not?

Dr. SCHAEFER. Yes, sir.

Senator COOK. Your selection of States excludes the Midwest, I think it would be interesting if you could get into what is commonly referred to as the breadbasket of America to see whether there is a greater knowledge of the proper consumption of food. I think you may have alluded to this in your remarks.

Dr. SCHAEFER. Correct. As we look over the low-income areas, you know there is a vast section in the Dakotas, right down through there, with Indian reservations. I haven't made a point of this, but we have received permission from the Bureau of the Budget to include this kind of survey and extend it to the Indian reservation populations. We have actually completed a very small study in a Navajo Indian Reservation. We just finished the final study.

There are many different sampling procedures with these populations. This pilot study is primarily to give us information as to how we could best sample and get their collaboration and cooperation. We will look into it again: in the low-income areas which predominantly are occupied by the Indian reservations, the Dakotas, and also down through most of the Midwest.

We are hopeful of getting into the Indian population jointly with the Division of Indian Health.

Senator PERCY. Mr. Chairman, before we recess I would like it to be noted that Illinois is the largest exporting State in the Nation and that agricultural products and agricultural equipment constitute a very large part of our exports. For this reason, I would be most interested in ascertaining what degree of malnutrition exists in southern Illinois and what resources you have available to help us study the question. I can assure you our full cooperation at the State level in this regard.

The CHAIRMAN. Before Senator Kennedy left, Dr. Schaefer, he asked you, as I remember his question, if there were a significant number of cases of starvation, outright starvation, in the United States. I am not sure we understood your answer to that question.

Dr. SCHAEFER. I hope I indicated, Senator, that we consider that there is a significant amount of malnutrition; now, insofar as our definition of starvation and classification by a more or less clinical term assessment, now we have evidence, as you saw in the film of the child, that this is the type of starvation that can lead to death unless it is diagnosed and that child is treated.

So far we have seen, let's say, seven cases actually which were recorded of what we call serious malnutrition, and this is really starvation.

The CHAIRMAN. Is that a large enough number to make any projections on?

Dr. SCHAEFER. No; I would prefer not to make projections on that because we really did not expect to see many, but the key things that we are anxious to get across is the large percentage that have these other risk findings, that unless there is a change in these preschool children they could be prime candidates for this, but we just wouldn't want to make projections on 7 out of 12,000.

The CHAIRMAN. Dr. Schaefer, can you come back at 2 o'clock to complete your appearance?

Dr. SCHAEFER. Certainly.

The CHAIRMAN. Dr. McGanity, could you be here at 2 o'clock? Dr. McGanity is from the University of Texas and, as I understand it, is a major figure in the Texas survey. I think we can complete the questioning of both you, Dr. Schaefer, and also Dr. McGanity this afternoon.

I will ask the committee to stand in recess until 2 o'clock.

(Whereupon, at 12:38 p.m. the committee was recessed, to be reconvened at 2 p.m. the same day.)

AFTERNOON SESSION

The CHAIRMAN. The committee will be in order.

Dr. Schaefer, if you are ready to go, we will be glad to hear the balance of your testimony.

STATEMENT OF DR. ARNOLD E. SCHAEFER, CHIEF, NUTRITION PROGRAM, ACCOMPANIED BY DR. OGDEN C. JOHNSON, CHIEF, DOMESTIC UNIT, NUTRITION PROGRAM; AND IRVING LEWIS, DEPUTY ADMINISTRATOR, HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION, DIVISION OF CHRONIC DISEASE PROGRAMS, REGIONAL MEDICAL PROGRAMS SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—Resumed

Dr. SCHAEFER. Senator, with your permission, I would just like to go back and review some of the highlights of our findings that were really not discussed this morning.

I think one of the problems that we were extremely interested in was the dental situation, the dental findings.

The dental examination includes an evaluation of dental health and the condition of the soft—periodontal—tissues of the mouth.

Granted that all dental findings cannot be claimed to be due to inadequate nutrition, there is an obvious relationship between dietary intake and the dental situation. For example, the presence of caries may be associated with the low intake of fluoride and spongy bleeding gums may indicate vitamin C deficiency.

Poor dental health is defined by increased decayed-missing-filled—DMF—rates. Inability to bite and chew leads to a selection of soft and readily swallowed foods which frequently are deficient in some of the essential nutrients and can lead eventually to overt malnutrition.

The second major cause of inadequate dentition among the aged, periodontal disease; while due primarily to poor oral hygiene and inadequate dental care, it is aggravated by improper nutrition.

The preliminary survey results found 18 percent of all subjects over 10 years of age reported it was difficult and painful to bite or chew food. Ninety-six percent of the sample had an average of 10 teeth either decayed, filled, or missing, with five of these needing immediate attention. When compared to the national average dental findings, the adults examined had six times as many decayed, unfilled teeth.

The lack of dental care is illustrated further by these facts:

In the total sample, only 15 out of each 100 decayed teeth had been filled. In the 5- to 9-year-old group, only three of each 100 decayed teeth had been filled.

The other portion of our presentation that wasn't really covered was the very preliminary data we have on dietary intake.

We all appreciate that this is an essential part of any complete nutrition study, needed to provide information on levels of nutrient intake, sources of nutrients, food habits, preparation practices and attitudes.

These dietary data provide information needed for complete interpretation of the clinical and biochemical results. This information is basic to planning dietary changes and modifying or initiating new programs that have an influence on food habits and intake.

The solution to problems uncovered by clinical and biochemical findings depends upon knowledge of the eating habits and food availability within the area along with a sound program of food.

Distribution, food processing, and marketing and, of course, ability to purchase food within an undernourished population, the dietary intake records will consistently show that intake is 50 percent or less of recommended allowances. Namely, vitamin A, vitamin C, and iron, and primarily we selected these because—as you recall, our biochemical evidence—we had a high prevalence of problems that are specifically related to vitamin A, vitamin C, and iron.

As I mentioned, at the present time the slide indicates that the data is only from a small segment of basically three age groups, the zero to 3-year-old, the 10-year-old, and the aged.

These three groups consumed 50 percent or less of the levels for iron, vitamins A and C.

At the present time, we have completed processing the dietary intake data for only a small segmentof certain vulnerable age groups. This slide shows the percent of individuals from each of the three age groups who consumed 50 percent or less of the levels considered adequate for iron, vitamin A, and vitamin C. Later analyses will give more detailed information on levels consumed for these and other essential nutrients, protein, thiamine, niacin, and riboflavin, as well as calories.

The dietary inadequacies vary between the age groups. Iron intake is low in over 60 percent of the young children. Adolescents and older individuals both have low intake of vitamin A, with almost 40 percent of both groups consuming less than amounts considered adequate.

For example, one-third of the children less than 6 years old were anemic, which was corroborated by our dietary findings that 60 percent

of this age group were consuming less than 50 percent of the recommend allowance.

The same age group also had a high prevalence whose food intake provided considerably less amounts of iron and also vitamin A and vitamin C.

Our studies to date clearly indicate that there is malnutrition, and in our opinion it occurs in an unexpectedly large proportion of our sample population.

One of the major objectives of the national nutrition survey is to determine the prevalence of the various population groups that are in a serious health risk status as a result of their nutritional status.

Inadequate food, caloric, and nutrient intake, if prolonged, results in weakness, fatigue, and inability to carry out the simplest task and, as you know, in its extreme form leads to starvation and death. Degrees of caloric and other nutrient deficiencies manifest themselves in retarded growth in the young child.

Of special concern to us is so-called hidden hunger, in which the individual may not recognize any particular symptom; however, in essence, he has such low nutrient tissue levels that if he is subjected to a continued inadequate diet and/or additional stress such as hard physical labor, infections or chronic disease, his psysiological functional performance is reduced and eventually the physical manifestations of malnutrition will appear.

The preschool child from time of weaning until approximately 6 years of age is the most vulnerable to problems of malnutrition. His well-being is dependent upon the knowledge and capability of the mother to properly feed him and protect his health, supply clothing, and shelter.

The problems of malnutrition are definitely associated with other health, education, social, and economic problems.

I think we discussed many of the other areas sufficiently so that I would primarily just prefer to more or less summarize some of the key findings to point out that in our sample we found a prevalence of one-third of the children under 6 years of age had hemoglobin levels in such a range that they would require treatment for anemia.

We are getting additional data on other nutrients that are involved in anemia, such as folic acid, vitamin B_{12}, and the other nutrients.

However, based on our hemoglobin data, which is perhaps most precise and the easiest and quickest to obtain, the incidence of having one-third of our children at such risk levels we consider highly significant.

We mentioned the goiter problem, the fact that unless one has a goiter that requires surgery, the individual or even the medical profession pays litle attention to it.

We consider that it does not warrant having even 1 percent, let alone 5 percent, of our population subjected to being candidates for enlarged thyroid that requires surgery, especially when it can be prevented at a very low cost.

I just mentioned the dental problems, which obviously are severe, and do have a relationship to the nutritional status when it gets to such a degree that it affects the ability to bite and chew food.

Senator ELLENDER. How much of that is due to lack of dental care? Do you know? Did you try to separate one due to nutrition and the other due to lack of dental care?

Dr. SCHAEFER. We think these go hand in hand.

If you recall, Senator, I gave figures earlier this morning that 4 percent of our population had what we classified as scorbutic-type gums. This is due to a vitamin C deficiency, primarily, granted that there are other health problems that affect the dental structure and the dental condition of an individual. Along with that, we had confirmatory evidence that 4 percent of our entire population had blood vitamin C levels at less than one-tenth of a milligram, which is at really such a low level that if this were continued, one would expect to see real signs of scurvy coming up. Also the fact that nearly 16 percentile of our entire population group had vitamin C levels that we indicated were at risk. We might remember also that vitamin C is necessary for proper bone development, not just calcium. We often forget that some of these other nutrients are involved in proper bone formation, such as the vitamin C.

In addition to the bleeding-type gums involved, there obviously is a need for greatly expanded dental health care. This, I think, becomes very obvious as one relates the number of decayed teeth that require filling.

Basically, it is hard to separate one from the other. They are interrelated. It is both a health and an adequate food intake problem.

Now, the vitamin A picture is one that is disturbing in regard, again, to the high number of preschool children, one-third, that are in the high-risk category.

I think it is fair to point out that vitamin A is involved in proper eyesight. If a deficiency is prolonged, one of the early symptoms one sees is a Bitot's spot, which is a white foamlike appearance on the side of the eye, and a dryness of the eye. This is usually associated with vitamin A deficiency.

The next step is progressive deterioration of the eye tissue, eventually leading to total blindness.

We did not see a case of actual blindness. However, we are saying that with this high risk due to inadequate vitamin A nutrition, we cannot afford to wait until that child has this severe symptom.

I have mentioned the problem on vitamin C, which does not appear to be restricted to any age group.

As you know, vitamin C, the major source of it is from citrus fruits, from tomatoes, and again this takes on the complexion of having all age groups aware of the fact that they need to have these nutrients on a daily basis.

The vitamin D picture, where we did see 18 cases of rickets, again this may not seem high in number, but the fact that 3 percent to 4 percent of all 6-year-olds showed some physical evidence of vitamin D deficiency is certainly reason for concern and concerted action to prevent this.

Senator JAVITS. Mr. Chairman, before the doctor leaves these descriptions of the effects of each of these deficiencies, may I ask him a question?

The CHAIRMAN. Surely.

Senator JAVITS. We are very interested, it seems to me, and if not, we should be, in the effect upon children of these various illnesses so far as making them good learners or bad learners.

For example, in the city schools we have run into children called slow learners, underachievers. Can you describe to us the relationship

between these nutritional deficiencies and the capability of a child to accept normal learning, normal intellectual process, normal activity?

Dr. SCHAEFER. Yes. There are examples. There are specific studies that have been conducted both in the United States and abroad indicating, for example, many of these nutrients.

You take the problem of anemia, where a recent study supported by OEO in Montana documents that children with low hemoglobin levels, actually in the risk population, some not as low as reported today, were given simple tasks, and a measurement was then made to determine mental fatigue, and there was a highly correlated and significant finding that those in an anemic classification were unable to carry out their tasks for a significant period of time.

There was a big difference in the time between those that could address themselves to a specific task which would require putting round sticks in round holes, or do drawings, compared to those that were at hemoglobin levels at an adequate stature.

I think we often forget that one of the really critical problems that has struck the United States, and helped focus attention on nutrition and mental development, happened in 1952, due to a vitamin B_6 deficiency that occurred in a prepared product that was overheated and destroyed this nutrient, and approximately 80 children died in two States.

Probably more significant, or even worse, in a way, were the 300 or 400 that survived. They were mentally retarded for life.

This finding was further substantiated by additional studies in animals that vitamin B_6 not made available in proper amounts can cause serious mental retardation.

We have a number of these examples.

The child that comes to school without breakfast, without proper nutrition, and who is lethargic, is certainly not a candidate for getting the maximum learning, taking advantage of his learning capacity.

You will hear later on tomorrow from a school superintendent from Texas who will reiterate his story and his findings as to the necessity to insure the proper health and feeding of children, if he wanted to get the maximum learning capabilities out of them.

Senator JAVITS. I gather you found the incidence of anemia and vitamin A deficiency the highest among these preschool children.

Dr. SCHAEFER. Correct.

Senator JAVITS. This is the most damaging to the future learning process?

Dr. SCHAEFER. This is the most damaging.

Senator JAVITS. Thank you, Mr. Chairman.

Dr. JOHNSON. I have just one comment.

I think there are two areas that have to be considered here. One is this retarded ability to understand because you are hungry, you don't have enough to eat, which is going to occur in children in school.

I think what we are concerned with is the more important problem, that there are children who are permanently damaged; refeeding when they are 6, 7, 8 years old, giving added food, is not going to overcome this damage.

We cannot do anything about that, when they get into another program. These are children that have to be reached during the first 3 years of life.

Senator JAVITS. At their homes?

Dr. JOHNSON. At their homes.

Senator JAVITS. Thank you, Mr. Chairman.

Dr. SCHAEFER. I would like to make a few comments, because we are collecting data about food donation programs and food stamp plans.

In Texas, only about 8 percent of our families surveyed participated in either of these programs, either food stamp or food donation plans.

This number is too few to enable us to make any correlation of the effect of these programs on the health status at this time.

We anticipate a much greater number of families participating in either program from Louisiana and Kentucky, so that within a few months we certainly hope to have at least an impression of the influence of these programs on the health status of those recipients.

The CHAIRMAN. Dr. Schaefer, in that connection, why do you think there are such low participation as that in the food assistance programs?

Dr. SCHAEFER. Senator McGovern, I would hope that Dr. McGanity can add to this, but it is our impression that many of the people were not aware of the fact that these programs were available, and then you have heard—and I have read much of the testimony that has been given to this committee beforehand—many of the trials and tribulations of getting certified, getting the programs, the lack of transportation.

There have been steps made now to implement and correct some of these, and, I think, Dr. McGanity will also address himself to the plans and programs at the local and at the State level.

The survey team has collected data on food donation and food stamp programs as regards the monetary contributions in Louisiana.

Of the 19 parishes that were in our sample selected, 10 now have food stamp programs, and four commodity distribution programs. This leaves five that had none at the time of our study.

We should keep in mind that in Louisiana, welfare eligibility does not automatically make a family eligible for food stamps.

The average monetary value of these programs per participant during the month of July 1968, when our data was collected, was approximately 17 cents per person per day from the food donation program. It was approximately 23 cents of bonus food from the food stamp plan.

This is considerably lower than we would consider essential to furnish an adequate diet. It does serve as a supplement.

I should like to conclude, Senator, by primarily saying that as the survey continues, we will be correlating the clinical, dietary, and laboratory data with environment, income, education, welfare, food donation programs, and employment information that has been collected as part of the survey.

As additional information is evaluated, I am certain a clearer picture of the problem, and, hopefully, more definitive potential solutions, will be forthcoming.

Copies of the reports on correlations, as well as preliminary reports from each of the States, will be made available to the Department of Agriculture, Office of Economic Opportunity, other Federal agencies,

the State health departments concerned, and especially to this committee, as rapidly as we can assemble it.

One of the greatest rewards my staff and I have received as a result of this National Nutrition Survey is the unstinting, sincere cooperation at the State and local level of health, education, welfare, and agricultural personnel.

Certainly it is our impression that these officials are anxious to define the problem, assess their local resources, and proceed with corrective and preventive measures to the best of their ability.

In the next few days, and even today, you will hear directly from some of these representatives from Texas and Louisiana, in which I trust they will make reference to some of the action programs that they already now have underway.

Texas and Louisiana are already reviewing the educational curricula, kindergarten through senior high school, in reference to strengthening health study units and incorporating additional units with emphasis on nutrition. They are reviewing procedures to get to the mother of the prekindergarten child, introducing the school lunch program as a means of more than just feeding the child once a day, and evaluating and improving breakfast programs.

The one clear-cut point that stands out is the need for improved education and nutrition, health and family planning, and that these are fundamental to long-range plans.

I think, it is also fair to point out, that we do have problems of malnutrition of the magnitudes that I previously referred to, and these certainly require attention as rapidly as possible. Programs for remedial and preventive action against malnutrition can only be effective when they are based on actual health needs.

We are pleased that our group has been offered the opportunity to assist in initiating this National Nutrition Survey.

I thank you gentlemen.

The CHAIRMAN. Thank you very much, Dr. Schaefer.

I think this report, when it is completed, will be an absolutely invaluable document for the purpose of this committee. It will provide us with the scientific underpinning that we must have to make accurate judgments both about the extent of the malnutrition problem, and about some of the things that may be done about it.

I am wondering if, at this point, you can make any preliminary evaluation on the general competence of the food programs that are now operating.

You have made reference to the limited number of people that are participating, but, to those persons who are participating, either under the food stamp program or the commodity distribution program, do you feel that the composition of that program, the way it is handled, is generally effective? Is it doing the job?

Dr. SCHAEFER. I don't think there is any doubt that it accomplishes one mission, and this is that it makes food available, and in this way this supplies or supports their economic status.

I am extremely doubtful whether this has made any real appreciable contribution to the nutritional health of the key vulnerable groups that we are talking about.

I know that Agriculture has extended their programs. It now includes 22 items, but we have yet to find a family on our data to date that are recipients of the complete list of 22 items.

Secondly, again it is our sincere concern that food stamp plans, to be effective, must incorporate within them instructions to the mother on proper purchasing and maximum use of that food stamp dollar.

You are all aware of the problems of putting the money up to obtain the food stamps in the first place. I would hope that this could be virtually eliminated in the future for the real needy.

There are some pilot studies ongoing now jointly between OEO, Agriculture, and Welfare, and the Children's Bureau, which are putting emphasis on placing food on a health need basis, and this currently is reaching a very small percentage. It is this kind of approach that I think in areas where we have need, and people are unable to purchase it, we have the responsibility to see it is used to provide required food.

Whether this would be done by special food stamps for preschool child feeding, without a requirement for a bonus, I am certainly not capable of answering, but I think there is need.

The CHAIRMAN. Senator Javits?

Senator JAVITS. Of course this was the big issue that involved so much heat with the former Secretary of Agriculture. That was the general feeling of the Labor and Public Welfare Committee, after we made a trip out of Washington ourselves, that food should be made available, strictly on a health need basis.

We found, to our dismay, that it couldn't even in some cases be prescribed by the doctor, as if it were medicine, because of the impediments of the law.

It has been claimed that much of this has been dealt with and dispelled. However, I must say that I am very skeptical about that, and I think your figure for Texas bears that out.

Senator McGovern and I were just talking about how appalling it is that only 8 percent of the need is apparently being met.

I am not saying that this is all that is being done, but from what you say, in food distribution and food stamp programs—8 percent in so big and developed a State. I must say that this should give the whole country deep moral concern and great pause. It should make us even more grateful that this committee, under Senator McGovern's chairmanship, and pursuant to his own resolution, has come into being.

There are no ideological differences here. The author of the original resolution was Senator Stennis, who is certainly no wild-eyed liberal, and it is a wonderful thing that that is so, because this is a problem that appeals to the heart of every American.

Senator Ellender is properly proud that his committee is working in the interests of millions of farmers, who produce so much, and they do. This is the greatest agricultural production machine the world has ever known, but somehow or other, we have missed in making all the necessary connections in the human terms which you gentlemen described.

I would like to join with the chairman in expressing our gratitude to you, and especially urging you to do everything you can to accelerate the study and, because it may be a matter of appropriations, authority, and people, I think it is equally part of your testimony to tell us when you think you could complete this, and what resources you need to do it.

We may not be able to deliver them for you, but we can certainly try.

Would you do that for us?

Dr. SCHAEFER. We certainly can.

Senator JAVITS. Do you want to do that now?

Dr. SCHAEFER. I prefer to do it later.

Senator JAVITS. I ask unanimous consent that we may have some communication which will tell us what are the optimum completion dates for your work, and what you need in money and men to accomplish it.

Thank you.

(The information requested can be found at the end of Dr. Schaefer's prepared statement, p. 752.)

Senator ELLENDER. I understood you this morning to say that you had all the money available that you needed. I think we appropriated a little over $1½ million, which is available, as I understand it.

Mr. LEWIS. Yes.

Former Secretary Cohen, Senator, had advised the committee in his last testimony here that he had sent to the Appropriations Committee a necessary letter stating that he had reprogramed the funds in order to complete the survey, including the first five States and the second five States, and as I indicated this morning, money is at this moment, as I see it, no problem for us unless some sudden obstacle develops that we are not at this moment aware of, and that Secretary Cohen before he left office was not aware of, and we are proceeding with the contracts as far as time permits.

I would still like to give you an appropriate communication, but I don't want to leave the committee with the view that money is our problem.

Senator JAVITS. Is there any optimum date by which this can be done?

Dr. SCHAEFER. In all candor, it would be unfair if I didn't point out that the speed with which we get the job done depends also on manpower, and my staff and I are approximately eight in number, and I have had a dedicated staff, but in all candor, and fairness to them, unless we get relief in personnel—and I know that this is an administrative problem—this does have a bearing on how fast we can move.

Senator JAVITS. Give us some idea of the whole picture, so that we know what we can do. It may be we have done all we can, as Senator Ellender has said, and the doctor has said, but let us know.

The CHAIRMAN. Senator Ellender, do you have any more questions?

Senator ELLENDER. No; except that I would like you to get that comparison, if you will, as soon as possible.

You say a third of the children are undernourished. How much of that third come from families that are able to properly provide for them, if they should try?

I think most of it is mental. That is, they don't know any better. This involves not only food, but education, primarily.

Dr. SCHAEFER. Senator, the only generalization we can make to date is that one-half of our families or 54 percent, roughly, are getting less than $3,000 a year income, and if you remember the figure that one-half of those have four or more members per family, this turns out to be a fairly small per capita income basis, and as I told you this morning, we do not have it broken down, but I will be very surprised if this third is not greatly in the group that are in the low-income class.

I am saying this on the basis of other studies that have been conducted in Mississippi, Ohio, and other, smaller studies which indicate

that the prevalence in general is anywhere from 50 percent greater or more in the poor income class.

I am confident we will find correlation with income. There are certain nutritional problems that we think we will find, irrespective of income, and they need another kind of approach, but this shouldn't belittle the fact that in the areas of real need there needs to be a sympathetic and immediate relief of their problems, again based on the health need requirement.

Senator ELLENDER. Another thing you might inform us on, if you are able to do it, is whether or not the States in which you are working have completely cooperated with the Federal Government in providing a food stamp plan and other methods of obtaining food.

I know of my own knowledge that many of them won't cooperate.

Dr. SCHAEFER. This information we will have for you, sir, when we finish the survey.

(The following documents will be printed in the record at this point: Dr. Schaefer's Biographical Sketch; A Summary of the National Nutrition Survey; Prepared Statement by Dr. Schaefer; Response of the Department of Health, Education, and Welfare to Questions of the Select Committee, November 1968; Protocol for Assessment of Nutritional Health Status; National Nutrition Survey Guidelines and Procedures; and Malnutrition at Home and Abroad:)

BIOGRAPHICAL SKETCH OF DR. ARNOLD E. SCHAEFER

Dr. Arnold E. Schaefer is Chief, Nutrition Program, National Center for Chronic Disease Control, Bureau of Disease Prevention and Environmental Control, Public Health Service, Department of Health, Education, and Welfare.

Since his appointment to the Public Health Service on March 1, 1955, Dr. Schaefer has served as Head, Nutrition Section, Office of International Research, National Institutes of Health, and Executive Director, Interdepartmental Committee on Nutrition for National Defense (ICNND), before assuming his present position. Prior to this, he served as Head, Nutrition Research Department, Squibb Institute for Medical Research.

Dr. Schaefer received the B.S. degree from South Dakota State University in 1939 and the Ph. D. degree in biochemistry from the University of Wisconsin in 1947.

Dr. Schaefer is currently President, Federation of American Societies for Experimental Biology. He is a Past President of the American Institute of Nutrition, a Fellow of the American Public Health Association, an Affiliate of the Royal Society of Medicine, and a member of a number of other scientific organizations and fraternities.

Dr. Schaefer has more than 85 publications on nutrition and nutrition health problems, and is co-author of the "ICNND Manual for Nutrition Surveys" and of the published reports of the 35 nutrition surveys conducted under the auspices of the Nutrition Program.

BRIEF CHRONOLOGY OF EMPLOYMENT

Research Assistant, South Dakota State College, Chemistry Experiment Station, 1939–40.

Research Assistant, University of Wisconsin, 1947.

Associate Animal Nutritionist, Alabama Polytechnic Institute, 1947–51.

Head, Nutrition Research Department, Squibb Institute for Medical Research, New Brunswick, N.J., 1951–55.

Biochemist (Nutrition), ICNND, NIH, March 1955–January 1956.

Deputy Executive Director, ICNND, NIH, January–October 1956.

Executive Director, ICNND, NIH, October 1956–June 30, 1965.

Head, Nutrition Section, Office of International Research, Office of the Director, NIH, July 1, 1965–July 31, 1967.

Chief, Nutrition Program, National Center for Chronic Disease Control, Bureau of Disease Prevention and Environmental Control, Public Health Service, August 1, 1967 to present.

MILITARY SERVICE

Commissioned 2nd Lt. Inf., June 5, 1939.
Nutrition Officer, USA, February 1942–February 1946 (Major 1945) (Chief, Nutrition Section, Surgeon's Office, Central Base Section and Western Base Section, ETO).
Lt. Colonel, MSC, June 1956 to December 18, 1964 (Mobilization Designation U.S. Army OSG, Preventive Medicine Division). Retired USA Reserve December 18, 1964.

SOCIETY MEMBERSHIP

American Institute of Nutrition, Association of Vitamin Chemists, American Public Health Association, American Association for Advancement of Science, American Cancer Institute, American Chemical Society, New York Academy of Sciences, and Animal Nutrition Research Council.

HONORS AND OTHER SPECIAL SCIENTIFIC RECOGNITION

Sigma Xi; Gamma Alpha; Fellow, American Public Health Association; Affiliate, Royal Society of Medicine; and Diplomate, American Board of Nutrition.

OFFICES AND COMMITTEE MEMBERSHIPS:

President, Federation of American Societies for Experimental Biology (FASEB), 1967–68.
Past President, American Institute of Nutrition (AIN), 1967–68.
Liaison Member, Committee on Nutrition, American Academy of Pediatrics.
Liaison Member, National Research Council, National Academy of Sciences.
Member, Committee on Geographic Nutrition, National Research Council, National Academy of Sciences, 1967–68.
Member, U.S. National Committee, International Union of Nutritional Sciences (IUNS), 1967–70.
Member, Interagency Group on Evaluation of Nutritional Status of U.S. Children (HEW–PHS, CB; USDA; OEO).
Member, Food and Nutrition Section Council, American Public Health Association, 1967–70.

SPECIAL RESEARCH AND SCIENTIFIC INTERESTS

Epidemiology of nutritional disease and relation to metabolic diseases—cardiovascular, diabetes, and vestical calculi.
International and domestic human nutrition appraisal.
Methodology for assessment of nutritional status.
Nutritional anemias, metabolic effects of protein deficiency in relation to other nutrients.

Summary of the National Nutrition Survey, Department of Health, Education, and Welfare, Public Health Service, Health Services and Mental Health Administration Program

I. Survey development and current status

1. What is the authorization for a national nutrition survey, and what are the survey's objectives?

In a mandate from the Congress under the Partnership for Health Amendments of 1967, the Secretary of Health, Education, and Welfare, in consultation and cooperation with other officials of the Federal Government and of the States, shall make a comprehensive survey of the incidence and location of serious hunger and malnutrition and health problems incident thereto in the United States.

2. How was the survey implemented?

The Nutrition Program of the Public Health Service was designated by the Secretary to plan, develop, and carry out the mandate. An advisory committee composed of representatives from the U.S. Department of Agriculture, Office of Economic Opportunity, Children's Bureau, Office of Education, Public Health Service, and the Office of the Secretary of HEW assisted the Nutrition Program in developing overall objectives, selecting participating states, and in establishing

other general guidelines. The HEW Regional Office personnel initiated contact with the respective states and have assisted the Nutrition Program in implementing the surveys.

Specific methodologies were developed by the Nutrition Program staff in cooperation with a number of professional Ad Hoc committees. Dr. Arnold E. Schaefer, Chief of the Nutrition Program, and many of the Ad Hoc committee members have participated in 33 international nutrition surveys since 1956. These surveys were conducted under the auspices of the Interdepartmental Committee on Nutrition for National Defense, which is now the Nutrition Program.

3. How were States selected for participation in the initial phase of the survey?

The Advisory Committee, with other appropriate officials, agreed on 10 states to constitute the first phase of the National Nutrition Survey. Criteria used to select the states included geographical representation (with both urban and rural representation) and diversity of economic, ethnic, and socio-cultural composition of the states. Additional specific considerations were such factors as concentration of migrant labor, infant, and maternal mortality rates higher than the national averages, and variations in types of food distribution and welfare programs. The findings from the first phase of the survey can be extended to groups having similar characteristics.

Within each state sample, subsamples of groups more vulnerable to nutritional stress were selected for more detailed study. These subsamples include infants, pregnant and lactating females, adolescents, and the aging.

The first 10 states selected were Texas, Louisiana, New York, Kentucky, Michigan, California, Washington, South Carolina, West Virginia, and Massachusetts. Concurrent with the National Nutrition Survey, a pilot study of the Navajo Indian population at Greasewood, Arizona is being conducted to collect baseline data for initiating a food distribution program for that specific Indian population.

4. How is the survey funded?

Reprogramed funding for conducting the nutrition surveys in Texas, Louisiana, New York, Kentucky, Michigan, and New York City, and for basic staff and supporting expenses, was made available by the U.S. Office of Education ($225,000), Social Rehabilitation Services ($225,000). U.S. Department of Agriculture ($100,000), Office of Economic Opportunity ($275,000), and the Public Health Service ($900,000).

For FY 1969, $1.5 million is being reprogramed from Public Health Service funds, and $0.5 million is being added from the Office of Education and the Administration On Aging. This $2 million will fund the five state contracts for Massachusetts, California, Washington, West Virginia, and South Carolina.

5. How are the surveys being coordinated and conducted in the states?

The surveys within the states are conducted on a contract basis at the request and under the statewide coordination of their health departments. Coordinated leadership, supportive planning and development, professional assistance, and contractual funding emanates from the Nutrition Program Office.

In New York, Kentucky, and Michigan the State Health Departments are conducting the state survey. In Texas, the University of Texas Medical Branch at Galveston co-sponsored the survey with the State Health Department, and in Louisiana the survey is co-sponsored by the State Health Department and the Tulane University Medical School.

Additional assistance has been available to the states from the Food and Drug Administration, U.S. Army Medical Research and Nutrition Laboratory and the Office of Economic Opportunity.

6. What are the methodologies, procedures, and standards used in carrying out the surveys?

The methodologies, procedures, and standards published in the *Manual for Nutrition Surveys* are being used as guidelines in developing and carrying out the survey, and in interpreting data collected. The Manual was published by the Interdepartmental Committee on Nutrition for National Defense in 1957, with a second edition being printed in 1963. This committee was composed of representatives from the (U.S.) Agency for International Development, the (U.S.) Departments of State, Health, Education, and Welfare, Defense, Army, Navy, Air Force, Agriculture, Interior, and the Atomic Energy Commission.

The Manual was designed to (a) establish uniformity in methods, techniques, procedures, and guidelines for conducting surveys, (b) outline and define responsibilities and duties of survey team members, (c) provide a guide to inter-

pretation of dietary, biochemical, and clinical data collected, (d) serve as a working reference of major facts essential to proper appraisal of nutritional status, and to aid in interpreting findings in order to draft practical, effective recommendations to alleviate nutritional problems discovered, and to (e) assist in training personnel in nutritional appraisal techniques and to stimulate continued nutritional efforts.

Where indicated, procedures were modified to conform with domestic requirements.

7. What method is being used for selecting the samples to be surveyed?

The sample design for the nutrition surveys in each state was developed by the Nutrition Program in cooperation with the National Center for Health Statistics, Department of Health, Education, and Welfare, based upon tested procedures of the Bureau of Census in its sample surveys. Priority efforts in the first phase of the survey were directed at low income economic areas. A random selection was made of census enumeration district in proportion to the number of families reported in the 1960 Census in the lowest one-fourth income group. This resulted in the selection of enumeration districts to obtain an estimated sample size of about 2,000 households with an estimated 8,000 individuals. Within each enumeration district a segment with an average of about 60 housing units was randomly selected. Finally, on the basis of a random start, an average of about 20 households in each enumeration district were chosen to be invited to participate in the survey.

8. What is the progress status of each State survey to date?

Texas.—Field activities were completed in late November, 1968. Compilation and interpretation of data is now well under way.

Louisiana.—Field activities are approximately 75% complete. Scheduled completion is set for late January or early February, 1969.

New York State.—Field activities nearly 50% complete. Weather dictates field activity progress during winter months.

Kentucky.—Field activities began in the Eastern Kentucky counties in November. Weather is a factor here, also, in determining the progress of the survey team during winter months.

Michigan and New York City.—Field activities to begin in February, 1969.

Navajo Indians Pilot Study.—Survey field activities completed. Data being analyzed.

9. Has the nutrition program given consideration to the development and/or support of preventive and corrective programs related to the problem of malnutrition in the States as a follow-up activity to the survey?

It has become increasingly clear to the Nutrition Program staff that a carefully developed, high priority, major effort of nationwide significance is required to combat malnutrition as a health problem in the United States. As the surveys progress in the various states, this belief continues to be reinforced. There appears to be no doubt but that this growing problem can be greatly minimized, and even eliminated in many instances. This can possibly be achieved through a coordinated and sustained national effort that would involve not only the development of vastly more effective food distribution planning, and related programming of all types, but also must necessarily include an imaginative, practical, and meaningful consumer education program that would reach all people of every age and economic level in the nation.

To date, the Nutrition Program has begun to address itself to the encouragement and support of the development of pilot studies, and demonstration and evaluation programs, in the states related to the broad spectrum of nutrition education. The interest demonstrated by state and local agencies, particularly from education and health personnel, relative to the review and strengthening of this critical area of health education at all age levels has been of such significance that this channel of communication has been encouraged, and assistance rendered when requested.

II. SPECIFIC ANALYSES USED IN THE SURVEY TO ADDRESS NUTRITIONAL STATUS

What are the components of the survey in the examination of family households?

Clinical.—Participants undergo a detailed clinical examination. This includes a medical history (including immunization records), physical examinaton, anthropometric measurements, hand skeleton x-rays (for an objective assessment of physical growth and development) and a dental examination. The clinical exam-

ination places primary emphasis on the presence or absence of key lesions associated with nutrient deficiencies.

Additional tests are incorporated at the discretion of the states. To date these have included parasitology, hearing and sight testing, screening for diabetes, and cardiovascular abnormalities.

Biochemical.—Biochemical analyses are carried out on blood and urine specimens obtained from survey participants to identify the levels of nutrients. This data will be compared to standards to determine the prevalence of the population at risk of health impairment due to specific nutrient deficiencies. The biochemical analyses are the most precise measure of nutritional status of population groups.

Dietary.—Dietary data will be collected and analyzed to estimate nutrient intake and to provide an indication of the nutritional quality of the diets consumed. These data will also assist in the interpretation of the clinical and biochemical results and be of value for planning follow-up programs.

Data will be collected on actual food consumed, frequency of use of selected food groups, and general information on dietary patterns, food sources, and food preparation.

Specific intake data will be collected on households, infants, adolescents, aged, and pregnant and lactating females.

Data will be collected for each locality on availability and participation in food distribution and food stamp programs, school feeding programs, range of food prices for staple foods and related pertinent data.

Socio-economic.—Socio-economic factors related to health are recorded of each household. These factors include the size of the dwelling, family size, water, sanitary and cooking facilities, principal wage earners, income, ethnic group identification, educational level of the occupants and other related factors.

2. How will the data be interpreted?

Data collected will be compared with accepted guidelines, including those set forth in the manual published by the Interdepartmental Committee on Nurition for National Defense. In addition, expert advisory groups are represented by the American Academy of Pediatrics Committee on Nurition, the Food and Nutrition Board of the National Academy of Science, and the Food and Nutrition Council of the American Medical Association to review and interpret the data collected.

PREPARED STATEMENT BY DR. ARNOLD E. SCHAEFER

Mr. Chairman, I welcome the opportunity to appear before this committee to present a current status report on the National Nutrition Survey. At the present time surveys are in progress or completed in four states. It is not possible to make correlations and projections from this preliminary data; these can be made only after results are compiled for the total survey. However, we are finding definite signs of malnutrition in these early results.

INTRODUCTION

The National Nutrition Survey is the first comprehensive survey ever developed to assess the nutritional status of the population of the United States of America. Therefore, it is appropriate to review the rationale of the various components of the study. *Nutrition cannot be divorced from health.* Nutrition is a part of human biology. It is a cross-link between biochemistry and physiology and addresses the intact organism throughout its life span. Adequate nutrition implies the physiological utilization of essential nutrients in the amounts and balance to promote optimum physical and mental function from preconception to death. Thus, a comprehensive nutritional status study must be so designed to reflect the relationship between food intake, utilization, and the total health status. The first indications of malnutrition will be manifested by such signs and symptoms as:

1. retardation of growth;
2. lower serum and urinary excretion levels of certain nutrients; and
3. less efficient physiological performance.

After the early symptoms there will appear various clinical signs such as changes in skin, hair, and eyes. It is only after prolonged malnutrition that the advanced signs—such as the classical deficiency diseases—appear. Extensive research and our experience in thirty-three international surveys support this thesis. Therefore, a comprehensive and meaningful nutritional status study must be designed to detect the early "risk" signals as well as to identify overt signs

and symptoms of malnutrition. The National Nutrition Survey has been planned to achieve this.

The National Nutrition Survey design incorporates:

1. Clinical assessment, including a physical history and examination, various anthropometric measurements such as height, weight, and subcutaneous fat, and bone x-ray measurements.
2. Biochemical measurements of the levels of various substances in blood and urine.
3. Dietary assessment of nutrient intake and usual patterns of consumption.
4. Dental examinations.
5. Related data such as socio-economic status, food sources, educational status, etc.

A more detailed discussion of each of these parameters will be presented later.

THE NATIONAL NUTRITION SURVEY

In order to describe the nutrition study to this committee, I would like to show a short film [1] that is based on one of the initial state surveys, Texas. The film demonstrates the procedures that have been incorporated into the study and also gives some preliminary indications of the types of nutrition problems that are appearing in segments of the United States population.

This film was produced primarily for training and information for the States that would subsequently follow in the national survey. Therefore, it was desirable to include examples of advanced clinical and dental lesions that are associated with malnutrition. Some of the examples were photographed during the progress of the survey. Others were taken from our previous surveys in other countries.

Film.—The film that you have just seen outlines the procedures that are used to collect the nutritional status data in each of the ten states that constitute the first phase of the National Nutrition Survey. These states are Texas, Louisiana, New York (including an additional survey of New York City), Kentucky, Michigan, California, Washington, South Carolina, West Virgina, and Massachusetts.

The progress of each state survey is as follows:

Texas.—Field activities were completed in late November 1968. Compilation and interpretation of data is now well under way.

Louisiana.—Field activities are approximately seventy-five percent complete. Scheduled completion is set for late January or early February 1969.

New York State.—Field activities nearly fifty percent complete. Weather dictates field activity progress during winter months.

Kentucky.—Field activities began in the eastern Kentucky counties in November. Weather is a factor here, also, in determining the progress of the survey team during winter months.

Michigan and New York City.—Field activities to begin in February 1969.

California and Washington.—Dates set for selecting the sample during January 1969.

West Virginia and Massachusetts.—Sample selected in each state.

South Carolina.—Initial contact made and one briefing conference held at the request of the Governor.

The ten states that constitute the first phase of the National Nutrition Survey were selected to represent broad geographic representations, rural and urban populations, and the diversity of economic, ethnic, and socio-cultural patterns within the U.S.A. Other factors such as the concentration of migrant labor, infant and maternal mortality rates, and the variation in types of food distribution and welfare programs were also considered. The data from each of the survey states will be necessary before definitive correlations and conclusions can be applied to all people in the U.S.A. who have similar socio-economic and ethnic characteristics.

METHODOLOGY

The design of the National Nutrition Survey was outlined earlier. We would like to discuss each of these components in more detail. Before doing this, however, we feel it is imperative that terms used be plainly defined.

Nutrition is the science of food and its relation to health. It is the physiological utilization of all the essential nutrients in proper amounts and balance to promote optimum physical and mental function by an individual from preconception to death.

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[1] The commentary of this film appears on pp. 680–686.

Malnutrition is a generic term encompassing undernutrition, over-nutrition, and nutrient imbalance. It is an impairment of health and physiological function resulting from the failure of an individual to obtain all the essential nutrients in proper amount and balance. Malnutrition is a spectrum of (clearly) definable medical entities and may be diagnosed by physical examination, physical anthropometry (measurement of body lengths, and the circumferences, etc.), biochemical and x-ray tests.

Undernutrition is defined for the purposes of this report as the consumption of an insufficient quantity of food or one or more essential nutrients resulting in health impairment.

Overnutrition conversely is the consumption of excess quantity of food or of one or more nutrients leading to an impairment of health.

Nutrient imbalance is the consumption of either an excess or insufficient quantity of one or more essential nutrients producing impaired utilization of nutrients.

Hunger as used in these reports will be considered synonymous with undernutrition.

Starvation (or advanced undernutrition) will refer to insufficient consumption and utilization of calories, the effect of which is wastage of body tissues and ultimately death. In children, the clinical term used for starvation is marasmus.

A copy of the "Guidelines and Procedures" of the National Nutrition Survey which explains in detail the methodologies used in the state surveys is attached (Appendices 1, 2, 3). These guidelines and those used for data interpretation were developed from accepted national and international standards by the Nutrition Program staff in cooperation with a number of professional Ad Hoc committees. The methodologies, procedures, and suggested guides published in the *Manual for Nutrition Surveys* were used as guidelines. This manual was published by the Interdepartmental Committee on Nutrition for National Defense in 1957, with a second edition being printed in 1963. This committee was composed of representatives from the (U.S.) Agency for International Development, the (U.S.) Department of State; Health, Education and Welfare, Defense, Army, Navy, Air Force, Agriculture, Interior, and the Atomic Energy Commission. A copy of this Manual has been distributed to the Committee members.

Clinical

The purpose of the clinical assessment component of a nutrition survey is to detect physical signs and symptoms of deviation from health due to malnutrition and includes:

(1) A medical history and physical examination. In general, the physical examination evaluates long-term nutritional history as was explained earlier. The medical history, which is designed to obtain prevalent disease patterns such as infections or parasitic infestations which influence absorption and metabolism of nutrients independent of dietary intake, is useful in assessing interrelationships of nutritional status and disease.

Some of the symptoms and signs associated with malnutrition are defined below:

Bitot's spots

Well-demarcated, superficial, dry, greyish or chalky-white, foamy lesions, triangular or irregular in shape, more often confined to the regions lateral to the cornea and never overlying it.

Angular Lesions

Angular stomatitis: The term is used to described lesions associated with cracking of the angles of the mouth. The cracks may be shallow or deep.

Angular scars: Healed lesions of angular stomatitis may appear pink or blanched depending on the time elapsed.

Spongy, bleeding gums (when associated with vitamin C deficiency): Purplish, spongy swelling of the soft tissue between the teeth and/or gum margins. May bleed easily on slight pressure.

Thyroid enlargement

The gland is visibly and palpably enlarged. The enlargement may be diffuse or nodular.

Follicular hyperkeratosis

The lesion consists of thickening and hardening of the skin surrounding the hair follicles. It is readily detected by the spiky feeling it gives when the palm

is passed over the lesion. The surrounding skin is dry and lacks the usual amount of moisture and oiliness.

Edema

Usually apparent over ankles and feet and may extend to other areas of extremities. In early stages detected by firm pressure for a few seconds on the skin. The sign is taken as positive if there is visible and palpable pit that persists after the pressure is removed. (Associated with low serum albumen.)

Winged scapula

May be a sign of loss of muscle tone and wasting.

(2) Anthropometric studies are incorporated in the clinical assessment of a nutrition survey to help determine the effect of nutrition on physical growth and development.

(3) Bone x-ray measurements afford quantification of developmental status, regardless of body build, which complicates comparisons of different populations. Bone changes are also seen in nutritional deficiency conditions such as rickets, osteomalacia, infantile scurvy, fluorosis and protein-calorie malnutrition.

Biochemical Measurements

Biochemical measurements of the levels of various substances in body tissues and fluids reflect current or recent nutritional status. Depletion of body stores of nutrients is the first step in the development of nutritional deficiency disease. As the deficiency progresses, functional impairment occurs, and finally the physical changes characteristic of a clinically manifest deficiency disease appear. Biochemical measurements, therefore, allow an identification of risk populations as well as populations with frank malnutrition.

Dental Examination

The dental examination includes an evaluation of dental health and the condition of the soft (periodontal) tissues of the mouth. While all dental findings cannot be claimed to result from inadequate nutrition, obvious relationship to dietary intake exists. For example, the presence of caries may be associated with a low intake of fluoride, and spongy bleeding gums indicate vitamin C deficiency. Poor dental health is defined by increased decayed-missing-filled (D.M.F.) rates. Inability to bite and chew leads to a selection of soft and readily swallowed foods which frequently are deficient in some of the essential nutrients and can lead eventually to overt malnutrition. The second major cause of inadequate dentation among the aged, periodontal disease, while due primarily to poor oral hygiene and inadequate dental care can be aggravated by nutritionally determined caries and diseases of the gums.

Dietary

Dietary intake data is an essential part of any complete nutrition study, needed to provide information on levels of nutrient intake, sources of nutrients, food habits, preparation practices and attitudes. These dietary data provide information needed for complete interpretation of the clinical and biochemical results. This information is basic to planning dietary changes and modifying or initiating new programs that have an influence in food habits and intake. The solution to problems uncovered by clinical and biochemical assessments depends upon knowledge of the eating habits and food availability within the area along with a sound program of food technology.

Other related factors

A variety of non-nutritional factors affect food choices and intake. A nutritional status study must include data collection of these items for a complete assessment of possible causes underlying malnutrition and to provide a basis for future planning. Examples of some of the related factors are:

(1) Welfare programs.
(2) Food distribution programs.
(3) General food availability.
(4) Health and educational facilities.
(5) Socio-economic and ethnic characteristics.

NATIONAL NUTRITION SURVEY SAMPLE

To date twelve thousand individuals have been studied. Preliminary data processing has begun on sixty to seventy percent of this group. The trends we present today may continue as further data become available. However, assump-

tions should not be made that this will occur. This preliminary data should be viewed as describing only a sub-sample of the total national survey.

The National Nutrition Survey was designed so that the first phase would place priority on low income areas. A random selection was made from Bureau of Census enumeration districts where the largest percentage of families were living in poverty. The universe from which the sample was drawn represented twenty-five percent of the state's population and the lowest income quartile based on 1960 census data. This resulted in a selection of approximately one hundred enumeration districts per state with twenty households selected from each enumeration district. This would then yield six to eight thousand individuals from two thousand households per state. The estimated sample size for the ten states will include approximately seventy thousand individuals. To date, the majority of families falling within the sampling technique have had annual incomes less than $3,000. Approximately eighty percent have had incomes less than $5,000. Figure 1 (see p. 732.)

We do not have the complete summary of the per capita income status but certain meaningful data are available:

1. Forty-nine percent of the households with incomes less than $1200 were a one-person family.
2. One-half of the families with incomes less than $3,000 had four or more family members.

Obviously, any correlations of nutritional status and economic status must await more refined analysis even though early trends suggest that the economic status may be an important underlying factor in the families' nutritional patterns. Incomes ranged from $180 to $42,000 per annum. Over fifty percent had incomes less than $3,000 annually. (Cash income only.)

Final data analysis will take into consideration such factors as income other than cash, e.g., commodities, free school lunches, home produced food, etc. to make more meaningful economic data.

In addition to income, some other characteristics of the sample are:

1. Fifty-five percent of the sample examined has been Negro.
2. Twenty-five percent of the families have been Spanish-American. Forty-one percent of this group spoke Spanish as the principal—and most frequently—the only language.
3. An age distribution of the groups particularly vulnerable to nutritional stress shows:

Children 0–6 years constituted nineteen percent of the total group. Children 10–16 years constituted twenty-five percent of the total group.

Adults 60 years and older constituted thirteen percent of the total group.

4. Only fifty percent of the male respondents reported that they worked full time in the month and year preceding their examination at the clinic.

CHARACTERISTICS OF MALNOURISHED POPULATIONS

It is possible to identify biochemical and physical variations between well-nourished and poorly nourished groups. Primarily, one should not find signs of undernutrition in a well-fed population except in the presence of a disease state which could precipitate nutritional stress.

Extensive international surveys (reference to Interdepartmental Committee on Nutrition and National Defense) have shown:

(*a*) that five to thirty percent of an undernourished population will have serum and excretion levels below an acceptable limit as defined in the guidelines.

(*b*) Children in under-nourished populations are retarded in physical growth; their mean height per age is five to fifteen percent less than that observed in well-nourished populations.

(c) A significant proportion will exhibit clinical signs of undernutrition. This will vary from less than one percent to five percent.

(*d*) Dietary intake records will consistently show that intake is fifty percent or less of essential nutrients.

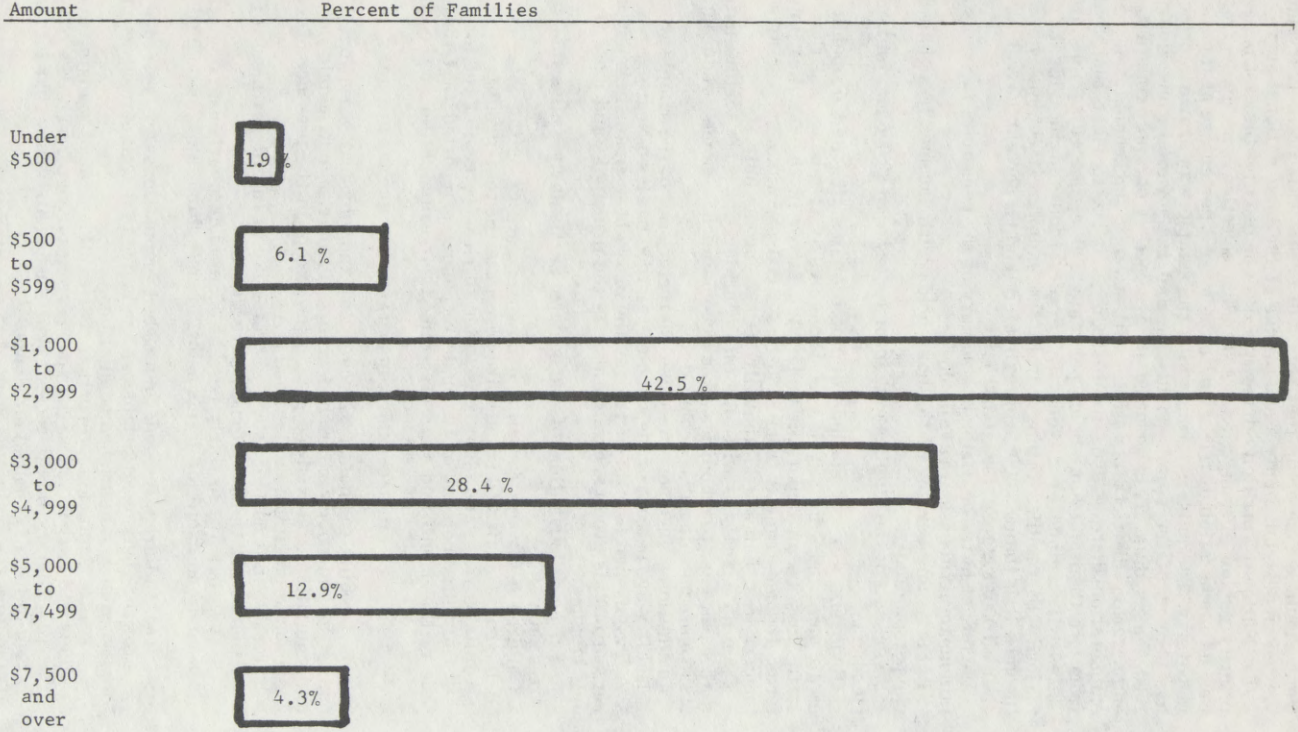
Guidelines for evaluating each of these parameters were discussed and are attached. (Appendix No. 3.)

PRELIMINARY FINDINGS

The preliminary data clearly indicates an alarming prevalence of those characteristics that are associated with undernourished groups. Even though these findings come from a small sub-sample of the total National Nutrition Survey, it is

Figure No. 1

ANNUAL FAMILY INCOME



unreasonable in an affluent society to discover such signs as those seen to date. Let us look at some of these:

Clinical findings

When one recalls that clinical symptoms are apt to appear only after prolonged inadequate nutrition, the following findings are of greater concern.

(*a*) Three and seven tenths percent of the 0–6 year old subjects show evidence of vitamin D deficiency: eighteen cases of rickets have been diagnosed.

(*b*) Four to five percent of the subjects exhibit either/or both winged scapula and pot-belly. These findings are associated with protein/calorie malnutrition.

(*c*) Five percent of the total population examined to date exhibits an enlarged thyroid gland associated with low iodine intake. The World Health Organization classifies an area as having endemic goiter when five percent of the population has enlarged thyroid glands.

(*d*) Eight cases of Bitot's Spots (frequently attributed to vitamin A deficiency) have been noted and confirmed.

(*e*) Other changes in hair, skin, and lips which may be indicative of poor nutrition have been noted.

Dental

All dental findings cannot be claimed to be a result of inadequate nutrition, but they have obvious relationship to dietary intake. For example, eighteen percent of all subjects ten years of age and over reported it was difficult and painful to bite or chew food. Ninety-six percent of the sample had an average of ten teeth either decayed, filled, or missing, with five of these needing immediate attention.

When compared to the national average dental findings, the adults examined had six times as many decayed, unfilled teeth.

The lack of dental care is illustrated further by these facts: In the total sample, only fifteen out of each one hundred decayed teeth had been filled. In the 5 to 9 year old group, only three of each one-hundred decayed teeth had been filled.

Growth retardation

The length of most children at birth is similar in both poorly nourished and well-nourished populations. In the sample we have studied thus far, the children between one and three years of age fall below the average height reported for children in the U.S.A. In our sample, three times the expected number of children fell below the sixteenth percentile. This percentile is represented by the lower light line in Figures 2A and 2B. A number of this group was more than ten percent below the average height for his age.

Wrist bone x-ray data are being analyzed for further evidence of growth retardation. Analysis of the first 120 x-rays of these children indicates that about three and one-half percent of these children had retarded growth. As further data are available and correlated the significance of this will be established.

Biochemical analyses

The laboratory findings indicate that the sample studied thus far has characteristics of poorly nourished populations. (Figure No. 3, p. 736.) Guidelines for evaluating these blood and urine levels were mentioned earlier and appear in the Appendix. Levels are considered to be less than acceptable when they approximate the levels associated with disease status or when the levels are sufficiently low to constitute a risk status. Nine to nineteen percent of all ages in this sample had blood and urine levels that were less than acceptable. These results are similar to and in some cases worse than the results from nutrition surveys of developing countries around the world.

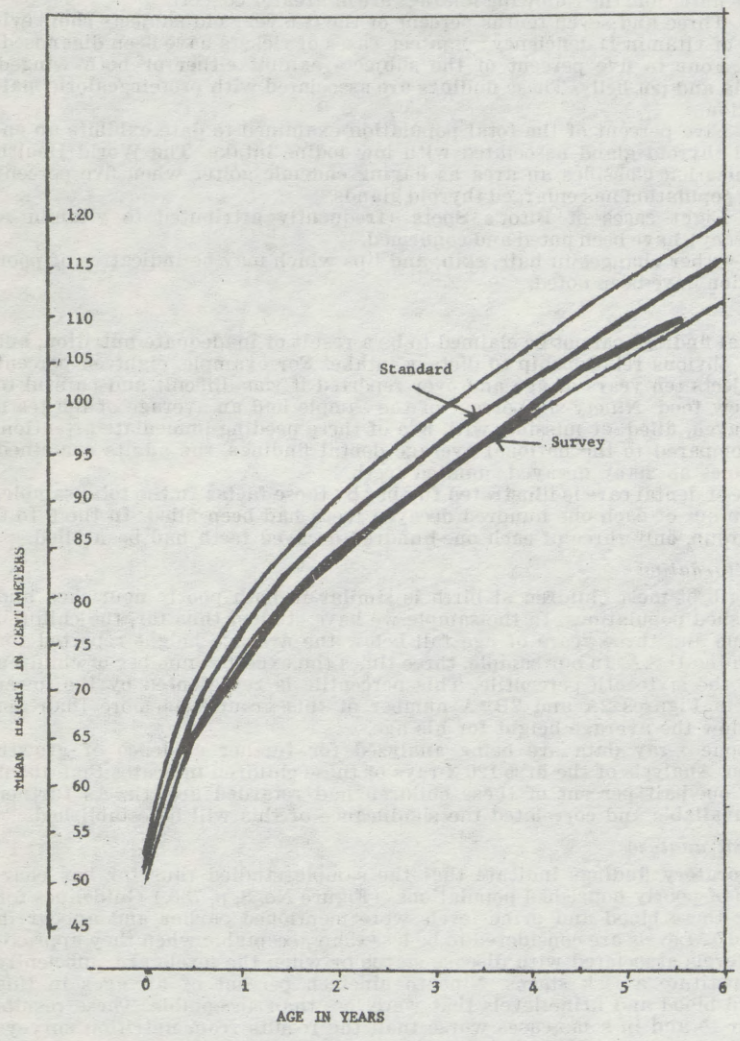
Of more interest are the laboratory findings for various age groups.

Hemoglobin Levels: an index of anemia: One-third of the children under six years of age had hemoglobin levels in the unacceptable range. (Figure No. 4, p. 737.) While the prevalence declined in older age groups, there still are a large number with hemoglobin levels that are usually associated with poor nutritional health. Perhaps it is pertinent to state that the cut-off level for hemoglobin was set at that level considered by physicians to need treatment.

Vitamin A: The findings for vitamin A present a somewhat similar picture. (Figure No. 5, p. 738.) The population less than six years of age has the highest percent of persons with unacceptable levels. Thirty-three percent of that group were at unacceptable levels. These findings are characteristic of those reported from areas of the world where vitamin A deficiency is a major problem.

Figure No. 2A

HEIGHT (CM) AND AGE RELATIONSHIP FOR BOYS
UNDER SIX YEARS OF AGE
NATIONAL NUTRITION SURVEY, 1968



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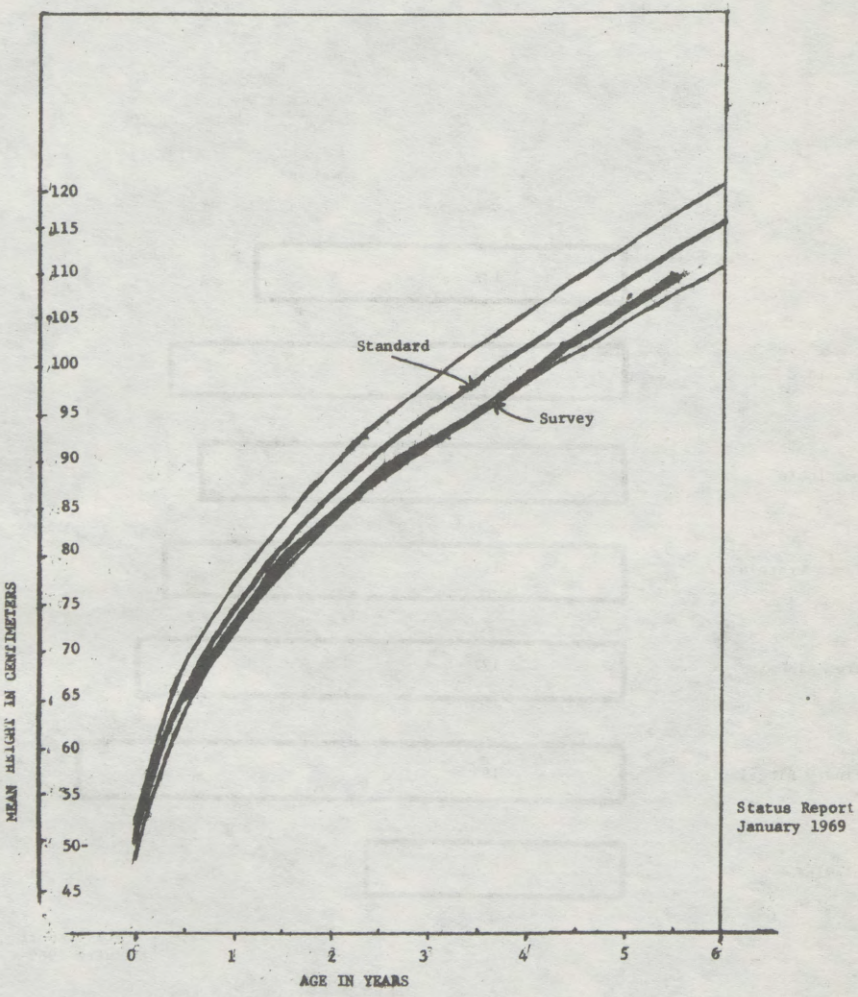
In population studies it has been suggested that where five percent or more of the sample has values within the less than acceptable range, this constitutes evidence of vitamin A deficiency within the population. This is also the level at which night blindness appears.

Vitamin C (Ascorbic acid) : Serum vitamin C levels were less than acceptable in twelve to sixteen percent of all age groups. (Figure No. 6, 739.) Four persons of the total age group had scorbutic type gums. These findings suggest that the intake of food supplying vitamin C is reduced among all ages. Preliminary dietary intakes tend to confirm this. Once again, the percentage of individuals with

Figure No. 2B

HEIGHT (CM) AND AGE RELATIONSHIP FOR GIRLS
UNDER SIX YEARS OF AGE
NATIONAL NUTRITION SURVEY, 1968



unacceptable serum levels is characteristic of reports from poorly nourished populations. This is added evidence of malnutrition within the group studied thus far.

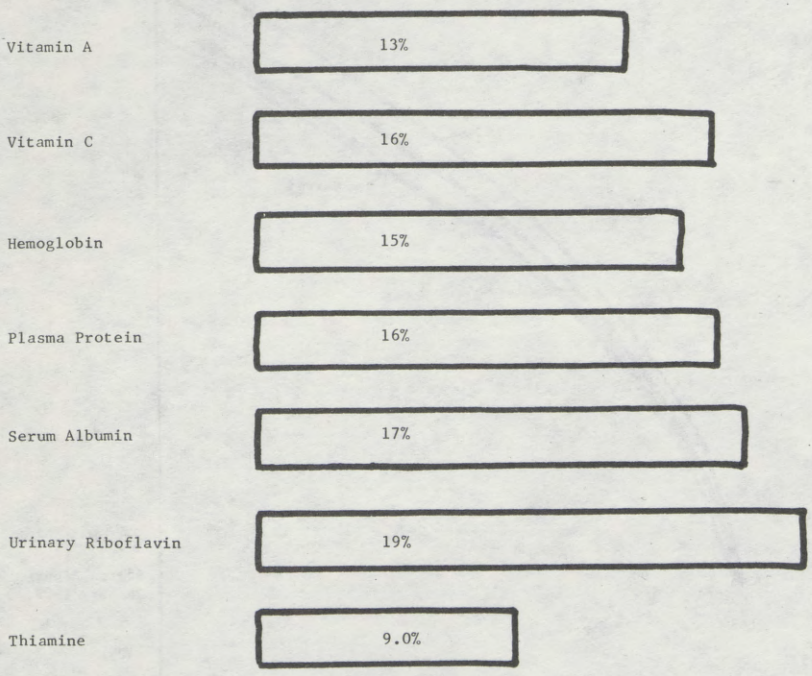
Serum protein and serum albumin: Sixteen and three-tenths percent of the overall population had levels for serum protein at less than acceptable levels. Seventeen and one-tenth percent had unacceptable levels of serum albumin. We have found values in our sample that are considerably less than those we have observed in populations where protein deficiency is a well-defined clinical problem.

Figure No. 3

Laboratory Findings

Percent of Population with Less than Acceptable Levels

(All Age Groups)



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Urinary riboflavin and urinary thiamine levels: Urinary riboflavin and urinary thiamine levels are low in a substantial portion of the total sample studied to date. Fewer analyses have been completed for these two nutrients. Within the first twenty-four thousand urine samples, nineteen percent of the population had less than acceptable levels for urinary riboflavin and nine percent for urinary thiamine.

Dietary: At the present time we have completed processing the dietary intake data for only a small segment of certain vulnerable age groups. Figure No. 7 (p. 740) shows the percent of individuals from each of the three age groups who consumed fifty percent or less of the levels considered adequate for calories, iron, vitamin A and vitamin C. Later analyses will give more detailed information on

Figure No. 4

HEMOGLOBIN LEVELS

Percent of Population with less than Acceptable Levels

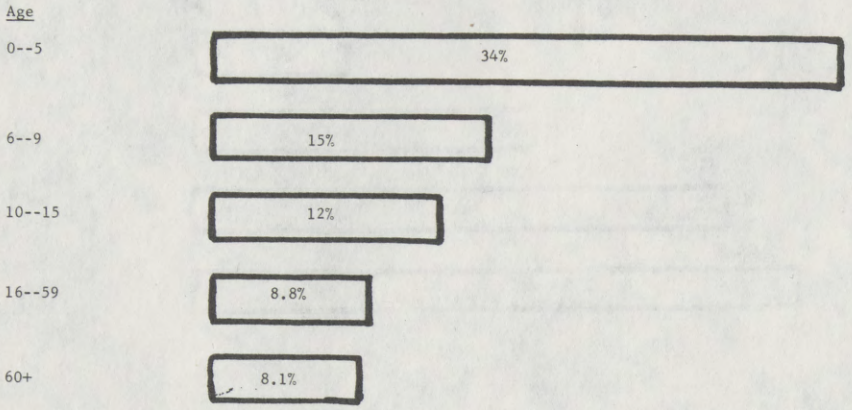


Figure No. 5

SERUM VITAMIN A LEVELS

Percent of Population with Less than Acceptable Levels

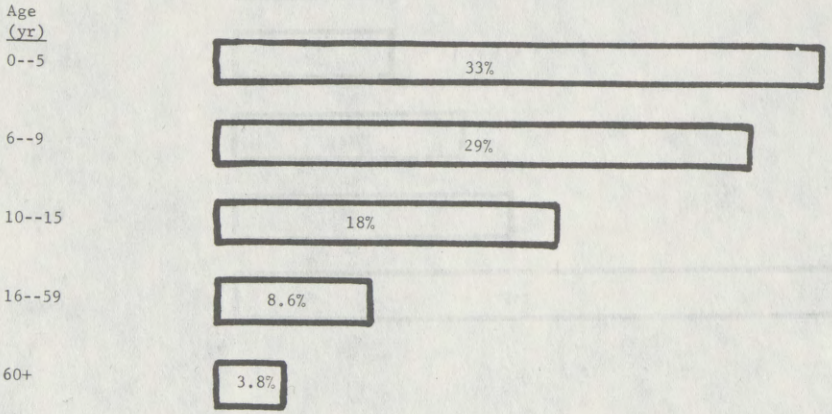
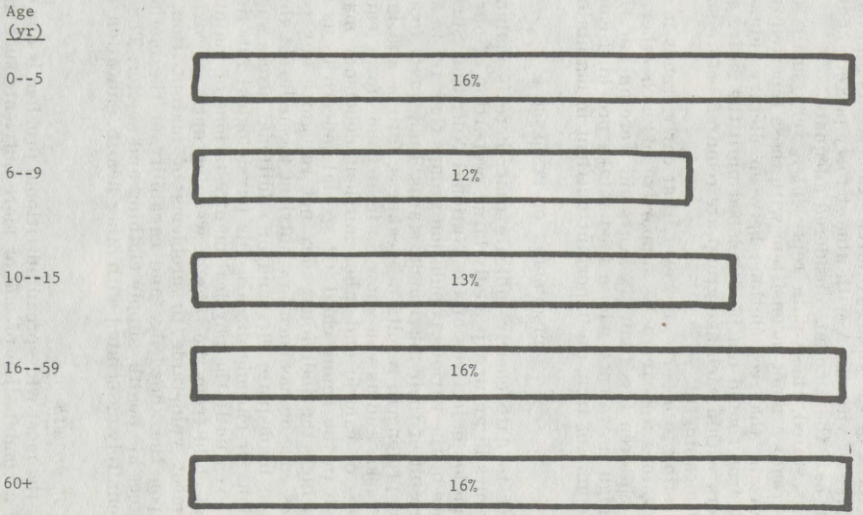


Figure No. 6

SERUM VITAMIN C LEVELS

Percent of Population with less than Acceptable Levels



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levels consumed for these and other essential nutrients, protein, thiamine, niacin, and riboflavin.

FIGURE NO. 7—NUTRIENT LEVELS FROM DIETS CONSUMED

[Percent of individuals who consumed 50 percent or less of standards considered adequate for selected nutrients]

Age	Iron	Vitamin A	Vitamin C
0 to 36 months	63	20	40
10 to 16 years	33	39	32
60 years and over	18	39	30

The dietary inadequacies vary between the age groups. Iron intake is low in over sixty percent of the young children. Adolescents and older individuals both have low intake of vitamin A with almost forty percent of both groups consuming less than half the amount considered adequate.

Although as stated, these data represent a very small segment of the total group, these trends are not inconsistent with those reported from smaller studies.

It is important that correlations between dietary intake, clinical and biochemical patterns should not be developed until the entire survey is completed. Large numbers within each age group are required before such correlations can be valid and meaningful.

It is interesting to observe, however, that early trends in certain dietary and biochemical values appear to be supportive of each other. For example, one-third of the children less than six years old were anemic. The same age group also had a high prevalence whose food intake provided considerably less than adequate amounts of iron, an important nutrient in maintaining adequate hemoglobin levels.

DISCUSSION OF FINDINGS

Our studies to date clearly indicate that there is malnutrition, and in our opinion it occurs in an unexpectedly large proportion of our sample population. One of the major objectives of the National Nutrition Survey is to determine the prevalence of the various population groups that are in a serious health risk status as a result of their nutritional status. Inadequate food, caloric and nutrient intake, if prolonged, results in weakness, fatigue and inability to carry out the simplest tasks, and as you know, in its extreme form leads to starvation and death. Degrees of caloric and other nutrient deficiency manifests itself in retarded growth in the young child. Of special concern to us is so-called "hidden hunger" in which the individual may not recognize any particular symptom; however, in essence he has such low nutrient tissue levels, that if he is subjected to a continued inadequate diet and/or additional stress such as hard physical labor, infectious or chronic disease, his physiological functional performance is reduced and eventually the physical manifestations of malnutrition will appear. The preschool child from the time of weaning until approximately six years of age is the most vulnerable to problems of malnutrition. His well-being is dependent upon the knowledge and capability of the mother to properly feed him and protect his health, supply clothing and shelter. The problems of malnutrition are definitely associated with other health, education, social and economic problems.

Retardation of growth

In general, the most widespread nutritional problem is one of multiple nutrient deficiency of a combination of one or more nutrients such as protein, vitamins, minerals and calories. It is important to bear in mind and perhaps shocking to realize that the problems in the poverty groups in the United States seem to be very similar to those we have encountered in the developing countries.

Overall health status is better probably due to the better environmental sanitation (pure water, safe food supply, and waste disposal systems). Also medical care, though limited in many areas, is still more available in the United States than in the developing countries.

Height and weight measurements for age provide the simplest means we have for assessing early growth status. The data of this status report of the National Nutrition Survey seem to indicate that we do have growth retardation in the 1 to 6 year old child. In addition to the growth curves figure, we have preliminary evidence of this retardation from our wrist bone x-ray analyses.

Analyses of a very small number (120) of x-rays from children reveal retarded bone growth in 3.5 percent. Of even greater consequence and more concern are the usual undetected detrimental effects of early malnutrition on the learning ability, mental and neurological capacity and behaviour of children who survive impaired physical growth.

I wish to re-emphasize that all essential nutrients must be provided to man as well as to lower animals at adequate levels to insure optimal growth and development. Our findings on the high prevalence of anemia, reduced serum albumin, vitamin A, and vitamin C levels and urinary riboflavin clearly indicate the seriousness and magnitude of the problem.

Consuming a diet with only one nutrient restricted at a sub-optimal level is reflected in reduced tissue stores in chickens, rats, dogs, pigs or any animal and results first in retardation of growth. At sub-optimal levels of nutrient intake animals may continue to live and grow at a slow rate, but they are not productive from an economic standpoint. The farmer or the petowner today in the United States need not worry about the nutritional adequacy of the formulated animal feed since these are produced to insure adequate levels of all nutrients. This is not the case for man. Our diets are based on our knowledge of what food selection will provide the required nutrients, customs, personal preference, and cost factors. Lack of knowledge of food needs or insufficient money to purchase food needs can result in the consumption of a poor diet and lead to malnutrition.

To date in our studies we have found seven cases which the physician diagnoses as severe malnutrition using such terms as kwashiorkor (severe protein and multiple nutrient deficiency) and marasmus, primarily a caloric deficiency. We did not expect to find such cases in the United States. In the majority of these cases a universal contributing factor was a lack of knowledge on the part of the mother. How to feed the child and lack of proper health care for these cases is often complicated by infectious disease or diarrhea. In many of the developing areas where we have worked, Africa, Latin America, and Asia these severe cases of malnutrition only rarely are found; they either are hospitalized or have died.

Vitamin A. Problems

Of primary concern to our group who have worked in the international field is the fact that non-fat dry milk which has vitamin A and D removed, was distributed under the food commodity distribution program primarily to the poverty groups. In 1965 our office was instrumental in having AID and Agriculture fortify non-fat dry milk with vitamins A and D to be shipped overseas. It was not until the fall of 1968 that non-fat dry milk was fortified for use in food donation programs in the United States. I wish to point out that much of the data we are reporting here this morning is based on the family groups we studied in the months of July through November 1968.

Inadequate vitamin A nutrition is of concern to us for the following reasons: One of the early symptoms is night blindness which usually occurs in a number of individuals who have blood serum levels less than our guideline of acceptable levels (less than 20 mcg per 100 ml serum). In advanced vitamin A deficiency permanent blindness occurs. We did not find such cases. However, here our concern is the fact that we have such a large proportion, thirteen percent of the entire population studied, that had levels which we consider places them in a high risk category. We do not know how long these people have had these low levels or whether their vitamin intake is now being increased or decreased. We can't afford the risk that any of these persons will develop the severe deficiency.

Goiter

Unless you happen to be the individual who requires surgery for an enlarged thyroid or goiter due to iodine deficiency a discussion of this problem evokes little response even among the medical profession. Over thirty years ago, the United States was one of the first countries to launch a large scale aggressive program to eradicate goiter by promulgating the use of iodized salt. One does not eradicate goiter one generation then forget about the problem. Our findings to date indicate that in the areas where we have worked, approximately 5 percent of the population has goiter. This is not an economical problem. The fact that it can be prevented for less than one-fourth of a cent per person per year testifies to this. In many areas throughout the United States iodized salt is not even available for man; however I can assure you that no poultry, swine, or pets are

fed a salt, mineral mix without iodine. If they did, they wouldn't be in business today. In many areas, although not all, the price of iodized salt is the same as for regular salt. The eradication of goiter involved one of the dramatic effective examples of food industry working in cooperation with the health and education people. Somewhere along the line there has been a breakdown. Dr. McGanity will report that in his study in Texas 40 percent of the local markets failed to even stock iodized salt even though there was no price differential. In Texas it was primarily because the stores did not realize they should. Obviously the people were not asking for it because they didn't know they needed the iodine.

Anemia

An analysis of our data to date shows that 15 percent of the population had hemoglobin levels less than acceptable, which means that they are candidates for medical treatment. In fact, in our surveys we have established a procedure that within three days of the surveys all individuals having hemoglobin values of less than 10-gram per 100 ml of blood are reported to the appropriate health authority or their personal physician. Anemia is not restricted to the low income groups. In reviewing the data on anemia throughout the United States during the past thirty years, we are now asking questions whether or not we have made any headway in reducing its prevalence. The data suggest that the prevalence may have remained the same during the past thirty years in the United States. In the impoverished population this problem may actually be on the increase. In addition to the hemoglobin data, we will have confirmatory evidence from other measurements such as serum iron, folic acid levels, and hematocrits. These data will be made available at a later date.

We wish to point out that the prevalence of anemia is influenced by other factors besides inadequate nutrition, such as blood loss (especially in females), by parasitic infestation (especially hookworm), and inborn errors resulting in genetic abnormal hemoglobins. However, the contribution to the overall prevalence of anemia due to these two factors appears to be small. Anemia results in fatigue, listlessness, and inability to perform optimally in terms of physical and mental performance. The anemic schoolchild is handicapped before he even walks into the school.

Food donation—Food stamp plans

In Texas only eight percent of our surveyed families participated in either food stamp or food donation plans. This number is so few that a correlation of the effect of these programs on health status is not possible. We anticipate a much greater number of families participating in either program from the Louisiana and Kentucky studies so that within a few months we will at least have an impression of the influence of these programs on health.

The survey team has collected data on the food donation and food stamp programs in Louisiana. Of the 19 parishes, 10 now have food stamp programs and 4 have commodity distribution programs. In Louisiana welfare eligibility does not automatically make a family eligible for food stamps. The average monetary value of these programs per participant during the month of July 1968 was 17 cents per person per day from food donation programs, and 23 cents bonus from the food stamp plan. The adequacy of this supplement to an inadequate diet is questionable and is being reviewed.

Other survey findings

The fact that we have discovered cases of rickets again alerts us to the reality that we cannot ignore public health nutrition programs once they have started. This disease was virtually eradicated over thirty years ago through the simple mechanism of fortifying milk with vitamin D at no cost to the consumer. We are currently collecting data on costs between non-fortified and fortified milk. This information has still not yet been tabulated; but I can assure you gentlemen that if you will check the price of vitamin D milk and other milk in the Washington area, you will be surprised at the price differential.

For many years, vitamin D fortified milk did not cost one cent per half gallon more than non-fortified milk. We are now beginning to ask the question: Does the mother know that she should feed her child and teenager vitamin D fortified milk?

This leads me to the basic question as to why should we find such prevalence of malnutrition. We pride ourselves with the fact that the United States has

the most sophisticated food production, processing, and market distribution system in the world. Industry adds over 3,000 new kinds of food to the market each year. Education of the public to insure proper health and nutrition is taken for granted. One of the obvious answers is that: as an educated affluent society with a tremendous abundance of food we assume we consume the right quantities, and qualities of food. Nutritional health is not commodity oriented, but is dependent upon educating every consumer that certain foods supply certain nutrients and these must be consumed in adequate amounts nearly daily. Is this where we have failed? Have we failed because we assumed: (1) that all consumers did know what kind of food and quantities and quality to feed all segments of the family: (2) that the preschool child, the lactating mother, the teenager, the aged in all socio-economic groups would have access to a good diet; (3) that those with limited money would know how to make a perfect selection of nutritious low-cost foods, thus obtaining an optimal diet; (4) that the "modern" food, produced by the world's best food industry would have, by some miracle, enriched just the right foods with the right nutrients for all population groups?

As the survey continues, we will be correlating the clinical, dietary, and laboratory data with environment, income, education, welfare, food donation programs, and employment information which has been collected as part of the survey. As this additional information is evaluated, a clearer picture of the problem, and hopefully, a solution will be forthcoming. Copies of reports on correlations, as well as preliminary reports from each of the states will be available to the Department of Agriculture, Office of Economic Opportunity and other Federal agencies, the state health departments concerned, and to this committee as rapidly as possible.

One of the greatest rewards my staff and I have received as a result of this National Nutrition Survey is the unstinting sincere cooperation at the state and local levels of health, education, welfare, and agriculture personnel. These officials are anxious to define the problems, assess their local resources, and proceed with corrective and preventive measures. In the next few days you will hear directly from representatives of Texas and Louisiana in reference to action programs under-way and others planned. Texas and Louisiana are already reviewing the educational curricula—kindergarten through senior high school—in reference to strengthening health study units, and incorporating additional units with emphasis on nutrition. They are reviewing procedures to get to the mother of the prekindergarten child, introducing the school lunch program as a means of more than just feeding the children once a day and evaluating and improving breakfast programs. The one clearcut point that stands out is the need for improved education in nutrition, health, and family planning education for the current mother, the future mother now in school, and every other person concerned with planning or purchasing food. This is the same type of approach for problem solving that we have developed as a result of other surveys.

Appendix No. 2—Summary Comments Regarding Nutrients Reported in Preliminary Data

Calories are necessary in adequate amounts to supply the necessary energy for growth and development and normal body functioning. Inadequate caloric intake is evidenced by lack of growth in children, lack of energy, and loss of weight. Advanced caloric malnutrition leads to eventual starvation and death.

Major sources: All foods contain some calories. The starchy, sweet, and fat foods are more concentrated sources.

Protein is essential for normal growth and development as well as normal function of the organism. A severe or prolonged deficiency of protein results in retardation of growth and mental capacities and eventually to starvation and death in children. In adults there are less specific deficiency symptoms which include loss of weight, lassitude, and decreased resistance to disease.

Major sources: Animal foods, meat, fish, poultry, and milk products are the major source of protein in the U.S.A. Protein from cereals and beans may be an important source in groups where animal foods are avoided, or are too costly.

Vitamin A is essential for the formation of cells, particularly in the skin and is essential for normal vision. It aids in maintaining resistance to infections. Deficiency signs include Bitot spots, night blindness, and skin changes

characterized by dry, rough skin. Prolonged Vitamin A deficiency can lead to permanent blindness.

Major sources: Whole milk and whole milk products; dark green, leafy, and yellow vegetables; and liver.

Vitamin D is necessary for the absorption of calcium and the normal development of bones. Lack of vitamin D results in rickets in children.

Major sources: Vitamin D fortified milk is the major food source. Vitamin D is formed in the skin upon exposure to sunlight.

Vitamin C is important for normal tooth and bone formation and wound healing. It plays a role in normal resistance to infection. A deficiency results in soft, spongy gums (scorbutic type), prolonged wound healing, and in the advanced deficiency state, the classical disease, scurvy.

Major sources: Citrus fruits, tomatoes, and certain vegetables such as cabbage and potatoes.

Thiamine is essential for growth, normal function of the nervous system, and normal metabolism. A deficiency of thiamine results in retardation of growth, edema, and changes in the nervous system. Advanced deficiency can result in beriberi.

Major sources: Liver, eggs, whole grain or enriched cereal and cereal products, and lean meat.

Riboflavin is essential for utilization of protein and is also involved in other metabolic processes. A deficiency can result in skin changes such as angular lesions, tongue changes, and poor growth.

Major sources: Dairy products are the major dietary source in the U.S.A. Meats and green leafy vegetables are other sources.

Niacin is essential for normal digestion and utilization of food. The classical deficiency state is pellagra, characterized by diarrhea, dermatitis, dementia, and death.

Major sources: Liver, meats, whole grain, and enriched cereal and cereal products.

Calcium is necessary for formation of bones and teeth. Other functioning is its role in normal blood clotting and normal functioning of nerve tissue. A deficiency in children may be associated with rickets; in adults calcium loss from bones may occur.

Major sources: In U.S.A. dietary are milk and milk products, fortified cereal products, certain leafy vegetables.

Iron is necessary for the formation of hemoglobin, a component of red blood cells. Iron deficiency symptoms include weakness and fatigability. Advanced deficiency leads to anemia.

Major sources: Liver, green leafy vegetables, dried fruits, enriched cereals and cereal products, molasses and raisins are major sources in the U.S.A.

Iodine is essential for normal function of the thyroid gland. A deficiency of iodine will result in enlargement of the thyroid gland, which is known as goiter.

Major sources: Iodized salt is probably the most widely used source in the U.S.A. Seafood, water, and plants from certain areas contribute substantial amounts.

Appendix 3—Biochemical Determinations Done in National Nutrition Survey

Blood.—Hemoglobin; Hematocrit; total serum protein and albumin; Vitamin A and carotene; Vitamin C; Serum folate; Red blood cell folate (if serum folate is low); Serum iron; Serum iron binding capacity.

Urine.—Riboflavin; Thiamine; Creatinine; Urea nitrogen; Glucose (qualitative); Protein (qualitative); Iodine.

Number of biochemical determinations

Determination	*Number of samples*
Blood:	
Hemoglobin	6100
Plasma protein	2460
Serum albumin	1807
Vitamin A	3600
Vitamin C	3600
Urine:	
Riboflavin	2350
Thiamine	2350

Biochemical data—Preliminary guidelines for interpretation of blood data

	Less than acceptable
Total serum protein : gm/100ml	≤ 6.4
Serum albumin (electrophonetic method) : gm/100ml	≤ 3.51
Hemoglobin : gm/100ml	≤10.9
Plasma Vitamin C : mg/100ml	≤19.0
Plasma Vitamin A : mcg/100ml	≤19.0

Footnote: Guidelines for pregnant women taken from Manual of Nutrition Surveys (ICNND), Chapt. 9, p. 236.

Guidelines for interpretation of urinary vitamin excretion data

	Less than acceptable
Thiamine : μg/gm creatinine :	
1–3 years	<176
4–6 years	<121
7–9 years	<181
10–12 years	<181
13–15 years	<151
≤15 years	< 66
Pregnancy (2nd and 3rd trimester)	< 55
Riboflavin : μg/gm creatinine :	
1–3 years	<500
4–6 years	<300
7–9 years	<270
10–15 years	<200
≤15 years	< 80
Pregnancy (2nd and 3rd trimester)	<120

DIETARY GUIDELINES FOR SELECTED NUTRIENTS FOR PRELIMINARY REPORT

CALORIES

	Weight (average) kilograms	K calories/ Kilogram/ day	K calories per day
Age:			
0 to 1 month	4.1	120	1,080
2 to 6 months	6.8	110	1,650
7 to 12 months	9.1	100	2,000
13 to 24 months	11.4	90	
25 to 48 months	14.6	86	
49 to 71 months	18.5	82	
Years:			
6 to 8 years	23.2	82	
8 to 10 years	29.1		
10 to 12 years:			
Male	35.8	68	
Female	37.5	64	
13 to 16 years:			
Male	53.2	60	
Female	52.5	48	
17 to 19 years:			
Male	64.7	44	
Female	57.3	35	

ADULTS

Age years	Weight (kilograms) (male)	K calories kilograms/ day	Weight (kilograms) (female)	K calories kilograms/ day
20 to 29	74.9	40	62.4	35
30 to 39	78.0	38	65.9	33
40 to 49	78.5	37	69.3	31
50 to 59	78.5	36	71.6	30
60 to 69	76.6	34	72.0	29
More than 70	76.6	34	69.8	29

Note: Average weight of adults adapted from PHS Publication 1000, series 11, No. 14. Pregnant—2nd and 3d trimester 200 calories day above basic allowance. Age, weight, calories for 0 to 12 months exact as in NRC; Age, weight, calories for 13 months to 19 years; weight averaged from Faulkner's growth chart, 50th percentile, calorie requirements set by nutrition program.

Ascorbic acid—For all—30 mg/day

Vitamin A

Age:	*International units*
0–1 month	1,500
2–6 months	1,500
7–12 months	1,500
13–24 months	2,000
24–48 months	2,000
49–71 months	2,000
6–8 years	2,500
8–10 years	2,500
10–12 years	2,500
≤12 years	3,500

Pregnant.
Lactating—1000 I.U. plus basic requirements.
Assumed 70% carotene, 30% retinol.

Iron

Age:	*Mg/day*
0–1 month	10
2–6 months	10
7–12 months	10
13–24 months	15
25–48 months	15
49–71 months	10
6–8 years	10
8–10 years	10
10–12 years:	
Male	10
Female	18
13–16 years:	
Male	18
Female	18
17–19 years:	
Male	18
Female	18
Adults:	
Male	10
Female (to 55)	18
Female (55 on)	10

Pregnant and Lactating—No special.

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6. Interdepartmental Committee on Nutrition for National Defense. "Manual for Nutrition Surveys." U.S. Government Printing Office, Washington, D.C., 1957, Revised 1963.
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8. Growth Charts, Department of Pediatrics, State University of Iowa, 1943.

(The following are replies to questions asked of Dr. Schaefer by members of the committee:)

Question: What is the earliest possible completion date for the first ten states and what funds and personnel are needed to meet this date?

The first 10 state phase of the National Nutrition Survey is approximately 25% completed. In the judgment of the Nutrition Program staff, it will be possible to complete the field data collection on these by December 31, 1969, with a final report to be prepared within three months of that date.

The $2,216,000 available during fiscal year 1969 for the Nutrition Program basic support and state survey contracts is sufficient for the remainder of the fiscal year. Health Services and Mental Health Administration will provide adequate resources to complete the first phase of the National Nutrition Survey by December 31, 1969.

Question: What additional states or areas need to be surveyed in order to get a more complete national picture of hunger and malnutrition for our entire population?

Phase 1 of the National Nutrition Survey is restricted to the populations in the lower quartile of income areas in 10 states. It does not include other income levels in these states, nor does it completely cover every geographic area of the United States and such special areas as Indian reservations, Alaska, Puerto Rico, Virgin Islands, and the Trust Territories, which have different demographic characteristics. Therefore, consideration will be given to including these areas in a second phase of the National Nutrition Survey.

However, the need for a second phase will be dependent, to a large extent, upon the findings from the first phase. Once we have information on the prevalence of various types of malnutrition, location and causes, it is very likely that the procedures, including sampling, will need to be modified.

At the present time, the Health Services and Mental Health Administration is developing plans for a continuing program of surveillance and remedial action based on the findings of phase 1 of the National Nutrition Survey. It is probable that second phase survey requirements would be integrated with this program.

In establishing such a surveillance program, first priority would be given those areas not included in phase 1. Attention would be directed to those areas which are uniquely different from a demographic high-risk standpoint, such as Great Plains, Indian reservations, Alaska, Virgin Islands and the Trust Territories.

Question: What is the total number and qualifications of Public Health Administrators and Nutritionists in the U.S.?

State and territorial health officers

There were positions budgeted and filled for Health Administrators in all 50 states, the District of Columbia, Puerto Rico, the Virgin Islands, Guam, and the Trust Territories of the Pacific Islands in 1968. All were physicians with the exception of the nonmedical administrator in Guam.

TABLE 1.—STATE AND TERRITORIAL HEALTH OFFICERS, 1968

Region	Budgeted	Filled	M.D.
States (50)	50	50	50
District of Columbia	1	1	1
Puerto Rico	1	1	1
Guam	1	1	
Trust Territories of the Pacific Islands	1	1	1
Virgin Islands	1	1	1

Local health agencies

In January 1966, there were 1,710 local health departments providing local public health services. These health departments included four types of organizations: county, city, local health district, and state health districts.

Table 2 shows that 36 percent of the local units employ full-time medical health officers, 17 percent have full-time nonmedical administrators. The position is vacant in 8 percent of the units. Twenty-eight percent of these vacancies have been unfilled for 5 years or more. Only two states (Florida with 43 units and Nevada with 2 units) and the District of Columbia (with one unit) have all local health officer positions filled by full-time physicians. Seventeen other states currently employ only medical administrators, but some of these serve more than one unit or serve part time.

TABLE 2.—LOCAL HEALTH UNITS (UNITED STATES, JAN. 1, 1966)

Total number of units	Full-time health officer				Part-time health officer, serving single unit		Vacant
	Serving single unit		Serving more than 1 unit				
	Physician head						
	Yes	No	Yes	No	Yes	No	
1,710	616	288	351	16	274	22	143

In some of these states there are a good many vacancies.

In 21 States there is sharing of health officer services; 130 physicians supply administrative direction to 351 local health units. Seventy-five of these physicians have administrative responsibility for 2 health units, 36 for 3 health units, 12 for 4 health units, and 7 for 5 or more local health units.

Training of local health administrators

Only 28 percent of all local health administrators have professional training in public health. The proportion of local health administrators with such training varies widely among the states ranging from none in 3 states to 92 percent of the local health officers in New York with such training.

The 317 nonmedical administrators represent a variety of backgrounds including civil engineers, Doctors of Veterinary Medicine, Doctors of Osteopathy, and registered nurses.

Table 3 summarizes the training for the total U.S.A. and for the survey states.

TABLE 3.—U.S. LOCAL HEALTH UNIT ADMINISTRATORS (JAN. 1, 1969)

	Total	Total medical	Total nonmedical	DDS	Nonmedical			
					MPH, DPH or MSPH	Other degree	RN or PHN	No degree reported
United States	1,337	1,020	317	4	20	42	44	207
NATIONAL NUTRITION SURVEY STATES								
States:								
Texas	51	49	2					2
Louisiana	22	22						
New York	37	37						
Kentucky	63	37	26				3	23
Michigan	42	36	6					6
West Virginia	52	51	1			1		
California	44	44						
Washington	32	32						
Massachusetts	78	18	60		2	15	2	41
South Carolina	38	28	10		1	2	3	4

Local health services in survey States

It can be noted that in the survey states approximately the same percent (32%) of local units employ full-time medical health officers as does the entire U.S.A. (36%). The percentage of units in survey states sharing a health officer is higher in the survey states. One hundred eighty-six units have part-time shared health officers whereas the total in the U.S.A. is 351. The vacancy rate is about 4.6% as contrasted to 8% for the U.S.A. However, in the survey states one state accounted for approximately two-thirds of the vacancies.

TABLE 4.—LOCAL HEALTH UNITS IN SURVEY STATES

States	Total number of units	Physician head						
		Full-time health officer				Part-time health officer serving single unit		
		Serving single unit		Serving more than 1 unit				
		Yes	No	Yes	No	Yes	No	Vacan
Total	611	197	101	186	7	91	1	28
Texas	63	21	1	19	2	20		
Louisiana	64	7		39				18
New York	42	34		8				
Kentucky	121	14	24	70	5			8
Michigan	47	30	6	10		1		
West Virginia	53	7		2		43	1	
California	58	43		15				
Washington	33	15		2		16		
Massachusetts	80	13	60			5		2
South Carolina	50	13	10	21		6		

Manpower and training for public health nutrition

Manpower.—The nutritionist is a person with special training knowledge and competence in the science of nutrition. Among professional nutritionists, various emphases in education and practice have developed. These include public health nutritionists; medical nutritionists; therapeutic, administrative, and clinic dietitians; professors of nutrition and public health nutrition; and research nutritionists. In general, within the health agency the only person with comprehensive nutrition expertise is the public health nutritionist.

In 1968, of the 50 states five had no nutrition positions reported as budgeted at the state level. All other states plus the District of Columbia, Guam, Puerto Rico, and the Virgin Islands had one or more nutrition positions budgeted and filled at the state or territorial level. The total number of budgeted, filled, and vacant positions for the U.S.A. and the survey states appears in Table 5.

TABLE 5.—NUTRITION PERSONNEL (NOVEMBER 1968)

U.S. total (475)	State and territorial			City and county		
	Budgeted	Filled	Vacant	Budgeted	Filled	Vacant
	325	253	72	150	122	28
National Nutrition Survey States:						
Texas	2	2	0	11	11	0
Louisiana	14	10	4	3	0	3
New York (including New York City)	21	13	8	49	35	14
Kentucky	9	7	2	11	11	0
Michigan	9	5	4	5	4	1
West Virginia	6	4	2	0	0	0
California	9	8	1	11	11	0
Washington	4	3	1	0	0	0
Massachusetts	12	6	6	7	5	2
South Carolina	6	5	1	0	0	0

The number of dietitians is much greater with a reported 12,495 employed, qualified dietitians in 1967. Only 6 percent of these were in public health, research, or programs teaching nutritionists. Over 1,000 research scientists (members of the American Institute of Nutrition) are actively involved in nutrition programs.

Training.—In 1966, there were 64 approved internships for dietitians. The Office of Education reported 132 persons received advanced degrees in foods and nutrition, 24 in institution management or administration, and 142 in nutrition.

In 1967, thirteen schools offered graduate programs in public health nutrition. The location and number of students and graduates for 1966–1967 is shown in Table 6.

TABLE 6.—LOCATION AND OWNERSHIP OF SCHOOLS OFFERING MASTERS DEGREES IN PUBLIC HEALTH NUTRITION AND NUMBERS OF STUDENTS AND GRADUATES, 1966–67

Location	School	Ownership	Students	Graduates
	Total, 13 schools		152	84
California	University of California, School of Public Health, Berkeley.	Public	19	13
	University of California, School of Public Health, Los Angeles.	do	41	17
Massachusetts	Harvard University, School of Public Health, Boston.	Private	9	3
	Massachusetts Institute of Technology, Cambridge.[1]	do	12	5
Michigan	University of Michigan, School of Public Health, Ann Arbor.	Public	11	8
Minnesota	University of Minnesota, School of Public Health, Minneapolis.	do	7	1
New York	Columbia University, School of Public Health, New York.	Private	17	16
	Columbia University Teachers College, New York.	do	6	4
	Cornell University, Graduate School of Nutrition, Ithaca.	do	2	1
North Carolina	University of North Carolina, School of Public Health, Chapel Hill.	Public	7	7
Ohio	Case Western Reserve University, Department of Nutrition, Cleveland.	Private	11	6
Pennsylvania	Pennsylvania State University, College of Home Economics, University Park.	do	5	
Tennessee	University of Tennessee, College of Home Economics, Knoxville.	Public	5	3

[1] Degrees are granted in nutrition, biochemistry, and metabolism.

Source: Individual schools.

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Question: Comparison of Prevalence of Malnutrition in the U.S. with Some of the Findings of the International Surveys.

The percent of participants with "unacceptable" biochemistry levels and goiter in selected foreign surveys and in the preliminary findings of the National Nutrition Survey (U.S. National 1968) are listed in the attached table.

In the U.S. National Survey, 15 percent of the participants had hemoglobin levels (Hb.) classified as anemic. Anemia was found in from 3 to 7½ times more individuals in the U.S. survey than in the Central American countries.

In general, the vitamin A, vitamin C, serum protein, and serum albumin findings were as serious, or more so, than in Central America and numerous other countries listed.

Urinary riboflavin and thiamine findings are similar to those found in non-rice-eating countries.

An incidence of 5 percent goiter was found in the U.S. National Survey. As was indicated previously, by WHO standards, a prevalence of 5 percent of goiter in a population designates an endemic area.

In reference to Senator Kennedy's query regarding surveys in European industrial countries, very limited information is available and practically no post-war data are available. This limited information is primary food consumption data which cannot be used to identify prevalence of malnutrition, since they do not include physical examinations or biochemical findings. We are contacting key nutritionists in Sweden, Great Britain, France, and Germany to determine if any studies have been completed recently or are being planned.

Canada is planning a survey patterned after the U.S. survey and plans to be in the field by late 1969 or early 1970. Some of their personnel have received training in our state surveys.

COMPARISON OF MALNUTRITION BETWEEN FOREIGN COUNTRIES

	Percent participants with "unacceptable" biochemistry levels							
	Hb.	Plasma vitamin A	Serum vitamin C	Serum protein	Serum albumin	Urinary thiamine	Urinary ribo-flavin	Enlarged thyroid (goiter)
United States:								
U.S. national, 1968	15.0	13.0	16.0	16.0	17.0	9.0	19.0	5.0
Montana Indians, Fort Belknap, 1961	9.0	62.0	1.0	2.0	3.0	7.0	16.0	12.0
Alaska Eskimos, 1958		19.0	22.0					2.0
Central America:								
Guatemala, 1965	3.0	10.5	5.0	3.0	3.0	25.0	33.0	5.0
Honduras, 1966	5.0	22.0	2.0	10.0	3.4	11.0	11.0	
El Salvador, 1965	4.0	23.0	8.0	4.0	5.1	2.0	12.0	
Nicaragua, 1966	2.0	8.0	1.0	3.0	4.8	14.0	4.0	
Costa Rica, 1966	4.0	17.0	2.0	8.0	17.1	49.0	4.0	
Panama, 1967	5.0	6.0	6.0	7.0	12.3	48.0	24.0	
Far East:								
Malaya, 1962:								
Total		9.4	9.4	3.1	15.3	24.5	43.5	6.9
Up to 15 years		22.8	3.6	4.0	5.3			3.7
Thailand, 1960:								
Total		36.5	2.8	.9	29.0	43.5	87.9	21.4
Up to 15 years		55.4	6.9	0	39.0			8.7
South America:								
Northeast Brazil, 1963:								
Total		41.8	8.6	7.5	3.4	22.3	53.2	23.0
Up to 15 years		50.3	.3	8.6	2.4			15.4
Chile, 1960:								
Total		32.8	14.6	5.5		1.3	4.5	2.6
Up to 15 years		21.6	12.0	3.3				.8
Venezuela, 1963:								
Total		4.9	8.6	.5	33.8	28.9	38.1	11.8
Up to 15 years		8.0	.3	.9	13.8			7.9

Question: How do findings in the San Diego Independent School District, Duval County, Texas, compare with the findings from the rest of Texas?

Mr. Taylor, of the San Diego, Texas school district, reported on the health and nutrition program that is operating in the San Diego school system. The Nutrition Survey in Texas included San Diego, and therefore permits a comparison of nutritional status findings in the total Texas survey to those in San Diego. The survey conducted in the San Diego area revealed a marked improvement in the health, dental and nutrition status as compared to the findings for the State of Texas. Data available to us include primarily the prevalence of malnutrition as evaluated by biochemical findings for key nutrient levels in blood serum and urinary excretion. No unacceptable levels of Vitamin A serum protein, albumin, Vitamin C, or hemoglobin were found in school age children in San Diego. Anemia problems were present in women age 30 and above. Vitamin A levels were unacceptable in preschool children. Some thiamine and riboflavin problems were found in teenage girls.

Similar data on school children *vs.* adults as well as other parameters; poverty, income levels, educational status of parents, are being processed and analysis of the data will be made available within a few months.

COMPARISON OF LESS THAN ACCEPTABLE LEVELS OF BIOCHEMICAL MEASUREMENTS IN THE SAMPLE SURVEYED IN SAN DIEGO ENUMERATION DISTRICT AND TEXAS SURVEY

[Percent less than acceptable]

Biochemical measurement	State of Texas	San Diego E.D. total population
Serum vitamin A	19.7	6
Serum vitamin C	16.9	0
Serum protein	23.7	4
Serum albumin	21.8	6
Urinary thiamine	10.1	8
Urinary riboflavin	25.4	15

RESPONSE OF THE DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE TO THE QUESTIONS OF THE SENATE SELECT COMMITTEE ON NUTRITION AND RELATED HUMAN NEEDS—NOVEMBER 1968

(These comments are accompanied by the detailed background materials in the attachments.)

1. "Status of the national survey of nutrition of citizens of the United States covering work done, work in progress, and time table to completion."

A summary of the status of the National Nutrition Survey is enclosed. Phase I of this survey, comprising the identification and assessment of malnutrition in high-risk groups within five States is in progress (data collection is underway in Texas and Louisiana; recruitment and training operations are proceeding in Kentucky, Michigan, New York State, and New York City). Various criteria such as infant mortality rates, socio-economic status, etc., were used to select high-risk groups and locations within these States; it is felt that extrapolation to similar population groups in other locations will be possible with a reasonable degree of confidence.

The extension of Phase I to six other areas (Massachusetts, West Virginia, Washington, California, South Carolina, and among Navaho Indians) has been approved by the Bureau of the Budget; the Health Services and Mental Health Administration is in process of identifying specific funds for this extension.

Phase II of the National Nutrition Survey, a comprehensive nationwide assessment, is to be initiated at a later date.

Also enclosed in response to Question 1 is a progress report of the Study of Nutritional Status of Mississippi Preschool Children, part of an envisaged National Study of Nutritional Status of Preschool Children, conducted under a grant from the Children's Bureau, Social and Rehabilitation Service.

NATIONAL NUTRITION SURVEY, HEALTH SERVICES AND MENTAL HEALTH ADMINISTRATION—SEPTEMBER 6, 1968

I. Background summary

The Department of Health, Education, and Welfare, in response to the Partnership for Health Amendments passed by Congress early in December of 1967, designated the Nutrition Program, PHS, to conduct a survey to identify the incidence, magnitude, and location of malnutrition and related health problems.

The Nutrition Program (formerly the ICNND), assisted by various ad hoc committees, developed a protocol to be used by participating investigators. Methods developed during the completion of 33 international surveys, incorporating clinical, biochemical, and dietary procedures were altered when necessary to design a protocol appropriate to the U.S.A. population.

II. Participants and progress

A. At the present time, contracts have been signed with 5 states—Texas, Louisiana, Kentucky, Michigan, and New York. The last contract provides for a survey of New York City as a separate study from the state.

Louisiana and Texas are currently engaged in field operations. Texas will complete the data collection phase of their study in mid-September with the exception of that portion of their sample comprised of the migrant labor population. This group will be surveyed when they return to Texas in October or November and again in February before they leave.

Louisiana is approximately at the half-way mark of their field operation; it is anticipated that they will complete data collection in mid-fall.

Kentucky, New York, and New York City and Michigan are involved in identifying and recruiting personnel. The enumeration districts from which the sample will be drawn have been selected and maps made available to the states. Tentative schedules have been set for training of personnel in Kentucky and New York. Both of these states plan to initiate data collection in early October. The Michigan data collection will begin mid-December.

B. The Bureau of the Budget has approved the extension of the surveys to include Massachusetts, West Virginia, Washington, California, South Carolina, and a pilot study among the Navajo Indians.

To date, no funds are available to conduct the surveys in this second group of states.

III. Materials

A. Forms were developed to conform with the protocol, have been approved by B.O.B., and made available to participating states.

B. A manual including the survey background, design, sampling techniques, instructions, etc., is being finalized for circulation. It is available in draft form at this time. This manual will be of value to other groups interested in similar surveys as well as to those states participating in the National Nutrition Survey.

C. A series of three 16 mm information films are in the process of production. These films will illustrate the development and operation of a survey prior to field activities, the survey team in the field conducting examinations and collecting data, and will describe data compilation, interpretation, and follow-up programs.

IV. Data processing, results, interpretation

To date, data processing from Louisiana and Texas is in a preliminary state. Laboratory analyses are proceeding per arrangements with individual state facilities and the Medical Research and Nutrition Laboratory in Denver, Colorado. X-ray films are being processed and read per arrangement with The Center for Human Growth and Development at the University of Michigan.

Clinical, dental, dietary, and general descriptive data are being processed in part at the Tulane Biomedical Center and the University of Texas Medical School at Galveston. The necessity for curtailing these contractual arrangements and transferring the data processing to HEW will delay the final analyses from the first two states.

Final interpretation of the data cannot be made until all data is processed and reviewed because of the interrelationships between the various components (clinical, biochemical, dental, and dietary) as they relate to nutritional assessment.

Emergency medical problems are referred to State Health Departments for remedial action.

It is also important to note that this first phase of the National Nutrition Survey has been designed to draw the sample from geographic areas where the greatest number of persons live in poverty. Thus, the results cannot be extrapolated to be representative of the total U.S.A. They may, however, be indicative of populations with similar characteristics in other areas.

Protocol for assessment of nutritional health status

The nutrition health evaluation study will be administered in conjunction with State health departments using local resources, principally those of medical schools and research institutes in collaboration with colleges of agriculture. A key objective will be to supervise self-help programs, evaluate effectiveness of action programs which are directed to correct those deficiencies found, and to develop preventive programs.

The staff from the Nutrition Program, and its consultants who have had considerable experience in nutrition-health surveys both inside and outside of the United States, will assist in the planning and carrying out of the surveys. To date, over 500 scientists and technicians from 48 universities, colleges and institutions, have participated in the international nutrition survey program. Consultants with experience in nutrition-health epidemiological studies will be made available to assist in standardizing the laboratories and train personnel.

The survey procedures which have been standardized (Manual for Nutrition Surveys, 2nd Edition, 1963) will determine nutritional health status in terms of clinical, biochemical and food consumption parameters. Additional information on environmental factors which influence nutrition, health and poverty will be obtained. Guides have been developed during the past 12 years which

enable us to define the specific nutrient status of the population groups as "deficient," "low," and "acceptable" in terms of blood and urine levels and nutrient intake data. Also, comparisons can be made between nutritional status and such other factors as age, sex, income, and educational levels.

Goals of the survey are:

(1) Determination of nutritional status, identification, location, magnitude and cause of nutritional problems and establishments of baseline nutrition-health data.

(2) Identification and evaluation of welfare and food assistance programs which could influence nutritional health.

(3) Development of recommendations to overcome and prevent problems of malnutrition identified.

Following approval by the State government, representatives of the Nutrition Program, regional medical and nutritional representatives of DHEW and other Federal agencies with an interest in the nutritional health survey and food and nutrition programs, met with regional, State and local agencies and groups currently involved in action programs related to food and nutrition, including education. At this meeting the general program was outlined and the interest and capabilities of the Nutrition Program and other agencies presented.

Sampling method

The percent of families and single individuals within each Census enumeration district (ED) who fall below the Orshansky index of poverty will be calculated for each State to be surveyed. Within each State the ED's will be sorted into three strata:

(*a*) ED's within SMSA's.

(*b*) ED's in communities outside SMSA's but above 2500 population (urban).

(*c*) ED's outside both SMSA's and towns above 2500 population (rural).

Within each stratum and within each State, the ED's will be ranked by the percent of families and individuals below the poverty index. The universe for sampling will consist of the ED's with the highest percent of poverty accounting for 25 percent of the families and individuals within the stratum.

A systematic sample of these ED's in each State will serve as the subsample universe. A probability sample of the families within the selected ED's will be drawn and serve as the survey population.

An average of approximately 100 enumeration districts (ED's) will be selected per State (varying according to population). Twenty households will be randomly selected from each ED. Thus, in each State the clinical examination would involve approximately 8,000 individuals, with biochemical assessment conducted on approximately one-fourth of the families and dietary food intake data on approximately three-fourths of the households.

Survey forms to be utilized are attached.

Appendix II—Survey Procedures

1. Procedures to be used are those described in the *ICNND Manual for Surveys, Second Edition, 1963.* Standardization of methodology will be under the supervision of the Nutrition Program/PHS.

2. Field Operation: Approximately 10 to 12 weeks.

(*a*) *Clinical (physical medical examination):* 8,000 individuals.

(1) Collection of identification and anthropometric data.

(2) Examination for 60+ separate clinical signs of nutrition diseases.

(3) Bone growth—wrist bone X-ray.

(*b*) *Dental Examination:* 4,000–8,000

(1) Dental caries (DMF index).

(2) Enamel hypoplasis.

(3) Fluorosis.

(4) Gingival and periodontal condition (Periodontal index).

(5) Attrition.

(6) Oral hygiene.

(*c*) *Biochemical Assessment:*

To be conducted on one-fourth of the families of the total sample. On this same subsample the dietary intake data will be conducted.

(1) *Blood Analysis:*

(*a*) hemoglobin.

(*b*) hematocrit.

(*c*) total serum protein.

(*d*) serum albumin.
(*e*) serum vitamin A and carotene.
(*f*) serum vitamin C.

Those samples having a hemoglobin of 10 grams per 100 ml or less will be identified and the following done:

(*g*) blood smears
(*h*) total serum iron and iron binding capacity.
(*i*) serum folic acid and vitamin B_{12}.

(2) *Urinary analysis:*
(a) creatinine
(b) thiamine
(c) riboflavin
(d) iodine
(e) N'-methylnicotinamide (to be done on the subsample merely to insure adequate niacin intake).

(*d*) *Dietary food intake data:* Conducted in cooperation with U.S. Department of Agriculture and State Agricultural Colleges.

(1) *Methods:*
(*a*) food preparation (recipe) and consumption method (¼ of households of the same families in biochemical examination). Individual intake for infants.
(*b*) food composite analysis method (No. determined based on variation of dietary pattern).
(*c*) dietary questionnaire method (¾ of total households).

(2) *Analysis of nutrient intake data from standard food tables or by chemical analysis of:*
(a) calories
(b) protein
(c) fat
(d) carbohydrate
(e) calcium
(f) phosphorus
(g) iron
(h) vitamin A
(i) thiamine
(j) riboflavin
(k) niacin
(l) vitamin C

(3) Food composites will be analyzed for other vitamins such as vitamin B_{12}, folic acid, vitamin B_6, and other trace minerals, such as iodine, fluorine, copper, zinc, etc.

(4) Study of food habits, methods of preparation, taboos, cooking losses, waste, etc.

(5) Socio-economic data—food expenditures, food donations on Food Stamp Plan.

(*e*) *Health and education resources survey:*
(1) Preventive Medicine Programs.
(2) Mortality and morbidity data.
(3) Child and maternal care facilities and programs.
(4) Education—review of curricula and nutrition programs in secondary schools, professional schools and general public.
(5) Homes and clinics for the aged.

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FORMS USED BY FIELD INTERVIEWERS IN NATIONAL NUTRITION SURVEY

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

NATIONAL NUTRITION SURVEY
HOUSEHOLD INFORMATION

A. IDENTIFICATION CODES

STATE *(1–2)* ☐☐ COUNTRY *(3–5)* ☐☐☐ E.D. *(6–7)* ☐☐

FAMILY *(8–10)* ☐☐☐

B. ADDRESS *(House No., P.O. Box No., Street, Road, County, State)*

C. NUMBER OF INDIVIDUALS IN HOUSEHOLD *(16–17)* ☐☐

D. TYPE OF PLACE *(Enter number checked in code box)* *(18)* ☐

1. ☐ INSIDE CITY LIMITS *(2,500 population or more)* OR BUILT-UP SUBURB
2. ☐ NOT INSIDE SUCH LIMITS—PROPERTY CONTAINS 10 OR MORE ACRES AND PRODUCT SALES TOTALED $50 OR MORE IN 1967
3. ☐ PROPERTY CONTAINS UNDER 10 ACRES AND PRODUCT SALES TOTALED $250 OR MORE IN 1967
4. ☐ ALL OTHER PLACES

E. PUBLIC SEWER OR WATER PRESENT IN ROAD SERVING THIS DWELLING *(19)* ☐

1. ☐ BOTH SEWER AND WATER
2. ☐ SEWER ONLY
3. ☐ WATER ONLY
0. ☐ NEITHER

F. DWELLING UNIT CONTAINS PIPED WATER *(20)* ☐

1. ☐ COLD WATER ONLY
2. ☐ HOT AND COLD WATER
0. ☐ NEITHER

G. TOTAL NUMBER OF ROOMS NOT COUNTING BATHS OR UNLIVED IN ATTIC OR CELLAR *(21–22)* ☐☐

H. HOW MANY ROOMS ARE USED FOR SLEEPING? *(23–24)* ☐☐

I. WHAT IS USUAL LANGUAGE SPOKEN BY ADULTS IN THE HOUSE? *(25)* ☐

1. ☐ ENGLISH
2. ☐ SPANISH
3. ☐ FRENCH
4. ☐ AMERICAN INDIAN
5. ☐ OTHER

(Specify) _____

J. HOW LONG HAS HEAD OF HOUSEHOLD LIVED WITHIN 50 MILES OF THIS PLACE? *(Code no. years)* *(26–27)* ☐☐

K. AT AGE 16 DID HEAD LIVE IN: *(28)* ☐

1. ☐ LARGE CITY *(Over 50,000)*
2. ☐ SMALL TOWN OR CITY
3. ☐ THE COUNTRY

L. AT AGE 16 WHERE DID HEAD LIVE? *(29–30)* ☐☐

SPECIFY STATE OR TERRITORY _____

IF FOREIGN COUNTRY, ENTER 1 HERE *(31)* ☐

M. CONTROL

1. NAME OF INTERVIEWER	2. DATE VISITED	3. DATES OTHER CALLS WERE MADE

4. AVAILABLE PHONE NUMBER	5. WHERE IS PHONE LOCATED	6. UNABLE TO FIND ELIGIBLE
_____ ☐ NONE	☐ RESPONDENTS HOME ☐ HOME OF NEIGHBOR	☐ RESPONDENT AT HOME ☐ REFUSED TO RESPOND

N. DESCRIPTION OF DWELLING UNIT *(Identifying features)*

CONFIDENTIAL—All information which would permit identification of an individual or of an establishment will be held confidential, will be used only by persons engaged in and for the purpose of the survey and will be protected against disclosure in accordance with Provisions of 42 CFR Part 1.

NCCD-3 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203

O. FAMILY AND RELATIVES LIVING IN HOUSEHOLD

NOTE—If any persons are living here who are not relatives, enter names below. Enter number of persons in code box *(Code 0 if none)* and fill out a separate interview schedule for each unrelated individual and each separate family. *(See definitions on right.)* Enter number, address, etc., for each schedule the same as this but add B, C, etc., to the family number. In such cases, add A to the family number on this schedule.

1. LINE NO.	2. NAME OF RELATED RESIDENTS *(first, middle initial, last)*. INCLUDE THOSE ABSENT ONLY TEMPORARILY, BUT CIRCLE LINE NUMBER	3. RELATION TO FAMILY HEAD CODE: 1—HEAD 2—SPOUSE 3—CHILD 4—STEPCHILD 5—PARENT 6—OTHERS	4. DATE OF BIRTH *(month, day, year)*					
			MONTH		DAY		YEAR	
(11–12)		*(32)*	*(33)*	*(34)*	*(35)*	*(36)*	*(37)*	*(38)*
01								
02								
03								
04								
05								
06								
0.								
08								
09								
10								
11								
12								
13								
14								
15								

P. LIST NAMES OF UNRELATED PERSONS LIVING IN HOUSEHOLD

1. _____ 5. _____

2. _____ 6. _____

3. _____ 7. _____

4. _____ 8. _____

DEFINITIONS—Family—A group of persons related by blood, marriage or adoption who regularly live together in the same dwelling unit.
Unrelated individual—A person who lives alone, or lives with others to whom he is not related.
Work Experience—Full year, 40 weeks or more; Part year, under 40weeks. Full-time, 35 hours or more, weekly; part-time, under 35 hours, weekly. If two or more part-time job average out over the year at 35 hours or more per week, the person should be entered as working full-time. Military service is work; so is unpaid family labor in a family business. Housework in the home is labor but is not counted as work experience.

5. MARITAL STATUS	6. RACE		7. SEX	8. NOW IN SCHOOL	9. HIGHEST GRADE COMPLETED TO DATE	10. WORK EXPERIENCE DURING 1967 *(Omit persons under 12)*	
						A. PERSON WORKED	B. MAJOR REASON FOR NOT WORKING FULL YR. FULL-TIME
CODE: 1—MARRIED 2—WIDOWED 3—DIVORCED 4—SEPARATED 5—NEVER MARRIED	CODE: *(In Col. 40)* 1—CAUCASIAN 2—AMERICAN INDIAN 3—NEGRO 4—ORIENTAL ETHNIC GROUP CODE IN COL. 41 1—SPANISH AMERICAN 2—FRENCH 3—OTHER *(Specify)*		CODE: 1—MALE 2—FEMALE	CODE: 0—NO 1—YES 2—DAY NURS.	USE NUMBERS 1–12 FOR GRADES C–1, ETC., FOR COLLEGE PH–1, ETC., FOR POST HIGH SCHOOL NOT COLLEGE	CODE: 1—FULL YEAR, FULL-TIME 2—FULL YEAR, PART-TIME 3—PART YEAR, PART-TIME 4—PART YEAR, FULL-TIME 0—NONE	CODE: 1—ILL OR DISABLED 2—PREGNANT 3—OTHER *(Specify)* 4. NOT APPLICABLE
(39)	*(40)*	*(41)*	*(42)*	*(43)*	*(44–45)*	*(46)*	*(47)*

Q. ANY RELATIVE WHO LIVES HERE NOW BUT DID NOT LIVE HERE DURING 6 MONTHS OF 1967?

CODE REASON BELOW:

1—RETURNED FROM COLLEGE OR OTHER INSTITUTION
2—RETURNED FROM MILITARY
3—MARRIED INTO FAMILY
4—NEEDED SUPPORT OR HOUSING
5—BROKEN, SEPARATE HOME DUE TO DIVORCE, DEATH, ETC.
6—OTHER REASON

LINE NUMBER *(From item 01.)*	CODE *(48)*

R. ANY RELATIVE WHO DOES NOT LIVE HERE NOW BUT DID LIVE HERE DURING 6 MONTHS OF 1967?

CODE REASON BELOW:

1—WENT TO COLLEGE OR OTHER INSTITUTION
2—WENT INTO MILITARY
3—MARRIED AWAY FROM FAMILY
4—STARTED OWN HOUSEHOLD, NOT MARRIED
5—DIVORCED OR SEPARATED
6—DIED
7—OTHER

		CODE *(49)*

S. CASH INCOME OF ALL PERSONS LISTED IN ITEM 10a. IN 1967, PUT TOGETHER *(rounded to the nearest hundred)*

	AMOUNT
1. FROM WAGES AND SALARIES	
2. FROM OWN BUSINESS OR SELF EMPLOYMENT *(net profits and salary if any)*	
(a) FARM	
(b) NONFARM	
3. TOTAL INCOME *(1–26)*	
4. TOTAL INCOME FROM ITEM T.	
5. GRAND TOTAL *(Items 3 and 4)* *Code direct (Omit cents)* *(50–52)*	

T. WAS MONEY RECEIVED BY ANY MEMBER OF THE HOUSEHOLD *(listed on page 2)* FROM ANY OF THE FOLLOWING SOURCES

CODE: 1—YES 0—NO

1. ☐ UNEMPLOYMENT INSURANCE *(53)* ☐
2. ☐ PUBLIC PENSION *(Social Security)*, ETC. *(54)* ☐
3. ☐ PRIVATE PENSIONS *(55)* ☐
4. ☐ AID TO DEPENDENT CHILDREN *(56)* ☐
5. ☐ OTHER REGULAR PUBLIC WELFARE PAYMENT *(57)* ☐
6. ☐ ALIMONY OR ARMED FORCES ALLOTMENT *(58)* ☐
7. ☐ OTHER SOURCES *(59)* ☐

(Exclude one-time cash payments such as insurance compensation, prizes, gifts, sales of property)

U. DO ALL, SOME OR NONE OF THIS FAMILY TRAVEL SEASONALLY IN SEARCH OF WORK SUCH AS HARVESTING FRUIT, VEGETABLES, OR GRAIN CROPS; FISHING OR OTHER SEASONAL LABOR? *(60)* ☐

V. COMMENTS:

U.S. GOVERNMENT PRINTING OFFICE : 1968 OF—298–312

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

NATIONAL NUTRITION SURVEY

General Clinical Examination

(Adults and children 6 years and over)

A. IDENTIFICATION CODE

STATE *(1–2)* | COUNTRY *(3–5)* | E.D. *(6–7)*

FAMILY *(8–10)* | LINE NO. *(11–12)*

B. NAME

C. GENERAL EXAMINATION—IF "DOUBTFUL," PLEASE CHECK. CODE 0—NEGATIVE, 1—POSITIVE

EXAMINATION		DOUBTFUL	COL. NO.	CODE
1. FACE NEG.	a. NASOLABIAL SEBORRHEA		13	
	b. MALOR PIGMENTATION		14	
2. EYES NEG.	a. THICKENED OPAQUE BULBAR CONJUNCTIVAE		15	
	b. ANGULAR LESIONS OF EYELIDS		16	
	c. CIRCUMCORNEAL INJECTION BILATERAL		17	
	d. CONJUNCTIVAL INJECTION BILATERAL		18	
	e. XEROSIS CONJUNCTIVAE		19	
	f. BITOT'S SPOTS		20	
3. LIPS NEG.	a. ANGULAR LESIONS		21	
	b. CHEILOSIS		22	
4. TEETH NEG.	a. 1—EDENTULOUS, 2—PLATES, 3—BOTH		23	
	b. VISIBLE CARIES, 4+TEETH 1—DEBRIS, 2—CALCULUS, 3—BOTH		24 25	
	c. FLUOROSIS		26	
5. GUMS NEG.	a. GENERALIZED ATROPHY, RECESSION, INFLAMATION		27	
	b. MARGINAL REDNESS OR SWELLING		28	
	c. SWOLLEN RED PAPILLAE 1—LOCAL, 2—DIFFUSE		29	
	d. BLEEDING GUMS		30	
6. TONGUE NEG.	a. FILIFORM PAPILLARY ATROPHY 1—MILD, 2—MOD., 3—SEVERE		31	
	b. FUNGIFORM PAPILLARY HYPERTROPHY		32	
	c. GEOGRAPHIC		33	
	d. FISSURES		34	
	e. SERRATIONS OR SWELLINGS		35	
	f. RED EDGES		36	
	g. SCARLET, BEEFY GLOSSITIS		37	
	h. MAGNETA		38	

EXAMINATION		DOUBTFUL	COL. NO.	CODE
7. FACE AND NECK NEG.	a. NASOLABIAL SEBORRHEA		39	
	b. PAROTIDS VISIBLY ENLARGED		40	
	c. THYROID ENLARGED *(1), (2), (3), (4)*		41	
8. FINGER-NAILS NEG.	a. 1—CLUBBED, 2—SPOONED 3—BOTH		42	
9. SKIN NEG.	a. FOLLICULAR HYPERKERATOSIS, ARMS		43	
	b. FOLLICULAR HYPERKERATOSIS, BACK		44	
	c. DRY OR SCALING *(Xerosis)*		45	
	d. HYPERPIGMENTATION—FACE OR HANDS		46	
	e. THICKENED PRESSURE POINTS, NOT ELBOW OR KNEE		47	
	f. PERIFOLLICULOSIS		48	
	g. PURPURA OR PETECHIA		49	
	h. CRACKLED SKIN *(mosaic)*		50	
	i. LOSS OF ELASTICITY		51	
	j. PELLAGUOUS DERMATITIS *(Cumnent)*		52	
10. ABDOMEN NEG.	a. HEPATOMEGALY		53	
	b. CALF TENDERNESS		54	
	c. PRETIBIAL EDEMA BILATERAL		55	
11. LOWER EXTREMITIES NEG.	a. ABSENT KNEE JERK		56	
	b. ABSENT ANKLE JERK		57	
	c. ABSENT VIBRATORY SENSE		58	
12. SCROTUM NEG.	a. SCROTAL DERMATITIS		59	
NAME OF EXAMINER				

NCCD-3-1 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203

13. ANTHROPOMETRY

a. WEIGHT *(kg.)* CLOTHING ALLOWANCE	b. NUDE WEIGHT, *(Estimate kg.)* (60)	c. HEIGHT *(cm.)* (63)	d. KNEE HEIGHT *(cm.)* (66)
e. ARM CIRCUMFERENCE *(cm.)* (69)	f. SHOULDER BREADTH *(cm.)* (71)	g. WRIST BREADTH *(cm.)* (73)	h. KNEE BREADTH *(cm.)* (74)
i. SKINFOLD, RIGHT TRICEPS *(mm.)* (76)	j. SKINFOLD—SCAPULA *(mm.)* (78)	MEASURED BY *(name)*	
		RECORDED BY *(name)*	

14. OBSTETRIC HISTORY—Females 10 years and over

a. AGE AT MENARCHE? NOT TOTAL PAST PREGNANCIES (13–14)	b. NUMBER NOW LIVING (15–16)	c. NUMBER WHO HAVE DIED (17)	d. NUMBER OF STILLBORN (18)
e. NUMBER OF ABORTIONS (19)	f. SETS OF TWINS (20)	g. SETS OF TRIPLETS (21)	

15. LIVE BIRTHS *(Enter number living)*

a. AGE < 1 MONTH (22)	b. 1 MONTH TO 1 YEAR (23)	c. 1 YEAR TO 5 YEARS (24)	d. 5 YEARS AND OVER (25–26)

16. DEATHS *(Enter number died)*

a. AGE < 1 MONTH (27)	b. 1 MONTH TO 1 YEAR (28)	c. 1 YEAR TO 5 YEARS (29)	d. 5 YEARS AND OVER (30–31)

17. PREGNANCY AND MENOPAUSE

a. AGE FIRST PREGNANCY ENDED (32–33)	b. AGE LAST PREGNANCY ENDED (34–35)	c. AGE AT MENOPAUSE? NOT 40–59 YEARS (36–37)	d. FAMILY PLANNING CONTROL (38)
e. MENAROHE ACCURACY (39)	f. MENOPAUSE ACCURACY (40)	g. PREGNANT HISTORY ACCURACY (41)	h. RECORDER *(name)*

18. PREGNANT NOW (42)
1°=1, 2°=2, 3°=3 NO—0

19. LACTATING AND PREGNANT (43)
1°=4, 2°=5, 3°=6

20. COMMENTS

U.S. GOVERNMENT PRINTING OFFICE : 1968 OF—298–313

Budget Bureau No. 68–S68029
Approval expires June 30, 1968

NATIONAL NUTRITION SURVEY

Pediatric Clinical Examination Record

(Children less than 6 years only)

A. IDENTIFICATION CODE

STATE *(1–2)* | COUNTY *(3–5)* | E.D. *(6–7)* | FAMILY *(8–10)* | LINE NO. *(11–12)*

B. NAME *(First, middle, last)*

C. GENERAL EXAMINATION—CODE: 1—POSITIVE, 0—NEGATIVE; OTHER CODES WHERE DESIGNATED

	EXAMINATION	DOUBTFUL *(Check)*	COL NO.	CODE
1. HAIR				
NEG. ☐	a. DRY STARING		13	
	b. DYSPIGMENTED		14	
	c. EASILY PLUCKABLE		15	
	d. ABNORMAL TEXTURE OR LOSS OF CURL		16	
2. EYES				
	a. CIRCUM CORNEAL INJECTION BILATERAL		17	
NEG. ☐	b. CONJUNCTIVAL INJECTION, BILATERAL		18	
	c. XEROSIS CONJUNCTIVAE		19	
	d. BITOT'S SPOTS		20	
3. LIPS				
	a. ANGULAR LESIONS		21	
NEG. ☐	b. CHEILOSIS		22	
4. TEETH				
	a. VISIBLE CARIES 4 + TEETH		23	
NEG. ☐	b. *(1)*—DEBRIS, *(2)*—CALCULUS, *(3)*—BOTH		24	
	c. FLUOROSIS		25	
5. GUMS				
	a. MARGINAL REDNESS OR SWELLING		26	
NEG. ☐	b. SWOLLEN RED PAPILLAE, *(1)* LOCAL, *(2)* DIFFUSE		27	
	c. BLEEDING GUMS		28	
6. TONGUE				
	a. FILIFORM PAPILLARY ATROPHY		29	
NEG. ☐	b. FUNGIFORM PAPILLARY HYPERTROPHY OR HYPERPENIA		30	
	c. GEOGRAPHIC		31	
	d. FISSURES		32	
	e. SERRATIONS OR SWELLINGS		33	
	f. RED EDGES		34	

	EXAMINATION	DOUBTFUL *(Check)*	COL NO.	CODE
6. TONGUE CONTINUED	SCARLET BEEFY *(Glossitis)*		35	
	h. MAGENTA		36	
7. FACE AND NECK	a. NASOLABIAL SEBORRHEA		37	
	b. PAROTIDS VISIBLY ENLARGED		38	
NEG. ☐	c. THYROID ENLARGED *(1)*/*(2)*/*(3)*/*(4)*		39	
8. FINGERNAILS NEG. ☐	a. *(1)* CLUBBED *(2)* SPOONED *(3)* BOTH		40	
9. SKIN				
	a. FOLLICULAR HYPERKERATOSIS ARMS		41	
NEG. ☐	b. FOLLICULAR HYPERKERATOSIS BACK		42	
	c. DRY OR SCALING *(Xerosis)*		43	
	d. HYPERPIGMENTATION FACE AND HANDS		44	
	e. THICKENED PRESSURE POINTS		45	
10. ABDOMEN	a. POT BELLY		46	
NEG. ☐	b. HEPATOMEGALY		47	
	c. DIASTASIS RECTI		48	
11. LOWER EXTREMITIES NEG. ☐	a. PRETIBIAL EDEMA-BILATERAL		49	
12. SKELETAL	a. BEADING OF RIBS		50	
	b. BOWED LEGS		51	
NEG. ☐	c. EPIPHYSEAL ENLARGEMENT, WRISTS		52	
	d. BOSSING OF SKULL		53	
	e. WINGED SCAPULA		54	
13. IMPRESSIONS	a. *(1)* SKINNY, *(2)* FAT, *(3)* NEITHER		55	
NEG. ☐	b. *(1)* APATHETIC, *(2)* IRRITABLE, *(3)* BOTH		56	
	NAME OF EXAMINER			

NCCD–3–2 *(D.C.)*
4–6
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

14. ANTHROPOMETRY

a. WEIGHT *(Kg.)* CLOTHING ALLOWANCE (13–15)	b. NUDE WEIGHT *(Estimate (Kg.))* (16–18)	c. HEIGHT *(cm)* (19–20)	d. KNEE HEIGHT, RIGHT *(cm)* (21–24)
e. HEAD CIRCUMFERENCE *(cm)* (25–27)	f. CHEST CIRCUMFERENCE EXPIRATION *(cm)* (28–30)	g. ARM CIRCUMFERENCE, RIGHT *(cm)* (31–33)	i. SHOULDER BREADTH *(cm)* (34–36)
j. WRIST BREADTH, RIGHT *(cm)* (37–38)	k. KNEE BREADTH, RIGHT *(cm)* (39–40)	l. SKINFOLD, RIGHT TRICEPS *(mm)* (41–42)	m. SKINFOLD, SUBSCOPULAR *(mm)* (43–44)

15. MEASURED BY *(Name)*

16. RECORDED BY *(Name)*

17. COMMENTS

U.S. GOVERNMENT PRINTING OFFICE : 1968 OF—298–314

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

NATIONAL NUTRITION SURVEY
CLINICAL HISTORY

A. IDENTIFICATION CODE
STATE *(1–2)* | COUNTY *(3–5)* | E.D. *(6–7)*
FAMILY *(8–10)* | LINE NO. *(11–12)*

B. INFORMANT'S NAME *(13–14)* | **C.** INTERVIEWER'S NAME | **D.** INDIVIDUALS NAME

E. MALIGNANCY AND OPERATIONS *(All ages)* CODES: 0—NONE 1—DURING PAST YEAR 2—OVER ONE YEAR

SITE	MALIGNANCY		OPERATION		SITE	MALIGNANCY		OPERATION	
	COL.	CODE	COL.	CODE		COL.	CODE	COL.	CODE
1. HEAD OR NECK	17		18		5. URINARY	25		26	
2. HEART OR LUNGS	19		20		6. BONES	27		28	
3. BREASTS	21		22		7. BLOOD	29		30	
4. GASTRO-INTESTINAL	23		24		8. OTHER	31		32	

F. GENERAL MEDICAL HISTORY *(All individuals 6 years of age and over)*
CODES: 0—NONE 1—DURING PAST YEAR 2—OVER ONE YEAR AGO.

CONDITION	TREATMENT		HOSPITALIZED		CONDITION	TREATMENT		HOSPITALIZED	
	COL.	CODE	COL.	CODE		COL.	CODE	COL.	CODE
1. OBESITY	33		34		13. ASTHMA	57		58	
2. ALLERGY	35		36		14. TUBERCULOSIS	59		60	
3. ANEMIA	37		38		15. OTHER CHRONIC PULMONARY	61		62	
4. THYROID	39		40		16. LIVER DISEASE	63		64	
5. DIABETES	41		42		17. GALL BLADDER DISEASE	65		66	
6. CONGENITAL ANOMALY	43		44		18. ULCER, GASTRIC OR DUOD.	67		68	
7. PSYCHIATRIC DISORDERS	45		46		19. GLOMERULONEPHRITIS	69		70	
8. EPILEPSY	47		48		20. PYELONEPHRITIS	71		72	
9. STROKE	49		50		21. ABNORM. UTERINE BLEEDING	73		74	
10. CARDIOVASCULAR DISEASE	51		52		22. ARTHRITIS	75		76	
11. HEART FAILURE	53		54		23. FRACTURES	77		78	
12. HYPERTENSION	55		56		24. POST TRAUMA DISABILITY	79		80	

G. PEDIATRIC HISTORY FOR INDIVIDUALS UNDER 6 YEARS OF AGE *(Items 1–5) and 18–20 Code direct. 6–19, and 21 codes included)*

1. BIRTH ORDER *(Code direct)* *(33–34)*	2. AT WHAT AGE DID CHILD SIT ALONE? *(Months)* *(35–36)*	3. AT WHAT AGE DID CHILD WALK ALONE? *(Months)* *(37–38)*	4. AT WHAT AGE DID CHILD SAY WORDS LIKE "MAMA?" *(Months)* *(39–40)*

NCCD-3-3 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

G. PEDIATRIC HISTORY FOR INDIVIDUALS UNDER 6 YEARS OF AGE *(Continued)*

5. WAS CHILD FED SOLELY FROM BOTTLE? *(41)*
   a. ☐ Yes
   b. ☐ No *(Code No. 0)*

6. IF CHILD WAS BOTTLE FED, WAS MILK: *(42)*
   a. ☐ Whole cow's
   b. ☐ Commercial Formula
   c. ☐ Soybase
   d. ☐ Meat base

7. IF NOT BOTTLE FED AT WHAT AGE WAS CHILD WEANED *(Months)* *(43)*

8. DOES CHILD RECEIVE SUPPLEMENTAL VITAMINS? *(45)*
   a. ☐ Yes
   b. ☐ No

9. DOES OR DID CHILD HAVE CONGENIAL DEFECTS INVOLVING: *(46)*
   a. ☐ Heart
   b. ☐ Mouth
   c. ☐ Eyes
   d. ☐ Feet
   e. ☐ G.U. System
   f. ☐ Mental defic.
   g. ☐ Cerebral Palsy
   h. ☐ Other
   (Specify) _____

10. HAS CHILD HAD ANY OF THE FOLLOWING CONTAGIOUS DISEASES? *(47–49)* *(a) (b) (c)*
    CODES: 1—Yes 0—No
    a. ☐ Measles
    b. ☐ Chicken Pox
    c. ☐ Mumps

11. HAS CHILD RECEIVED ANY IMMUNIZATIONS? *(50)*
    a. ☐ Yes
    b. ☐ No

12. HAS CHILD RECEIVED ANY OF THE FOLLOWING IMMUNIZATIONS? *(51–55)* *(a) (b) (c) (d) (e)*
    CODES: 1—Mass Campaign 2—H.D. Clinic 3—Private Physician 0—No
    a. ☐ DPT
    b. ☐ Polio
    c. ☐ Smallpox
    d. ☐ Measles
    e. ☐ Mumps

13. DOES CHILD PASS WORMS? *(56)*
    CODE: 1—Tiny white 2—Pencil like 3—No

14. PICA *(57)*
    CODE: 1—Soil 2—Starch 3—Paint 4—Other

15. HAS CHILD EVER ACCIDENTALLY INGESTED MEDICINE OR POISON? *(58)*
    a. ☐ Yes b. ☐ No

16. HAS CHILD EVER HAD SERIOUS ACCIDENT RESULTING IN PHYSICAL INJURY? *(59)*
    a. ☐ Yes b. ☐ No

17. IF "YES" TO QUESTION 16 WHAT KIND OF ACCIDENT? *(60)*
    CODES: 1—Burn 2—Auto 3—Fall 4—Flying object 5—Suffocation

18. HOW MANY COLDS HAS CHILD HAD DURING PAST 6 MONTHS? *(Code direct, 8 or more as 8)* *(61)*

19. HOW MANY TIMES IN HIS LIFE HAS HE HAD PNEUMONIA? *(Code direct, 8 or more as 8)* *(62)*

20. HOW MANY TIMES HAS CHILD HAD DIARRHEA DURING PAST 6 MONTHS? *(Code direct, 8 or more as 8)* *(63)*

21. DOES HE HAVE DIARRHEA NOW? *(64)*
    a. ☐ Yes
    b. ☐ No

22. COMMENTS:

U.S. GOVERNMENT PRINTING OFFICE : 1968 O—298-315

NATIONAL NUTRITION SURVEY
LABORATORY RECORD

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

1	2		4		6			9	11			14		16		18		20	22		24		26		28	29	30		32				36	37	38	39
LABORATORY REFERENCE CODE			STATE		COUNTY			E. D.	FAMILY NUMBER			IND. NO.		DAY		MONTH		YEAR	YEAR		MONTH		DAY		SEX & CONDITION	RACE	OCCUPATION		SAMPLE				URINE			
LOCATION									CASE					DATE OF EXAMINATION					DATE OF BIRTH						SEX & CONDITION	RACE	OCCUPATION		SAMPLE NUMBER							
IDENTIFICATION																																			

CODE: SEX AND CONDITION

1. MALE
2. FEMALE
3. PREGNANT 1°
4. PREGNANT 2°
5. PREGNANT 3°
6. LACTATING
7. LACTATING + 1°
8. LACTATING + 2°

ITEM	COL. NO.	CODE
1. WHOLE BLOOD		
a. HEMOGLOBIN *(gm/100 ml)*	32	
b. HEMATOCRIT *(%)*	35	
c. RED CELL RIBOFLAVIN *(mcg/100 ml)*	37	
2. PLASMA		
a. TOTAL PROTEIN *(gm/100 ml)*	40	
b. ALBUMIN *(gm/100 ml)*	43	
c. α 1-GLOBULIN *(gm/100 ml)*	46	
d. α 2-GLOBULIN *(gm/100 ml)*	49	
e. β-GLOBULIN *(gm/100 ml)*	52	
f. γ-GLOBULIN *(gm/100 ml)*	55	
g. TOTAL GLOBULIN *(gm/100 ml)*	58	
h. VITAMIN A *(mcg/100 ml)*	61	
i. CAROTENE *(mcg/100 ml)*	64	
j. VITAMIN C *(mg/100 ml)*	67	
k. CHOLESTEROL *(mg/100 ml)*	70	
CARD NUMBER	78	301

ITEM	COL. NO.	CODE
3. ANTHROPMETRY		
a. HEIGHT *(cm)*	32	
b. WEIGHT *(kg)*	36	
4. URINE		
a. VOLUME	40	
b. TIME OF COLLECTION *(minutes)*	43	
c. SPECIFIC GRAVITY	47	
d. pH *(units)*	51	
e. CREATININE *(gm/100 ml)*	53	
f. RIBOFLAVIN *(mcg/gm creatinine)*	57	
g. THIAMINE *(mcg/gm creatinine)*	61	
h. N-METHYLNICOTINAMIDE *(mg/mg creatinine)*	65	
i. UREA NITROGEN *(gm/gm creatinine)*	68	
j. GLUCOSE *(strip test)*	71	
k. BLOOD *(strip test)*	72	
l. GLUCOSE *(Benedict's)*	73	
m. BLOOD *(Guaiac)*	74	
n. ALBUMIN	75	
CARD NUMBER	78	302

BIOCHEMISTRY	COL. NO.	CODE
5. OTHER DETERMINATIONS		
a. PLASMA UREA NITROGEN *(mg/100 ml)*	40	
b. PLASMA RIBOFLAVIN *(mcg/100 ml)*	42	
c. SERUM IRON *(mcg/100 ml)*	45	
d. SERUM IRON BINDING CAPACITY *(mcg/100 ml)*	48	
e. URINE CREATINE ÷ *(mg/gm creatinine)*	52	
f. PLASMA AMINO ACID RATIO	56	
g. URINARY HYDROXYPROLINE *(mg/day)*	58	
h. URINARY HYDROXYPROLINE *(mg/gm creatinine)*	60	
i. TRANSKETOLASE	62	
j. ALBUMIN *(Buiret)*	66	
k. ALBUMIN *(Heat)*	70	
CARD NUMBER	78	303

COMMENTS

NCCD-3-4 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

G. PEDIATRIC HISTORY FOR INDIVIDUALS UNDER 6 YEARS OF AGE *(Continued)*

5. WAS CHILD FED SOLELY FROM BOTTLE? *(41)* ☐☐
a. ☐ Yes
b. ☐ No *(Code No. 0)*

6. IF CHILD WAS BOTTLE FED, WAS MILK: *(42)* ☐
a. ☐ Whole cow's
b. ☐ Commercial Formula
c. ☐ Soybase
d. ☐ Meat base

7. IF NOT BOTTLE FED AT WHAT AGE WAS CHILD WEANED *(Months)* *(43)* ☐

8. DOES CHILD RECEIVE SUPPLEMENTAL VITAMINS? *(45)* ☐
a. ☐ Yes
b. ☐ No

9. DOES OR DID CHILD HAVE CONGENIAL DEFECTS INVOLVING: *(46)* ☐
a. ☐ Heart
b. ☐ Mouth
c. ☐ Eyes
d. ☐ Feet
e. ☐ G.U. System
f. ☐ Mental defic.
g. ☐ Cerebral Palsy
h. ☐ Other
(Specify) _____

10. HAS CHILD HAD ANY OF THE FOLLOWING CONTAGIOUS DISEASES? *(47–49)* *(a)* *(b)* *(c)* ☐☐☐
CODES: 1—Yes 0—No
a. ☐ Measles
b. ☐ Chicken Pox
c. ☐ Mumps

11. HAS CHILD RECEIVED ANY IMMUNIZATIONS? *(50)* ☐
a. ☐ Yes
b. ☐ No

12. HAS CHILD RECEIVED ANY OF THE FOLLOWING IMMUNIZATIONS? *(51–55)* *(a)* *(b)* *(c)* *(d)* *(e)* ☐☐☐☐☐
CODES: 1—Mass Campaign 2—H.D. Clinic 3—Private Physician 0—No
a. ☐ DPT
b. ☐ Polio
c. ☐ Smallpox
d. ☐ Measles
e. ☐ Mumps

13. DOES CHILD PASS WORMS? *(56)* ☐
CODE: 1—Tiny white 2—Pencil like 3—No

14. PICA *(57)* ☐
CODE: 1—Soil 2—Starch 3—Paint 4—Other

15. HAS CHILD EVER ACCIDENTALLY INGESTED MEDICINE OR POISON? *(58)* ☐
a. ☐ Yes b. ☐ No

16. HAS CHILD EVER HAD SERIOUS ACCIDENT RESULTING IN PHYSICAL INJURY? *(59)* ☐
a. ☐ Yes b. ☐ No

17. IF "YES," TO QUESTION 16 WHAT KIND OF ACCIDENT? *(60)* ☐
CODES: 1—Burn 2—Auto 3—Fall 4—Flying object 5—Suffocation

18. HOW MANY COLDS HAS CHILD HAD DURING PAST 6 MONTHS? *(Code direct, 8 or more as 8)* *(61)* ☐

19. HOW MANY TIMES IN HIS LIFE HAS HE HAD PNEUMONIA? *(Code direct, 8 or more as 8)* *(62)* ☐

20. HOW MANY TIMES HAS CHILD HAD DIARRHEA DURING PAST 6 MONTHS? *(Code direct, 8 or more as 8)* *(63)* ☐

21. DOES HE HAVE DIARRHEA NOW? *(64)* ☐
a. ☐ Yes
b. ☐ No

22. COMMENTS:

U.S. GOVERNMENT PRINTING OFFICE : 1968 O—298–316

NATIONAL NUTRITION SURVEY
DIETARY FORM 1

NAME

ADDRESS

Budget Bureau No. 68 S68029
Approval expires June 30, 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	64	65	76		77		78	79	80									76	1	1	3	1
													RESPOND-ENT'S LINE NO.		MONTH		DAY		YEAR		INTER-VIEWER		FORM COMPLETED CODE		SAMPLE TYPE HOUSEHOLD		DIETARY SURVEY	CONSUMER DATE	COL-LECTION METHOD									COM-PLETION CODE	SAMPLE TYPE HOUSEHOLD	DIETARY SURVEY	GENERAL INFOR-MATION	COL-LECTION METHOD

LOCATION | CASE | DATE OF RECALL

LINE NO.	FIRST NAME	LAST NAME	AGE AT LAST BIRTHDAY			SEX STATUS (Code)	MEALS EATEN FROM HOME YESTERDAY (Code)				MEALS EATEN AWAY FROM HOME YESTERDAY (Code)	USUAL MEAL PATTERN (Code)	SPECIAL DIET (Code)	DOCTOR PRESCRIP-TION (Code)	TIME ON DIET CODE 9'S IF DON'T KNOW				LINE NO.
			YRS.	MOS.	DAYS		A.M.	NOON	P.M.	BETWEEN MEALS					YEARS		MONTHS		
			(22)	(24)	(26)	(28)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)	(43)	(44)	74–75
01																			01
02																			02
03																			03
04																			04
05																			05
06																			06
07																			07
08																			08
09																			09
10																			10
11																			11
12																			12
13																			13
14																			14
15																			15

Sex Code (Col. 28)
1—MALE
2—FEMALE
3—1° PREGNANT
4—2° PREGNANT
5—3° PREGNANT
6—LACTATING
7—1° LACTATING AND PREGNANT
8—2° LACTATING AND PREGNANT
9—3° LACTATING AND PREGNANT

Consumer Code (Col. 33–36)
0—ATE
1—DID NOT EAT

Meals Code (Col. 37 and 38)
0—NONE
1—ALL MEALS
2—ONLY A.M.
3—ONLY NOON
4—ONLY EVENING
5—A.M. AND NOON
6—A.M. AND EVENING
7—NOON AND EVENING

Special Diet Code (Col. 37)
0—NONE
1—DIABETES
2—CLORIC RESTRICTION
3—NA. RESTR. PREGNANT
4—NA. RESTR. OTHER
5—OTHER *(Specify)*

Physician Prescribed Code (Col. 38)
1—YES
2—NO

Why not Completed (Col. 76)
1—REFUSAL
2—NOT AVAILABLE
3—INFORMANT INCAPABLE
4—OTHER

NCCD—3–5 *(D.C.)*
4–68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203

GPO : 1968 OF—290–317

770

NATIONAL NUTRITION SURVEY
DIETARY FORM 2

NAME | ADDRESS *(Street, City, State, ZIP Code)*

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	64	65
													RESPONDENT LINE NO.		MONTH		DAY		YEAR		
LOCATION										CASE			DATE OF RECALL									

COL. NO.	ITEM	CODE
22	1. WHERE DO YOU GET MOST OF YOUR FAMILY'S FOOD *(Record 1 if applicable 0 if not)* a. PURCHASED	
23	b. COMMODITIES	
24	c. HOME PRODUCED	
25	d. HUNTING AND FISHING	
26	e. GIFTS	
27	f. PAYMENT FOR WORK	
28-31	2. IF YOU PRODUCED ANY FOOD IN 1967 ESTIMATE AND RECORD HOW MUCH YOUR FAMILY CONSUMED *(Record 0, if none produced)* a. BEEF, NO. OF POUNDS	
32-35	b. PORK, NO. OF POUNDS	
36-39	c. POULTRY, NO. OF POUNDS	
40-41	d. OTHER ANIMAL PROTEIN NO. OF POUNDS	
42-43	e. MILK, GAL./DAY	
44-45	f. EGGS DOZ./WK.	
46-47	g. VEGETABLES AND/OR FRUITS AVAILABLE NO. OF WEEKS	

COL. NO.	ITEM	CODE
48-50	IF YOU PRESERVED FOOD *(Can, freeze, dry, etc.)* h. FRUITS, NO. OF QUARTS	
51-53	i. VEGETABLES, NO. OF QUARTS	
54	3. WHERE DO YOU USUALLY BUY YOUR FOOD AND HOW DO YOU PAY FOR IT? *(Circle "NO," if source not used. Do not circle both cash and credit)* a. SUPERMARKET	1 NO 2 CASH 3 CREDIT
55	b. FARM STORE	1 NO 2 CASH 3 CREDIT
56	c. NEIGHBORHOOD STORE	1 NO 2 CASH 3 CREDIT
57	d. OTHER *(specify)*	1 NO 2 CASH 3 CREDIT
58	4. ARE YOU ELIGIBLE TO RECEIVE FOOD STAMPS	1 NO 2 YES 3 NONE IN AREA
59	5. DO YOU PURCHASE FOOD STAMPS	1 NO 2 REGULARLY 3 OCCASIONALLY
60-63	6. HOW MUCH DO YOU PAY FOR THEM MONTHLY	0 NOT PURCHASED $ _____
64-65	INTERVIEWER	

COL. NO.	ITEM	CODE
74-75	CARD NUMBER 1	
76	COMPLETION OF FORM	
77-80	SAMPLE TYPE HOUSEHOLD DIETARY SURVEY GENERAL INFO.	1131
	REPEAT COLUMN 1-21 BEGINS CARD 2 20	
22-26	6. HOW MUCH DID YOU SPEND LAST MONTH FOR YOUR FAMILY FOOD? *(Include value of food stamps if used) (Omit cents)* WORK SPACE _____	$ _____
27	7. WAS THIS THE AMOUNT YOU USUALLY SPEND?	1 NO 2 YES
28	8. CIRCLE APPROPRIATE ANSWER FOR KITCHEN FACILITIES a. NO. SURFACE UNITS THAT WORK	
29	b. RESPONDENT'S ATTITUDE REGARDING SURFACE UNITS	1 ADEQUATE 2 NOT ADEQUATE
30	c. OVEN	0 NONE 1 FUNCTIONS 2 DOES NOT FUNCTION
31	d. REFRIGERATOR *(Respondent's answer)*	1 ADEQUATE 2 NOT ADEQUATE
32	e. KIND OF REFRIGERATOR	0 NONE 1 ICE 2 AUTOMATIC 3 HOME FREEZER 4 UTILIZE COMM. FREEZER 5 AUTO. COMB. R/F 6 COMB. OF ANY UNITS ABOVE
33	9. DO YOU SHARE COOKING FACILITIES?	1 NO 2 YES
34	10. DO YOU SHARE REFRIGERATOR?	1 NO 2 YES
35	11. DO YOU SHARE STORAGE FACILITIES?	1 NO 2 YES
36	12. DO YOU HAVE ELECTRICITY IN THE HOME?	1 NO 2 YES

COL. NO.	ITEM	CODE
43-47	13. DID YOU RECEIVE PUBLIC ASSISTANCE LAST MONTH? IF "YES," AMOUNT	1 NO $ _____
48-52	14. WHAT WAS HOUSEHOLD INCOME LAST MONTH?	$ _____
75-74	CARD NUMBER 2	21
76	COMPLETION OF FORM	
77-80	SAMPLE TYPE—HOUSEHOLD DIETARY SURVEY GENERAL INFORMATION DATA	1131

COMPLETION CODE *(Column 76)*

1—REFUSAL
2—NOT AVAILABLE
3—INFORMANT INCAPABLE
4—OTHER

REMARKS

NCCD-3-6 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

U.S. GOVERNMENT PRINTING OFFICE : 1968 OF—298-318

NATIONAL NUTRITION SURVEY
DIETARY FORM 3

NAME

ADDRESS

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	77	78	79	80	63	64	65	76	77	78	79	80
													RESPONDENT'S LINE NO.		MONTH		DAY		YEAR		YEARS		MONTHS		DAYS		MALE	FEMALE	PG. 1	PG. 2	PG. 3	LACT.	LACT. 1	LACT. 2	PG./LACT. AGED	DIETARY SURVEY	CONSUMER DATA	COLLECTION METHOD	DAY OF RECALL	INTERVIEWER	COMPLETION	HOUSEHOLD	PG./LACT.	AGED, M/F	DIETARY SURVEY	FOOD-GRAMS DATA	COLLECTION METHOD
IDENTIFICATION															DATE OF RECALL						AGE						SEX, STATUS, AND SAMPLE TYPE *(Circle one)*												SAMPLE TYPE *(Circle one)*							

COMPLETE IF INDIVIDUAL RECORD

INGESTION PERIOD	FOOD CODES					FOOD CONSUMED		WORK AREA *(If needed)*	SIZE OF EDIBLE PORTION SERVING			TIME OF DAY
									I	II	III	
24	25	26	27	28	29	FOOD ITEM	DESCRIPTION		30–34	35–39	40–44	45–48

COMPLETE FOLLOWING QUESTIONS IF AGING RESPONDENT—REPEAT COLUMN 1–21

COL. NO.	ITEM	CODE
22	*(Answer question 1–3 if lives alone or with other aging person)* 1. WHO USUALLY PREPARES YOUR FOOD?	1. SPOUSE 2. SELF 3. OTHER HOUSEHOLD MEMBER 4. OTHER
23	*(Ask only in food stamps are available in the area)* 2. ARE YOU ELIGIBLE TO PURCHASE? IF "YES," DO YOU PURCHASE?	1. NO 2. REGULARLY 3. OCCASIONALLY 4. NEVER
24	3. WHAT IS THE MAJOR SOURCE OF YOUR FOOD?	1. SELF INCOME *(Include social security)* 2. SOME PRODUCED 3. WELFARE $_____ 4. FAMILY 5. OTHER 6. WELFARE DONATED FOOD
25	*(Answer questions 4 and 5 if respondent is part of a larger household)* 4. DO YOU HAVE ADDITIONAL INCOME OF YOUR OWN?	1. NO 2. YES
26	5. DO YOU GENERALY EAT WITH OTHERS OF THE FAMILY?	1. NO 2. YES
75–76	CARD NUMBER	
77–80	SAMPLE TYPE AGING DIETARY SURVEY	5131

REMARKS

INGESTION PERIOD CODE *(Column 24)*

1. A.M.
2. NOON LUNCH
3. BETWEEN MEALS
4. P.M.
5. SCHOOL LUNCH
9. TOTAL DAY

COMPLETION CODE *(Column 76)*

1. REFUSAL
2. NOT AVAILABLE
3. INFORMANT INCAPABLE
4. OTHER

NCCD–3–7 *(D.C.)*
4–69
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VA. 22203

U.S. GOVERNMENT PRINTING OFFICE : 1968 O—298–319

NATIONAL NUTRITION SURVEY
DIETARY FORM 4

NAME | ADDRESS

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	44	65
													RESPONDENT'S LINE NO.		MONTH		DAY		YEAR			
IDENTIFICATION															DAY OF RECALL							

FOOD GROUP OR ITEM USUALLY SERVED AND ONE HALF OF HOUSEHOLD MEMBERS CONSUMED *(Exclude all 0–36 mos.)*

COL. NO.	CODE	ITEM	COL. NO.	CODED ITEM
22—	0101	1. MILK *(Beverages and cereals)* a. WHOLE FRESH	26—	____ DWMY
29—	0102	b. SKIM, FRESH OR BUTTERMILK	33—	____ DWMY
36—	0103	c. EVAPORATED *(Whole or skim)*	40—	____ DWMY
43—	0104	DRY SKIM	47—	____ DWMY
50—	0200	2. MEATS *(Includes franks, luncheon meats, etc.)*	54—	____ DWMY
57—	0300	3. POULTRY	61—	____ DWMY
64—	0400	4. FISH	68—	____ DWMY
CARD NUMBER 1			74—	40
SAMPLE TYPE FAMILY—DIETARY SURVEY FREQUENCY INTAKE DATA			77—	1141
REPEAT COLUMN 1–21 *(Begin card 2)*				
22—	0500	5. MIXED MEAT, FISH, POULTRY *(Dishes casseroles, stews, etc.)*	26—	____ DWMY
29—	0600	6. EGGS	33—	____ DWMY
36—	0105	7. CHEESE AND CHEESE DISHES	40—	____ DWMY
43—	0700	8. SOUPS AND GRAVIES	47—	____ DWMY
50—	090	9. LEGUMES—NUTS *(Mature or dry peas; beans, etc.)*	54—	____ DWMY
57—	1000	10. CEREALS AND GRAIN PRODUCTS *(Breads, rice, pasta, etc.)*	61—	____ DWMY
64—	1101	11. FRUITS AND VEGETABLES RICH IN VITAMIN C *(See guidelines)*	68—	____ DWMY
CARD NUMBER 2			74—	41
SAMPLE TYPE FAMILY—DIETARY SURVEY FREQUENCY INTAKE DATA			77—	1141
REPEAT COLUMN 1–21 *(Begin card 3)*				
22—	1102	b. VEGETABLES RICH IN VITAMIN A *(See guidelines)*	26—	____ DWMY
29—	1103	12. OTHER FRUITS AND VEGETABLES	33—	____ DWMY
36—	1201	13. SUGAR PRODUCTS *(Pastries and other desserts)*	40—	____ DWMY
43—	1202	14. SUGAR PRODUCTS *(Jams, jellies, candies)*	47—	____ DWMY
50—	1203	15. SWEETENED BEVERAGES *(See guidelines)*	54—	____ DWMY
57—	1400	a. ARTIFICALLY SWEETENED BEVERAGES *(See guidelines)*	61—	____ DWMY
64—	1402	b. COFFEE OR TEA	68—	____ DWMY
CARD NUMBER 3			74—	42
SAMPLE TYPE FAMILY—DIETARY SURVEY FREQUENCY INTAKE DATA			77—	1141
REPEAT COLUMN 1–21 *(Begin card 4)*				
22—	1403	e. BEER	26—	____ DWMY
29—	1404	f. WINE	33—	____ DWMY
36—	1405	g. WHISKEY, GIN VODKA, RUM	40—	____ DWMY
43—	1600	16. SNACK FOODS *(Chips, corn chips, etc.)*	47—	____ DWMY
CARD NUMBER 4			74—	43
SAMPLE TYPE FAMILY—DIETARY SURVEY FREQUENCY INTAKE DATA			77—	1141
REPEAT COLUMN 1–21 *(Begin card 5)*				
1. HOW MANY OF YOUR FAMILY USUALLY EAT TOGETHER AT a. THE A.M.			22—	1 ALL 2 NONE 3 SOME

ITEM	COL. NO.	CODED ITEM
1. HOW MANY OF YOUR FAMILY USUALLY EAT TOGETHER AT: *(Continued)* b. NOON	23—	1 ALL 2 NONE 3 SOME
2. HOW MANY OF YOUR HOUSEHOLD MEMBERS USUALLY EAT ONE OR MORE MEALS OUT a. EACH DAY	24—	
b. 2–3 TIMES A WEEK	26—	
AT OFFICE: FROM FORM 1		
TOTAL NUMBER OF PERSONS IN HOUSEHOLD	28—	
INTERVIEWERS NUMBER	64—	
CARD NUMBER 5	74—	44
COMPLETION OF FORM	76—	
SAMPLE TYPE—FAMILY DIETARY SURVEY: GENERAL INFORMATIONAL DATA	77—	1141

COMPLETION CODE *(Column 76)*
1—REFUSAL
2—NOT AVAILABLE
3—INFORMANT INCAPABLE
4—OTHER

FREQUENCY CODE:
D—DAY
W—WEEK
M—MONTH
Y—YEAR
O—NO

REMARKS

773

* NCCD–3–8 *(D.C.)*
4–68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE
ARLINGTON, VIRGINIA 22203

U.S. GOVERNMENT PRINTING OFFICE : 1968 OF—294-320 *

NATIONAL NUTRITION SURVEY
DIETARY FORM 5

NAME

ADDRESS

Budget Bureau No. 68-S68029
Approval Expires June 30, 1968

| | | |

NATIONAL NUTRITION SURVEY
DIETARY FORM 6

NAME

ADDRESS

Budget Bureau No. 68-S68029
Approval expires June 30, 1968

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	24	25	26	27	28	77	78	79	80	63	64	65	76	77	78	79	80
																					MONTHS	DAYS			SAMPLE TYPE INFANT	DIETARY SURVEY	CONSUMER DATA	COLLECTION METHOD	DAY OF RECALL	INTERVIEWER		COMPLETION	SAMPLE TYPE INFANT	DIETARY SURVEY	FOOD GRAM	COLLECTION METHOD
																					AGE				SEX											

MALE FEMALE *(Circle one)*

COMPLETION CODE
1—REFUSAL
2—NOT AVAILABLE
3—INFORMANT INCAPABLE
4—OTHER

SOURCES CODE *(Col. 49)*
T—TABLE FOOD
H—HOME PREPARED
COMMERCIAL
B—BABY COMMERCIALLY PREPARED
J—JUNIOR COMMERCIALLY PREPARED

PART A

COL. NO.	ITEM	CODE
22-23	1. WAS THE MILK *(he)* HAD YESTERDAY *(24 hrs.)* a. BREAST, IF "YES," (1) NUMBER OF TIMES	0 NO _____ TIMES
24	(2) WAS THIS	1 SCHEDULE 2 SELF-DEMAND
25-26	b. BOTTLE, IF "YES," (1) NUMBER OF BOTTLES	0 NO _____ BOTTLES
27	(2) WAS THE BOTTLE *(Use only if formula had dry skim milk)*	1 SCHEDULE 2 SELF-DEMAND
28	(3) WAS THIS DRY SKIM MILK PART OF YOUR DONATED FOOD?	1 NO 2 YES

PART B

INGESTION PERIOD	FOOD ITEM CODE	FORMULA ITEM	WORK AREA *(If needed)*	AMOUNT PREPARED I	AMOUNT PREPARED II	AMT. CONSUMED *(If less than tot.)* III
24	25-29			30-34	35-39	40-44
9	0 0 3 2 5	MILK, FRESH, WHOLE HOMOG.				
	0 0 3 2 1	EVAPORATED				
	0 0 3 2 0	CONDENSED				
	0 0 3 2 7	DRY SKIM				
	0 0 3 2 6	COMMERCIALLY PREPARED				
		FORMULA *(Code)*				
		WATER				
		TOTAL FORMULA VOLUME				
9		SUGAR				
9		SYRUP—KARO TYPE				
9		OTHER *(Specify)*				

PART C—WHAT OTHER FOODS DID *(Name)* HAVE YESTERDAY?

INGESTION PERIOD	FOOD CODES	FOOD CONSUMED	WORK AREA *(If needed)*	SIZE OF EDIBLE PORTION SERVING I	SIZE OF EDIBLE PORTION SERVING II	SIZE OF EDIBLE PORTION SERVING III	TIME OF DAY	SOURCES *(Circle one)*
24	25 26 27 28 29	FOOD ITEM		30-34	35-39	40-44	45-48	49
								T H B J
								T H B J
								T H B J
								T H B J
								T H B J
								T H B J
								T H B J
								T H B J

NCCD-3-10 *(D.C.)*
4-68
TEST ONLY

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—PUBLIC HEALTH SERVICE
NATIONAL CENTER FOR CHRONIC DISEASE CONTROL—NUTRITION PROGRAM
4040 NORTH FAIRFAX DRIVE, ARLINGTON, VIRGINIA 22203

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	24	25	26	27	28	63	64	65	76	77	78	79	80
												VITAMINS / MINERAL CODE														DAY OF RECORD		INTERVIEWER	COMPLETION	SAMPLE TYPE: INFANTS	DIETARY SURVEY	FOOD GRAM	COLLECTION METHOD
																														2	1	1	1

COMPLETION CODE *(Col. 76)*

1—REFUSAL
2—NOT AVAILABLE
3—INFORMANT INCAPABLE
4—OTHER

INGESTION PERIOD *(Col. 24)*

SOURCES CODE *(Col. 49)*

T—TABLE
H—HOME PREPARED
B—BABY COMMERCIALLY PREPARED
J—JUNIOR COMMERCIALLY PREPARED

VITAMIN CODE *(Col. 13)*

NO=1 YES=2

PART C—Continuation, if needed.

INGESTION PERIOD	FOOD CODES					FOOD CONSUMED		WORK AREA *(If needed)*	SIZE OF EDIBLE PORTION SERVING			TIME OF DAY	SOURCES *(Circle one)*
									I	II	III		
24	25	26	27	28	29	FOOD ITEM	BRAND *(If necessary)*		30–34	35–39	40–44	45–48	49
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J
													T H B J

PART D

COL. NO.	ITEM	CODE
29	3. IS THIS WHAT *(he)* USUALLY EATS?	1 YES 2 MORE FOOD 3 LESS—ILLNESS 4 LESS—NO FOOD 5 LESS—MOTHER ILL 6 LESS—OTHER
30	4. WHAT WERE THE FIRST FOUR FOODS *(he)* TOOK? 1. _____ 3. _____ 2. _____ 4. _____	
31	5. IS *(he)* TAKING VITAMINS OR MINERALS NOW? *(Code in Col. 13)* 1—NO 2—YES BRAND NAME _____	

COL. NO.	ITEM	CODE
30	6. DOES *(he)* USUALLY TAKE THESE DAILY?	1. NO 2. YES
31–33	7. HOW OLD WAS *(he)* WHEN HE STARTED TAKING THESE?	_____ DWMY
34	8. WAS HE EVER BREAST FED?	1. NO 2. YES
35–37	9. IF BREAST FED, AT WHAT AGE WERE OTHER MILKS STARTED?	99 NOT YET _____ DWMY

COL. NO.	ITEM	CODE
38–40	10. IF NOT NOW BREAST FED BUT WAS, AT WHAT AGE WAS HE WEANED?	99 NOT YET _____ DWMY
41–43	11. IF NOT NOW BOTTLE FED BUT WAS, AT WHAT AGE WAS HE WEANED?	99 NOT YET _____ DWMY
44–46	12. AT WHAT AGE WERE NON-MILK FOODS STARTED?	99 NOT YET _____ DWMY
74–75	CARD NUMBER	50
76	COMPLETION CODE	
77–80	SAMPLE TYPE—INFANT, DIETARY SURVEY GENERAL INFORMATION	2131

NCCD–3–10 *(D.C.)*
4–68
TEST ONLY

U.S. GOVERNMENT PRINTING OFFICE : 1968 O—298–322

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE—CONTRACTOR'S PROPOSAL

Contractor's name: University of Texas Medical Branch, Galveston, Texas.
Proposal requested by: Nutrition Program, National Center for Chronic Disease Control, Public Health Service, 9000 Rockville Pike, Bethesda, Maryland 20014.
Scope of work or services:

I. General Objectives

To conduct a comprehensive nutrition health survey of approximately 200 families in each of 103 enumeration districts in 26 counties in Texas and to establish baseline nutrition health data and to determine the incidence and location of serious hunger, malnutrition and resulting health problems in these areas.

II. Specific Objectives

A. Using the method of the National Center for Health Statistics, to separate the enumeration districts into segments of approximately 40 house units each; to select one segment randomly; and within this segment to select every other household for inclusion in the sample.

B. To establish initial contact with the selected household; to obtain cooperation of the family in the survey and to complete the household information questionnaire.

C. To complete the following dietary forms and questionnaires.

1. One half of the households which were randomly selected will have—
   (*a*) General dietary census data.
   (*b*) General dietary food preparation data.
   (*c*) Food frequency consumption data.
   (*d*) 24 hour household dietary recall data.
   (*e*) Individual 24 hour dietary recall on.
      1. All children 3–6 years of age.
      2. All pregnant/lactating females.
      3. All males 10–13 years of age.
      4. All females 10–16 years of age.

2. The remaining one half of households will have individual 24 hour recall dietary data obtained from—
   (*a*) All pregnant/lactating females.
   (*b*) All males 10–13 years of age.
   (*c*) All females 10–16 years of age.
   (*d*) All male and females over 60 years of age.

D. To complete a medical history and clinical examination of 100% of the sample using the protocol supplied by the PHS and the Manual for Nutrition Surveys.

E. On 25% of the sample randomly selected, complete hematological and biochemical measurements in accordance with the survey protocol and the manual. Collect blood and urine samples from the remaining 75% for the serum bank at CDC.

F. To complete biochemical and hematological analyses on all specimens except for urinary iodine, serum iron, iron binding capacity and folic acid using the manual and the survey protocol.

G. To prepare and ship urinary and hematologic specimens to the United States Army Medical Nutrition Laboratories for serum iron, serum binding, folic acid and micro A & C analyses; urine specimens to the Boston Medical Laboratories for urinary iodine analyses; and hematological specimens to the National Center for Communicable Disease Control for storage in the serum banks.

H. To analyze the health and education resources in each district to be surveyed.

I. To code, key punch and analyze all data except for the dietary, including biochemical data returned from analyses from the other laboratories.

J. To interpret the results of data analyses and provide the nutrition program with the following reports:

1. Initial reports on key findings on the baseline nutritional health status and the incidence of serious malnutrition on May 31, June 15, and June 30.
2. Subsequent monthly reports on key findings after June 30 and a final comprehensive analyses on all findings on January 1, 1969.

This project, in 103 ED's located in 26 Texas counties would be a cooperative effort under the joint supervision of the Texas State Department of Health and

the University of Texas Medical Branch, Galveston, in collaboration with state and local governmental agencies. The University of Texas Medical Branch will act as fiscal agent for the project. The operational aspects of the project will be under the direction of personnel of the University of Texas Medical Branch, Galveston. Methodology, format of data recorded and collected will be performed under specifications developed for all surveys in the national plan by the Nutrition Program, National Center for Chronic Disease Control, Public Health Service.

Schedule of Texas Surveys April to 15 November 1968

Included in the randomly designed sample of poverty-prone ED's in the rural and urban parts of our state will be a total anticipated population of approximately 1650 household units (families) i.e., 7000 to 8500 persons.

Based on the sample design 26 counties of the State will be surveyed. Work will be carried out in these counties from 10 major field work bases on the following proposed schedule. (Migrant workers from the Rio Grande Valley leave for their northern trip during late April. They return in late October. We propose to re-evaluate those families originally included in the sample of Hidalgo and Cameron Counties in April. The repeat evaluation is planned the first week of November.)

	ED	Family	Persons	Days work	Base of operations
1. Hidalgo	4	64	320		Harlingen/McAllen.
2. Cameron	3	48	240	10	
3. Nueces	3	48	240		Corpus Christi.
4. San Patricio	5	80	400	14	
5. Duval	3	48	240		
6. Hardin	1	16	80		Beaumont/Orange/Tyler.
7. Newton	3	48	240	10	
8. Anderson	3	48	240		
9. McLennan	2	32	160		Waco/Austin.
10. Limestone	4	64	320	21	
11. Lampasas	1	16	80		
12. Washington	3	48	240		
13. Travis	3	48	240		
14. Uvalde	2	32	160		
15. Frio	2	32	160	10	Uvalde/Eagle Pass.
16. Dimmit	3	48	240		
17. El Paso	10	160	800	21	El Paso/Odessa.
18. Ector	5	80	400		
19. Jones	2	32	160		
20. Haskell	2	32	160	12	Abilene/Wichita Falls.
21. Wichita	5	80	400		
22. Tarrant	4	64	320	12	Fort Worth/Dallas.
23. Dallas	7	112	560		
24. Harris	11	176	880	14	Houston.
25. Bexar	10	160	800	16	San Antonio.
26. Guadaloupe	2	32	160		
27. Hidalgo				6	Repeat migrant workers.
28. Cameron					

III. Protocol for Survey Procedures: 1650 Famalies—Approximately 7000–8500 Persons 40% Adult, 60% Children

A. Household information (100%)

B. Dietary information

1. 50% regular household and individual data (see C_1)
2. 50% individual data (see C_2)

C. Medical History, Clinical Examination: 100%

D. Anthropometric Measurements: 100%

E. Dental Examinations: 50 to 100%

F. Hematologic/Biochemicals: 25%

Blood and urine will be obtained from all, prepared for storage and selectively evaluated as needed, and transhipped (see G of scope)

G. Vulnerable groups of the population not included in the sample will be included to procure expanded background data with special reference to height and weight, and clinical manifestations of nutritional inadequacy.

As a byproduct of the biochemical work, data will be obtained to validate data provided by automated techniques as compared to manual procedures.

Special hematologic determinations with respect to anemia problems will be forwarded to the Army Nutrition Lab, Denver, Colorado, for the measurement of iron folic acid and vitamin B_{12} status. Urinary iodine will be shipped to Boston and sera to CDC Serum Bank in Atlanta.

IV. Personnel Requirements and Budget Request

All personnel required for the field operations of the survey will be employees of the University of Texas Medical Branch for the duration of this phase of the work. A dentist is requested for assignment to the team for the period of the survey from the National Institute for Dental Research. Two biochemists are requested from FDA for assignment to the Central Biochemical Lab for a period two weeks prior to and two weeks following the field operations. The loan of two portable battery powered X-ray units for the bone age studies is requested from the Army for the period of orientation and field operations, approximately 1 April through 30 November, 1968.

The survey team will have two components: 1. A core unit based and housed at the University of Texas Medical Branch, Galveston, which will include the biochemical and administrative personnel—total 4 persons for budgetary support.

2. The field operation team composed of 31.5 persons who will conduct other aspects of the survey work.

Statistical support for the first phase of the data processing is provided in contract No. Ph 86–68–108. In addition this contract provides the salary support for an additional nutritionist and anthropometrist. This request includes a request for per diem expenses for these two persons during field operations.

Cost of travelling the field team are included by station wagon vehicles. A modified per diem allowance of $300/per month/per person for field team personnel is requested.

Additional volunteer (non-pay) personnel needed to support the field survey activities will be recruited on a local basis in each county.

SECTION 1. CONTRACTORS ORGANIZATION, FACILITIES, AND QUALIFICATIONS

With respect to the contractor's organization, facilities, and qualifications for performing the work or services set forth in the preamble hereof, the contractor represents to the Government:

A. That it is a corporation organized and existing under the laws of the State of Texas, having its principal office and place of business in the city of Galveston in the State of Texas.

That it is a partnership consisting of (names and addresses of all partners): N/A.

That he is on individual trading as: N/A.

B. That it regularly employs 3,000 employees.

C. That work contemplated will be performed at the contractor's place of business located at University of Texas Medical Branch, Galveston, Texas 77550, and through field operations in 26 counties of the State of Texas.

D. That it has satisfied itself as to the full nature and extent of the work or services contemplated, the time and delivery factors involved and understands the complexities involved in the accomplishment of the work or services in all phases.

E. That it has available qualified personnel for the performance of the work or services called for within the time specified with exception of 2 biochemists, 1 dietary supervisor, 1 team administrator.

1. All other personnel will be recruited and employed as part-time personnel for the survey activities.

2. A dentist and two biochemists have been requested from other branches of United States Government for the period of training, orientation and field operations.

F. In order to properly perform this work or service, the contractor contemplates acquiring the following additional facilities. Rental of transportation for field operation:

(*a*) Basic transportation.

(*b*) Mobile biochemical field laboratory.

G. That it presently has the following commitments with the Government relating to the specified work or services and that these commitments will not

interfere with the completion of the work or services contemplated under this proposal:

PH—86–68–108 Contract, Dr. W. J. McGanity.

Re: National Nutrition Survey Statistical Support.

H. That it is currently engaged in work or services of the type required herein and that it is fully qualified for the performance of the work or services hereunder due to its experience in the field involved.

I. That if awarded the contract under negotiation it is the intention of the contrator to subcontract the following phases of the work or services: NIL.

J. That it has not employed or retained a company or person (other than a full-time employee) to solicit or secure this contract, and agrees to furnish information relating thereto as requested by the contracting officer.

K. That it has the necessary financial capacity, working capital, and other resources to perform the contract without assistance from any outside source.

L. That it is aware of the policy of the Government that Government personnel are prohibited from accepting gratuities, in whatever form, offered by organizations of individuals doing or desiring to do business with the Government That the acceptance of gifts or hospitality may tend to compromise both the Government and the recipient, and thus impair public confidence in the integrity of business relations between the Government and outside interests. That the contractor will cooperate to maintain the highest standards in its business relations with Government personnel in the negotiation, award, or administration of any contract which may result from its proposal.

SECTION 2. CONTRACTORS PROPOSAL

A. The contractor having satisfied himself as to the extent and nature of the work or services to be performed under this negotiation, hereby proposes to furnish all facilities, scientific and professional personnel, labor, equipment, materials, supplies and services (other than that to be furnished by the Government as hereinafter provided) and perform all work and services necessary and essential to acceptable completion of the work or services described in the preamble hereto for the total contract consideration shown in the cost breakdown.

B. The Contractor proposes to undertake the performance of the work or services contemplated on the basis that the contract price shall be as checked below:

☐ (1) A Fixed-Price
☒ (2) Cost Reimbursable
☐ (3) Cost Sharing
☐ (4) Cost-Plus-A-Fixed-Fee

C. The general provisions submitted herewith are acceptable as a part of such contract.

D. The amount quoted herein for the performance of the contemplated work or services does not include all applicable Federal excise taxes in effect on the date of any contract awarded as a result of this negotiation, but does not include any State or local taxes except as shown under paragraph J(6) of section 2 hereof.

E. The amount quoted herein for the performance of the work or services contemplated takes into consideration the contractor working the following work week schedule: 40 hour week, 8 a.m. to 5 p.m., 5 days per week—adjustment for field survey activities has been provided.

F. The contractor proposes that if awarded a contract, it will begin work immediately after award of contract, prosecute it vigorously in accordance with the following schedule by scope items:

1. Recruiting personnel immediately.
2. Training/orientation and standardization on or about May 1, 1968.
3. Start survey activities on or about May 10, 1968.
4. Finish survey activities on or about November 10.
5. Complete data processing for statistical analysis on or about December 15.

G. The contractor represents to the Government any charges contemplated as set forth in paragraph J of section 2, are not duplicative of any charges against any other Government contract, subcontract, or other Government source.

H. The contractor's price is predicated upon payments being made to it by the Government in the following manner: Quarterly.

I. The contractor agrees that it will allow 28 days from the date of this proposal for acceptance thereof by the Government.

J. The total estimated cost shown in line (11) below consists of the following items, the amount of each itemized and shown below representing the contractor's best estimate of the cost of such item:

(1)	Expendable Direct Material Costs[1]: Supplies	$19,000
(2)	Direct Labor Costs[2]	113,807
(3)	Other Direct Costs[3]:	
	Travel and per diem	75,000
	OASI	5,402
	WCI	569
(4)	Overhead[4] 20% of TDC (1), and — (2) or — (3) of items 1, 2, 3 above	42,756
(5)	Total ((1), (2), (3) and (4) above)	256,534
(6)	Special direct costs[5]	-------
(7)	Total ((5) and (6) above)	256,534
(8)	General and administrative expense	-------
(9)	Total ((7) and (8) above)	256,534
(10)	Fixed-fee/profit	-------
(11)	Total cost to Government ((9) and (10) above)	256,534

[1] Indicate whether discounts, rebates, allowances and credits are to be applied directly to the charges for the property involved or are apportioned through credits to overhead.
[2] If more than one department or division is involved, then submit figures for each such department or division.
[3] If any item listed is included in overhead, then so indicate.
[4] If alternate methods of computation are used, so indicate.
[5] Refers to taxes directly applicable to the work or to materials or other property required or used in the performance of the contract.

BUDGET—APR. 1 THROUGH DEC. 31, 1968

	Number of months	Salary amount request	Per diem allowance
Based Galveston:			
1 Biochemist	7½	7,875	-------
1 Research technician	7½	4,042	-------
1 Lab helper	7	1,869	-------
1 Clerk-typist	8	2,440	-------
Field operations:			
1 Team director	6	9,000	1,800
1 Team administrator	7	4,970	1,000
1 Dentist	6	6,300	1,800
4 Medical officers	6	7,920	7,200
4.5 Household interviewers/mappers	6	9,045	7,200
6 Dieticians	6	22,320	10,800
1 Dietary supervisor	7	5,600	1,800
1 Dental recorder	6	1,602	1,800
2 Anthropometry technicians	6	3,960	3,600
1 X-ray technician	6	3,084	1,800
4 Biochemical technicians	6	14,544	7,200
2 Drivers	5½	4,202	1,650
3 Registration clerks	6	5,034	5,400
Total, 35.5 persons	5½-8	113,807	53,050

Note: Personnel: Survey coordinators, William J. McGanity, University of Texas Medical Branch; Fratis L. Duff, Texas State Department of Health; biostatistical consultant, E. B. Bridgforth.

Travel and transportation:	
(a) 7 vehicles with insurance, maintenance/gas/oil/tires	$14,000
(b) Mobile biochemical laboratory with insurance/maintenance/gas/oil/tires—part of 3 year lease (6 months charged to Texas survey)	5,000
(c) Travel: base to field for coordinators and administrator estimated 30 trips, 60 days per diem	3,000
(d) Modified per diem for field team personnel (31)	53,000
Total	75,000
Equipment/supplies/materials:	
(a) Base and field biochemical laboratories [1]	11,000
(b) Field medical/dental/dietary/etc.	2,000
(c) Base and field administrative	3,000
(d) Audio-visual aids/communication and freight	3,000
Total	19,000
OASI	5,402
WCI	569
	−5,971
Total direct costs	213,778
Indirect cost 20% of total direct cost	42,756
Total	256,534

[1] As modified from manual nutrition surveys—includes additional technicon sampler II and colorimeter $2,000. Only items exceeding $1,000.

If contractor's method of cost distribution is incompatible with this form, cost estimate may be set forth in format of contractor's choice, provided that the information requested above is adequately reflected.

Use additional sheets to itemize where necessary for any items above.

SECTION 3. FACILITIES, EQUIPMENT AND MATERIALS TO BE FURNISHED CONTRACTOR BY THE GOVERNMENT

It is understood and agreed that the Government will furnish and deliver to the contractor, f.o.b. its plant the following equipment, materials and/or supplies:

MARCH 27, 1968.
Galveston, Texas

THE UNIVERSITY OF TEXAS MEDICAL BRANCH,
WARREN G. HARDING,
Vice President for Administration.
J. E. PEAVY, M.D., M.P.H.,
Commissioner of Health, Texas State Department of Health.

TULANE UNIVERSITY SCHOOL OF MEDICINE,
New Orleans, La.

PROPOSAL FOR NUTRITIONAL HEALTH SURVEY IN THE STATE OF LOUISIANA BY THE TULANE UNIVERSITY SCHOOL OF PUBLIC HEALTH AND TROPICAL MEDICINE

A. General objectives

To conduct, in collaboration with the Louisiana State Department of Health and other appropriate agencies of State and local government and under the administrative direction and control of the School of Public Health and Tropical Medicine of the Tulane University of Louisiana, a comprehensive nutritional health survey of approximately 2,000 families in 97 census enumeration districts

in 19 parishes (counties) in the State of Louisiana, to establish baseline nutritional health data and to determine the incidence and location of serious hunger, malnutrition and resulting health problems in these areas.

B. Specific objectives

1. Using the methods of the National Center of Health Statistics, to separate the census enumeration districts selected for the study into segments of approximately 40 housing units each, select one of these segments randomly, and within this segment select every other household for inclusion in the sample.

2. Establish the initial contacts with the selected households, obtain cooperation of the family in the survey and complete the household information questionnaires.

3. Complete the following dietary forms and questionnaires:

(*a*) On 50% of the households, randomly selected, to complete general dietary census data; frequency of food consumption data and 24-hour dietary recall data for all households, for all children aged 0 to 36 months, on all pregnant and/or lactating women, and on all males and females aged 10 to 16 years.

(*b*) On the remaining 50% of households to complete 24-hour dietary recall questionnaires on all males and females aged 60 years and over, on all pregnant and/or lactating females, and on all males and females aged 10 to 16 years.

4. Complete a medical history and clinical examination of 100% of the sample using the protocol supplied by the U.S. Public Health Service and the "Manual for Nutrition Surveys, 2nd Edition. Interdepartmental Committee on Nutrition for National Defense, U.S. Government Printing Office, Washington, D.C., 1963."

5. On 25% of the sample, randomly selected, to collect complete hematological and biochemical samples in accordance with the survey protocol and the "Manual for Nutrition Surveys." To collect blood specimens on the remaining 75% of the sample for the serum bank at the Communicable Disease Center, U.S. Public Service, Atlanta, Georgia.

6. Complete biochemical and hematological analysis on all specimens except for urinary iodine, serum iron and iron-bending capacity, and serum folate in accordance with the methods specified in the survey protocal and in the "Manual for Nutrition Surveys."

7. Prepare and ship blood samples to the U.S. Army Medical Research and Nutrition Laboratory, Fitzsimons General Hospital, Denver, Colorado for determination of serum iron and iron-binding capacity and serum folate and for ultramicro vitamin A and C analysis; to ship urine specimens to the Boston Medical Laboratories, Boston, Massachusetts for iodine analysis, and to ship serum samples to the Communicable Disease Center of the U.S. Public Health Service, Atlanta, Georgia for storage in the serum bank.

8. Analyze the health and education resources in each district to be surveyed.

9. Code all data, including data from analyses at other laboratories, in preparation for key-punching and computer analysis.

10. Interpret the results of data analysis and provide the Nutrition Program Chronic Disease Control Center, U.S. Public Health Service with the following reports: reports on key findings on baseline nutritional health and the incidence of serious malnutrition on May 31, June 15 and June 30, 1968 and monthly thereafter. A final comprehensive report on analysis of all findings will be submitted by January 1, 1969.

Submitted by

GRACE A. GOLDSMITH, M.D.,
Dean, School of Public Health and Tropical Medicine, Tulane University of Louisiana.
JESSE B. MORGAN,
Business Manager and Comptroller, Tulane University of Louisiana.
ANDREW HEDMEG, M.D.,
Louisiana State Department of Health, State Health Officer.

Personnel	Percent of time	Salary	TIAA–CREF	FICA	Total
Director	50	$6,000	$720	$264	$6,984
Administrative assistant	100	7,500	900	330	8,730
Biochemist	100	8,000	960	343	9,303
Technician III	100	2,700	----------	119	2,819
Technician II	100	2,600	----------	114	2,714
Technician I (2)	100	4,400	----------	194	4,594
Diener	100	1,600	----------	70	1,670
Research nutritionist	100	4,000	----------	176	4,176
Nutritionist (2)	100	6,000	----------	264	6,264
Nutritionist assistant	100	2,200	----------	97	2,297
Code clerks (2)	100	4,000	----------	176	4,176
Secretary	100	2,000	----------	88	2,088
Clinicians (2 at $50 per day for 60 days)		6,000	----------	264	6,264
Dentist	100	7,500	900	330	8,730
Dental assistant	100	2,600	----------	110	2,610
Anthropometrists (2)	100	10,000	1,200	440	11,640
Recorders for above (2 for 60 days at $40 per day)		4,800	----------	211	5,011
Field coordinators (4, includes travel and per diem)	100	18,000	----------	792	18,792
Public health nurses (2)	100	6,000	----------	264	6,264
Total		105,800	4,680	4,646	115,126

Travel for team members:	
Personal vehicles, 6 cars, 50 trips at average round trip distance of 400 miles, 9 cents per mile	$10,800
Transportation of subjects to examining location (schoolbus, 60 days at $40 per day)	2,400
Travel for director and administrative personnel	1,500
Total	14,700
Per diem: 24 people, 60 days at $16	23,040
Supplies:	
Laboratory supplies and glassware	3,000
Reagents	2,000
Office supplies and postage	600
Laundry service	500
Telephone and telegraph	500
Total	6,600
Equipment:	
Freezer chests for shipment of samples	300
Freezers for sample storage	1,000
Fume hood	1,500
Scales (Fairbanks-Morse low-beam model No. 12006)	125
Anthropometric equipment (infantometer, calipers, tapes, etc.)	500
Total	3,425
Other:	
Shipment of samples (field to laboratory; laboratory to Denver and Boston)	500
Installation of fume hood	500
Equipment maintenance	200
Liability insurance	2,500
Instructional material for team members, duplicating services, printing of consent forms, public relations material, audiovisual services, etc.	2,000
Rental of office space, 300 ft., 6 months	800
Total	6,500
Grand total	169,391

Note: Overhead requested: 45.2 percent overhead on salaries and wages for all personnel other than biochemist, 4 technicians, diener, clinicians, public health nurses, and recorders for anthropometrists. 45.2 percent×$75,700=$34,216. Off-campus rate of 24.9 percent on all other salaries and wages. 24.9 percent×$30,100=$7,495. Total overhead requested, $41,711.

NATIONAL NUTRITION SURVEY

Guidelines for Home Interviewers

Objectives of National Nutrition Survey

Under the Partnership for Health Amendments of 1967, the Congress has directed the Secretary of Health, Education and Welfare to conduct a National Nutrition Survey to determine the prevalence of malnutrition and related health problems among low income populations in the United States. Interest by state and local agencies in surveying middle and upper income populations during the survey process has led to the inclusion of these economic levels in the survey in some areas, although under less emphasized conditions. Some evaluative data will therefore be forthcoming from all economic levels.

Goals for the Home Interviewers

The survey is being conducted by health agencies in individual states. The home interviewer must "sell" the state nutrition survey to each household, relating it to the national effort. This may be accomplished by making the benefits to the families appear not only as real ones but also as available now. A free health exam, the opportunity to participate in a state-wide survey ultimately improving health conditions in their own community, and the contribution to scientific knowledge are each a possible motivation for the individual respondent which the interviewer may explore. In addition, some states include token monetary inducement to each active participant in the survey.

It is most important for the interviewer to establish rapport with the respondent - a feeling of mutual respect and trust - probably best explained as a combination of understanding, compassion, and sympathy with the respondents. The interviewer is the person who makes the first personal contact with the family and represents the survey to them. It is extremely important to recognize that the success of the survey may very well depend on the outcome of these initial communications. The respondent decides whether to participate by the appearance, by the approach, and by what is said on the part of the interviewer. The well-trained and experienced interviewer develops this good relationship more easily when he (or she) has a good understanding of the purposes, methods, and procedures to be followed in the survey.

In addition to establishing rapport and obtaining complete information on the questionnaire, the interviewer gives the respondent a choice of appointment times for the clinic. This is usually done in a way that the supervisor obtained (or is given) a block of time for his interviewers to use for appointments. The interviewer asks the respondent whether an afternoon or an evening time would be more convenient, emphasizing that there is no charge and that, upon request, their own doctor will receive

Note.—Charts and maps may be found in the Committee's files.

the results of the examination. (It also may be helpful to state the cost if the respondent were to obtain this type of examination elsewhere.) Since there is so much to be gained by complete information, each interviewer is asked to get a personal goal of 100 percent response and to return several times to each household where no one was home or when the interview was incomplete for some reason beyond the control of the respondents. It has been found helpful to have a senior interviewer return to nonresponders to attempt to obtain response.

Obtaining Cooperation

Frequently, the manner in which a question is asked will influence the extent to which the respondent will cooperate. A suggested attitude (or manner) that has been found to be useful is that of sympathetic understanding. This requires accepting the reply without a critical or disapproving facial expression, comment, or tone of voice. This will often take some effort to accomplish, but it is imperative to do so.

Another approach that is often helpful is that of inviting or persuading the respondent to cooperate by pointing out some of the advantages of participation. For example, these statements may help to convince the respondent, "these tests (or the examination) will help to tell you whether the foods you eat are giving you and your children the proper nourishment that you need," and "the information for the survey is strictly confidential and is to be used for statistical purposes only. Neither you nor your community will be identified."

Some respondents may fear examinations or be suspicious of "government officials," or even be apprehensive of anyone coming to their door. They may not be convinced that the interviewer is what he (or she) claims to be rather than another door-to-door salesman. The skillful and tactful interviewer attempts to allay these fears by use of many techniques. A pleasant, well-modulated voice will often be reassuring, as will showing the respondent the interviewer's Survey Identification Card at the start of the interview. A prepared introduction, presented in a sincere manner, should include identification of the interviewer, purpose of call, what is expected of the respondent, and the opportunity to choose alternative appointment dates or times for the clinic. A brief outline is the 5 W reporter's guide of who, what, why, when, and where.

An extremely useful procedure in gaining confidence on the part of the respondent especially is to have a person who is well known and well liked in the community accompany the interviewer to each household. Very often, when the respondent recognizes that the survey has the approval of community leaders and learns that her neighbors have participated, she will be more willing, if not anxious, to be included and to show up for the clinic.

A general orientation type of letter, mailed a few days in advance of the interviewer's visit, has been shown to be helpful. At the time of the interview itself a copy of the letter is given the respondent while

reference is made to the previously-mailed original which was addressed to "resident" at the household address, or to the family personally when this information is available. As they recall the previous letter, they may tend to be in a more affirmative frame of mind for response to the interviewer.

In summary, a friendly, sincere, helpful, and sympathetic approach will be influential in obtaining good rapport and response in the important home interview.

Use of the Forms and Their Interpretation

The form used by the home interviewer is a double form which is later separated along the perforation for separate processing. This Household Information Form is folded in a way that will produce a carbon copy of the Dietary Form 1 which is directly underneath it.

After the introduction is made, the interviewer proceeds by explaining that we list the family just as the census taker does and asks the respondent for the names and ages of family members and related residents. Additional families to the first, as well as any unrelated persons, are entered on separate interview forms.

Specific Procedures

1. Insert a carbon beneath the sheet for Item O, "Family and relatives living in household," and using two paper clips to insure accurate registration, continue to list the name, age, and sex of each related resident. Use a clipboard or other hard surface. Print firmly with a pencil to produce clear carbons. Print in block style all names and all words entered to insure legibility.

2. Enter age for children under 36 months old by putting two zeroes for "years" (14-15) and the number of months and days in (16-19). For all others enter the age at last birthday in years and zeroes for "months" and "days."

3. Continue along the line for each person, entering the appropriate code number for each column. Ask the respondent the specific question for each item to obtain complete answers. If the interviewer shows the respondent he is concerned and interested in a friendly way, he may get better response than otherwise.

4. When the lines are completed, remove the carbon and turn to page 1 to enter C, "Number of Individuals in Household." Items A and B can be partially completed from the segment list and should be prepared some time before the actual interview.

5. Item D, "Type of Place," need not be asked unless the interviewer is uncertain whether the house is in a rural farm or rural nonfarm area. Code 1 is "urban," codes 2 and 3 are each rural farm, and code 4 includes rural nonfarm. Codes 2 and 3 contain Census Bureau definitions since comparison with Census data is intended later.

6. Try to phrase these questions (Items E and F, etc.) in a conversational informal manner such as "Can you tell me if the house has public water (or a well in rural areas) and public sewer (or a septic tank in rural areas or some suburbs)?" Also attempt this for F - "Do you have running water, both hot and cold, in the house?"

7. The interviewer is challenged to use skill and ingenuity in rephrasing these questions (Items G through L) in a tactful, interested manner to obtain complete information. When respondent's answers are vague, try further questions that divide the topic into manageable parts. For example, if the respondent says "I'm not really sure," the interviewer could probe with "Are there six rooms on the first floor?" and "Do you use rooms in the attic as well?" For Item H ask also whether these are regularly used by family only so as to avoid counting the use of the sofa in the living room, for example, when relatives come in from out-of-town as a room for sleeping. Both Items K and L are concerned with where the head of the household spent his adolescence, rather than with where he was born (although this has been misinterpreted).

8. Use Item M, Control, and N, Description of housing unit, for reference on callbacks and as a record for each interviewer.

9. Items P and Q obtain detail on changes in family composition from last year to this. These items emphasize situations where family members or relatives have entered or left the household during last year and up to the present time. For Item P enter the person's line number from Item O, the name, and the code for the reason. For Item Q, group together persons with the same reason. Interpret each of these to read, "6 months or more of last year."

10. Try to rephrase the questions for both Items R and S emphasizing that these are confidential information to be used for statistical purposes only. One suggested approach for R: "I'm going to read different sources of income to you. Can you tell me, yes or no, whether any member of the household received unemployment insurance last year? last month? Social Security or a public pension last year? last month? A private pension last year? last month?" and so on for each of the eight sources. A pause is indicated after "last year". For Item S: "Can you remember about how much the total income for all persons in the family together was for last month? (pause) for last year?" "Can you guess about how much was from wages and salaries? (pause) About how much was from their own business or self-employment?" A card containing letters representing $1,000 intervals can be used to gain response by asking which letter is closest to the amount the respondent recalls. Very often it is helpful to have a casual rather than an intense manner with a sincere interest which indicates to the respondent that we do need her help on this survey and also that the information is to be kept confidential. Sometimes using a polite phrase with the word "please" or some gesture of courtesy will gain better response. Another suggested approach is, "I know it is not easy to recall some of this information, but would you try, please?" The incomes to be reported here are total incomes, before taxes, basically since most persons will more likely know the total

wages and will not recall the amount of taxes deducted or paid. Round the total income for last year to the nearest 100 dollars and for last month to the nearest ten dollars. Enter the amounts in the boxes provided and place a zero in the box at the left when needed.

11. The phrasing of Items T and U is probably reasonable enough to read directly to the respondent. If the respondent appears not to understand, reword the question. For example, "Can you tell me if (any of your family), (your husband), (your children), (you, yourself), travel in the fall to help with harvesting or to do other seasonal work?" For Item V, determine first whether the home is owned or rented and then find out the type of rental arrangement. If respondent lives in an apartment, the interviewer should rephrase the question accordingly.

12. The item for "comments" should contain some indication of the accuracy and reliability of the answers if the interviewer has reason to doubt. If necessary and if time permits, the interviewer might decide to go back over the questions if there are some that were overlooked or if some were not completely answered.

August 8, 1968
ECB - NCHS

SAMPLE DESIGN FOR HEW NUTRITION SURVEYS

Introduction

The Department of Health, Education, and Welfare is conducting surveys in several subjectively chosen states to estimate the prevalence of certain nutrition - related conditions such as anemia. Since primary interest is in malnutrition among the poor, the target population is restricted to those people living in specified geographic areas, where, according to the 1960 decennial census, a large proportion of the poor people lived. Therefore the universe of study does not include all of this lower economic group within a state, nor is it restricted to only the poor; a small proportion of the target population will be in the middle and upper income groups. The universe, or sampling frame was determined as follows:

(1) For each enumeration district in a state, the percent of families and single individuals which fell below the Orshansky poverty index was computed, using 1960 decennial Census information.*

(2) The ED's were sorted into three groups: ED's within SMSA's, ED's in other urban areas, and ED's in rural areas.

(3) Within each of the three groups, the ED's were ranked by the percent of families and individuals below the poverty index, in descending order from highest percent to lowest.

(4) Then, within each group, the 1960 population of families and individuals was accumulated until 25 percent of the total in the group was reached.

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*See "Dimensions of Poverty in 1964", page 8 for definition of the Orshansky poverty index.

(5) The target population is, therefore, the people presently living in the selected enumeration districts which accounted for approximately one-fourth of the states population in 1960.

The survey is based on a stratified probability sample of families and unrelated individuals residing at selected addresses. To make the survey economically and administratively feasible, among other reasons, the sampling plan involves several stages of selection. For rural and small urban areas of a state the first stage of sampling is the county. Then within the chosen county, segments of about 60 housing units within enumeration districts are selected. The last stage is a systematic sampling of addresses in the sample segments. The people living at these addresses compose the sample from small urban and rural areas. The sample for large urban areas is chosen in a similar way except that the first stage of selection is segments within enumeration districts.

The sample design should produce essentially self-weighted estimates since the sample is allocated to strata proportional to the total number of housing units in each stratum and the selection of sampling units is made with probability proportional to a size measure which, as in the sample allocation, is the number of housing units enumerated in the 1960 decennial Census.

Outline of Sampling Procedure

A. Rural and "Other Urban" Areas

1. Group counties into strata and select one county from each stratum with probability proportional to the

number of housing units in a county (A_{ij}). For very large, i.e., populous counties, a stratum will contain one county; for small counties, the strata will contain a number of counties.

2. Choose large counties with certainty

3. For each of the other strata, choose a random number between 1 and the accumulative total shown for the stratum. This random number identifies the county for the sample.

4. For each county chosen for the sample, including those chosen with certainty, select a sample of ED's as follows:

   (1) Determine the number of ED's desired from the county

   $$m_{1ij} = \frac{A_{1i}}{A_1} m_1$$

   where the subscript (1) refers to the Rural-"other urban" areas. A_{1i} is the number of survey units in the ith stratum; A_1 is the number of survey units in the rural-"other urban" areas (i.e., $A_1 = \Sigma A_{1i}$) and $m_1 = \frac{A_1}{A} m$ where A = total number of survey units in the Universe and m is the total sample.

   (2) Determine the sampling interval for the county by dividing the total number of survey units in the county by m_{1ij} or $K_{1ij} = \frac{A_{1ij}}{m_{1ij}}$.

   (3) Select a random number R between 1 and K_{1ij}. This determines the sample ED from the first interval.

Then select the remainder of the sample ED's from the County by adding the random number to the length of the sampling interval. For example, the second sample ED is identified by the number $R + K_{1ij}$. The third sample ED is identified by $R + 2\ K_{1ij}$, and so forth.

(4) For each Enumeration District selected in the sample try to divide it into segments of about 60 survey units. These segments should then be ordered in a random fashion and the number of units accumulated within the sample ED, similar to the way that we have accumulated the ED's within a county. The specifics of how this is done should be clear from the example given below.

(5) For each segment chosen, it is absolutely necessary that its geographic boundaries be identifiable from a map and that an on-sight listing be made of every housing unit within the segment.

(6) After the segments have been listed, we then select a systematic sample of housing units. First, number the housing units from 1 through the number in the segment, starting with the unit in the Northeast corner of the segment and numbering the units clockwise, following a serpentine path. After the units

have been numbered, select a random number between 1 and 3 and choose every third housing unit after the random start. All people in each housing unit selected will be included in the sample.

Probability of selecting housing units, or addresses in the sample.

The sample is designed so that each address or person in the universe has the same probability of selection, if all the segments are of equal size (which, of course, will not be true since we are not able to control the segment size that well). Otherwise the probability of selecting a person in the sample will vary from one segment to another. Since there are several independent stages of sample selection, the probability of selecting a person is the product of probabilities associated with the several stages of selection. The probability of selecting a person or an address is represented by the following expression.

$$P = \left(\frac{A_{ij}}{A_i}\right)\left(\frac{m_{ij} \cdot A_{ijk}}{A_{ij}}\right)\left(\frac{A_{ijkl}}{A_{ijk}}\right)\left(\frac{1}{3}\right) = \frac{m_{ij}\, A_{ijkl}}{3\, A_i}$$

A_i = Total housing units in the ith county group according to the 1960 Decennial Census.

A_{ij} = Total housing units in the jth county in the ith group according to the 1960 Decennial Census.

m_{ij} = Number of sample segments in the jth county in the ith county group.

A_{ijk} = Total housing units in the kth enumeration district in the jth county, i^{th} county group, according to the 1960 Decennial Census.

A_{ijkl} = Total housing units in the lth segment of kth enumeration district, according to the 1960 Decennial Census.

and 1/3 is the rate of selecting addresses that actually exist in the lth sample segment at the time of the survey.

The probability reduces to

$$P = \left(\frac{m}{3A}\right) A_{ijkl} \quad \text{since}$$

$$m_i = \frac{A_i}{A} \, m \quad \text{and}$$

$m_i = m_{ij}$ since only one county is selected from a county group.

Therefore, the probability of selecting a person in the sample is a function of the total number of segments in the sample, m, the number of housing units in the sample segments according to an a priori allocation of housing units in the segment according to the 1960 decennial census, A_{ijkl}, the total number of housing units in the universe according to the 1960 census, A, and the sample rate applied to housing units that actually existed (i.e. occupied) at the time of the survey (one-in-three).

Illustration of Sample Selection Procedure

1. Suppose we want a sample of 80 segments and 20 housing units per segment or total sample of 1600 survey units for the State of Louisiana. (Note: the sample to be selected is for illustrative purposes only and should not be interpreted as the sample for the Louisiana Nutrition Survey).
2. There is a total of 232,318 survey units in the Universe for Louisiana; 110,811 are in the rural-other urban group and 121,507 are in the SMSA's.

3. Thus $\frac{(110,811)}{(232,318)}$ (80) = 38.158 Enumeration Districts should be allocated to the "Other Urban" - rural group of parishes and 41.842 ED's to the SMSA group.

4. From the "Other Urban" - rural group, select random numbers to choose a county from each of the eleven groups or strata.

Stratum Number	Choose Random Number between	Random Number	Selected Parish
I	(Choose these with certainty)	-	St. Landry
II		-	Rapides
III	1 - 11512	2713	Acadia
IV	1 - 11232	7431	St. Martin
V	1 - 15758	12001	Evangeline
VI	1 - 4153	0127	Allen
VII	1 - 13194	6429	E. Feliciana
VIII	1 - 16620	14682	Pointe Coupee
IX	1 - 11692	1987	Webster
X	1 - 5846	5762	La Fourche
XI	1 - 3215	2155	Livingston

5. Determine the number of ED's for each parish by allocating total ED's proportional to total ED's in a stratum. For Saint Landry, for example, the expected number of ED's is $\frac{(9504)}{(110811)}$ (38.158) = 3.27; it is $\frac{(11232)}{(110811)}$ (38.158) = 3.87 for St. Martin. The expected number of ED's per parish is as follows:

	Expected No. of ED's	Sampling Interval
St. Landry	3.27	2,906.4
Rapides	2.78	2,906.8
St. Martin	3.87	648.3
Evangeline	5.43	962.1
Acadia	3.96	1,060.4
Allen	1.43	690.9
E. Feliciana	4.54	275.8
Pointe Coupee	5.72	423.4
*Webster (initial)	(4.03)	(556.3)
(after deleting ED # 0032)	3.03	551.8
La Fourche	2.01	200.5
Livingston	1.11	549.5
Total	38.15	

* See paragraph 7 below for explanation in sampling interval

6. Determine the sampling interval for the sample parishes by dividing the total survey units in the parish by the expected number of ED's to be chosen from that parish. For example, the sampling interval for St. Landry is 9504/3.27 = 2906.4. The sampling interval for each parish in the "Other Urban"-rural areas is shown above in paragraph 5.

7. There is one ED in Webster Parish that is larger than the sampling interval; namely, ED #0032, which has 570 survey units. Subtract this from the total of 2242 and recompute the sampling interval. Then the new interval is $\frac{2242 - 570}{4.03-1} = \frac{1672}{3.03} = 551.8$. For this sampling scheme any ED which has as many or more survey units as the computed sampling interval, that ED is chosen in the sample with certainty; its survey units must be subtracted from the total and a new sampling interval computed.

8. The selection of Sample Enumeration Districts is done as follows:

   (a) Choose a random number between 1 and the length of the sampling interval, using a table of random numbers. For St. Landry, the sampling interval is 2,906.4. Thus, the random number might be 1702.1. This chooses ED #0043. Next add the sampling interval to the random number as follows to choose the remaining ED's.

		Sample ED #'s
Random start	1702.1 ----------	0043
add	2906.8	
	4608.9 ----------	0059
add	2906.8	
	7515.7 ----------	0034P
add	2906.8	
	10422.5 ----------	This is larger than

the accumulated total number of survey units for the Parish. Thus, the sample ED's consist of the 3 listed.

Continue this procedure for each Parish until all sample ED's are selected.

9. The next step is to divide the sample ED's into segments of about 40 survey units each. The number of survey units assigned to the segments must add to the number of survey units for the ED according to the Census material. Next, order the segments randomly within the ED and accumulate the survey units in the segment as shown in the following example.

ED 0043 was chosen from St. Landry Parish which has 115 survey units. Suppose these units can be segmented as follows:

45	housing units in segment 1
34	" " " " 2
36	" " " " 3
Total 115	

Suppose that the segments are in random order as listed above.

Accumulative total just prior to ED # 0043 - - - - 1611

Accumulative total of ED # 0043

Segment 1 ---------- 1656

Segment 2 ---------- 1690

Segment 3 ---------- 1726

The number which chose ED # 0043 was 1702.1. Consequently this same number chooses segment #3.

10. After selecting a segment we must carefully map the segment and list each housing unit within the listed segment. Number the listed housing units sequentially, starting with the unit in the Northeast corner of the segment.

11. The last step is to select a systematic sample of every other housing unit in the listed segments. The starting number should be chosen randomly between 1 and 2.

NATIONAL NUTRITION SURVEY

Selection of Housing Units

A. General

The following guides have been proposed by the National Center for Health Statistics for use in the National Nutrition Survey to select households within the enumeration districts chosen for study.

Based upon a cruise survey of the enumeration district, it will be divided into segments of approximately 60 housing units each. A sample of 20 housing units will be obtained from the segment by selecting every second house for survey in accordance with the methods described below.

A segment thus will be a small area of land forming part of a census enumeration district within which all housing units are to be listed and from which the housing units to be interviewed are selected.

In urban areas (cities and towns) a segment is usually a single block bounded by streets. In the open country area, the segment boundaries may be roads, creeks, rivers, railroad tracks, etc. which can be readily identified. The procedures given below discuss the methods for determining the particular sampling unit and hence the households to be interviewed in a segment assigned for canvassing.

B. Cruise Counts of Housing Units

The sampling for this survey will be carried out by means of modern statistical procedures. For example, every effort has been made to give each household in the universe an equal chance to be chosen for interview, as well as to select a representative sample. At the same time, consideration has been given to the efficiency of the sample design. Thus, use will be made of maps and statistics available from the Bureau of the Census for small areas such as census enumeration districts. Aerial photographs and State Highway Department maps may also be used. However, in some of the smaller towns and places, information on the distribution of housing units will not be available. In order to maintain a high level of sampling efficiency, additional information is necessary before the final selection of segments and sampling units can be made. This information consists of rough counts of the housing units in specified areas of these smaller towns.

It will be necessary to obtain these rough counts in the segments prior to interviewing. A map will be provided showing the areas (outlined in color) for which housing unit counts are needed. These areas are to be cruised by automobile. Driving slowly along the streets in the area, count the housing units on the right-hand side of each street segment and record this count on the corresponding street segment shown on the map. A street segment is that portion of a street falling between two intersecting streets. All street segments in the area are to be covered in this manner. The resulting counts, although not 100% accurate, will provide sufficient information on the distribution of housing units within the area to enable efficient, as well as valid, selection of the sampling unit for the area.

C. Selection of Households to be Interviewed

1. Determination of sample households in rural areas

For areas outside of towns and cities, maps will be prepared on which the sample segments (or small land areas) have been delineated in red. It is in these areas delineated in red that the households to be interviewed will be determined. Each segment will be assigned a different five-digit number comprised of the county and the ED number which is used to identify all the work done in the segment. The segment identification number will be shown on both the Segment Sketch Sheet and the Segment List of Housing Units for each rural segment. These forms are discussed in the paragraphs below.

For each segment proceed as follows:

a. Locate the segment beyond doubt. This is easily done since segments are usually bounded by identifiable landmarks such as streets, roads, railroad tracks, streams, rivers, power lines, etc.

b. Make a large sketch of the segment on the Segment Sketch Sheet (see Appendix A), if the segment is not already sketched. There will be a sampling rate and start number recorded on each Segment Sketch Sheet. The use of these numbers in determining sample housing units will be described later.

c. Go to the northeast corner of the segment (or eastern-most point if the northeast corner is difficult to identify) and proceed around the segment in a clockwise direction, so that the housing units in the segment are on the right. Mark with a cross (X) the approximate location of all housing units inside the segment,

including those that are vacant, on the Segment Sketch. Since some structures (e.g., a house) may contain more than one housing unit, it is important to notice such things as separate entrances, the number of mail boxes, number of TV antennae, etc. A plurality of these usually indicates more than one housing unit within the structure. Whenever a structure contains more than one housing unit, as many X's should be marked on the sketch as there are housing units. If streets or roads run into or through the segment from the boundary road, be sure to explore them and to mark the location of all housing units inside the segment. Often in the country, a dirt road may lead to a farmhouse not visible from the main road, so it is important to cover all roads running into or through the segment, as well as driving over all the roads and highways which may serve as the exterior boundaries of the segment. After marking the approximate location of all housing units inside the segment, it may be advisable to stop at a store or residence inside or adjacent to the segment and ask a local resident to check over the sketch to see if all housing units in the segment have been located.

d. Number in pencil on the sketch all housing units consecutively 1, 2, 3, etc., in a clock-wise direction, starting with the one nearest the northeast corner of the segment (or the easternmost one if the northeast corner is difficult to identify). If there are two or more housing units in a single structure, number the lowest numbered address or apartment number first, then the remainder in ascending order of address or apartment number. If the addresses are the same and the housing units are not numbered, number from the bottom floor to the top floor, starting on the left of the first floor (the basement is considered the first floor) and proceeding around in a clock-wise, spiral direction.

e. The next step is to determine exactly which households in the segment are to be interviewed. This determination can be made by using the sampling rate and start number which appear on the Segment Sketch Sheet for the particular segment. The start number on this sheet designates the first housing unit selected for the sample. Circle in pencil this housing unit number on the sketch. The sampling rate specifies the interval between each housing unit to be interviewed, <u>after</u> the first housing unit has been selected. Thus, given a start number of 2 and a rate of 1/3 designate as "in the sample" the second housing unit numbered on the sketch and every third one thereafter (#2, #5, #8 #11, etc.) Circle in pencil these housing unit numbers on the sketch for that particular segment.

f. There may be occasions when a housing unit is designated for interview and, in making first contact with the residents in the structure, it is learned that it contains two housing units and not one as it originally appeared. In such instances <u>both</u> households are "in the sample" and, hence, selected for interview.

g. A Segment List of Housing Units form (see Appendix B) should be prepared for each segment assigned. The information at the top of this form, except for name and date (and boundaries for rural area segments), will have already been entered at the central office. Enter the exact mailing address (e.g. Route 1, Box 49-A) of each sample housing unit on this form using the same line number (Col. 1) as was assigned to the housing unit on the Segment Sketch. The housing units on the sketch not designated for interview are also to be listed on the Segment List of Housing Units, using the line numbers corresponding to their Segment Sketch numbers. Only the highway or road number or road name need be entered in the address column for those non-sample housing units in the segment, and no other entries are to be made on the form for these units.

The housing units in the sample are to receive new numbers in Column 4 of the listing form, in sequence, using 1 for the first housing unit in the sample, 2 for the second, etc. The numbering of the housing units in the sample has already been entered on the listing form for each segment, but only on the first page. In many instances a second listing page and sometimes a third will be needed. An example of the Segment List form to be used for second, third, etc., pages is shown in Appendix C. Note that for these additional pages the proper line numbers in Column 1 must be entered as well as the page number and total number of Segment List pages in the spaces in the upper right corner of the sheet. Continue the numbering in Col. 4 of subsequent pages according to the sampling rate for the segment. The number in Column 4 is important since, together with the Segment number, it will later serve to identify the sample household.

Indicate in Column 5 of the Segment List of Housing Units the <u>exact</u> number of each type of questionnaire completed for every individual housing unit in the sample. This count will enable those checking in completed work from interviewers to know the precise number of questionnaires which should have been returned for each sample housing unit. It also will enable field supervisors to evaluate the completeness of each interviewer's work.

Segment 03111 is bounded on three sides by roads and by a railroad track on the fourth side. A road runs through it. The first step is to go out to this segment and drive around it sufficiently to be sure it is correctly located and identified. Stop and make as large a sketch of the segment as possible on the Segment Sketch Sheet. Draw it so that the north side of the segment will be at the top of the page. Proceed then to the northeast corner of the segment (at the intersection of the northern road boundary and the railroad track) and begin coverage of the segment, marking on the sketch the location of all housing units with X's. Note that to move in a clock-wise direction from this starting point one will have to go out of the segment at the northeast corner and enter again at the southeast corner. Be sure to indicate only those housing units which are inside the boundaries of the segment.

The housing units marked on the sketch are numbered in pencil, starting with the one nearest the northeast corner and going clockwise. In Figure 2 note that housing unit #3 is located on a road leading into the segment and that housing units 7-10 and 11-17 are located on the road running through the segment. Roads leading into the segment are to be covered when first encountered by turning onto them into the segment and numbering the housing units on the right as the road is followed to its end or to the edge of the segment. Then turn around and continue to number the housing units on the right while returning to where the road entered the segment initially.

In this example assume that 60 housing units were located and numbered consecutively from 1 to 60 according to the rules, beginning in the northeast corner and moving in a clock-wise direction.

Suppose the start number at the top of the Segment Sketch Sheet is 1, then the first household to be interviewed would be #1 on the sketch, and if the sampling rate is 1 out of 3 one would interview at every second household on the sketch beginning with household #1. Thus circle on the sketch housing units #1, #4, #7,#10,#13,#16, #19, #22 and on through 58. These are the ones to be interviewed. Figure 2 shows what the sketch might look like after finishing the numbering of the housing units and selecting the sample households.

The Segment List of Housing Units would be filled out showing 60 housing units and hence using 60 lines. In column 4 of the listing form enter a 1 on line 1 (indicating sample housing unit #1), a 2 on line 4, a 3 on line 7 a 4 on line 10 and so on. If unable to interview at sample housing unit #3 (entered on line 7) on first call, but on a subsequent call found that there was a separate apartment at the rear, say, then a household questionnaire for the occupants of this apartment must be completed, as well as for the occupants of sample housing unit #3. In this case, designate the original housing unit as #3 in Column 4 but list the additional apartment at the end as #21 in Column 4. Since this housing unit would be listed on line 61, the number (61) must be shown on the Segment Sketch next to 3 which gives the approximate location of the new housing unit inside the segment.

2. Determination of sample households in places.

In places (cities or towns) the sample segments will comprise only one or two blocks. Do not sketch these segments. The Segment List of Housing Units will have the boundaries (i.e., street names) written in at the top of each list. The sampling rate and start number always are given at the top of the Segment List of Housing Units form. Handle these segments much in the same way as outlined previously for rural segments. Briefly, here is the proper sequence of things which must be done to determine which households are to be interviewed in a sample segment:

a. A street map with the assigned segment(s) outlined in color or a sketch of each assigned segment will be drawn on the Segment List of Housing Units given for use in that segment.

b. Then, using the map and the boundaries (i.e., street names) on the Segment List of Housing Units form for that segment, drive around the segment, confirming, without doubt, that one is in the proper block(s).

c. Walk in a clock-wise direction around the block and list the address and location of each housing unit inside the segment (including vacants) beginning at the northeast corner of the segment (or eastern-most corner if the northeast corner is difficult to determine). Handle the numbering of multi-unit structures (apartments) in the manner outlined below.

d. From the sampling rate and start number for the segment determine, in the same manner as prescribed for rural areas, which housing units are in the sample. Number these serially in Column 4. A Questionnaire is to be completed for these sample housing units numbered in Column 4 of the listing form unless unable to get an interview there.

D. Rules for Listing Multiple Dwelling Units

Case I. There is a regular numbering or lettering system.

1. Begin with the lowest number or letter and proceed numerically alphabetically to the highest number or letter.

2. If the basement units in a structure are not included in the numbering or lettering system list the basement units before the upper floors are listed.

Case II. There is no numbering or lettering system.

1. Always list units on a lower floor before listing the units of an upper floor, beginning with the basement.

2. The unit(s) on the right are to always be listed before the unit(s) on the left. When there are two or more corridors or halls in a building, always list the corridor to the right first. Within each corridor or hall list each unit on the right of the corridor beginning at the front and working to the rear. Then list each of the units on the left going from the rear to the front.

3. In structures having units in the front and the rear, list the front unit(s) before the rear.

Note: If multiple addresses (an address listed more than once) are encountered on the listing sheet and the units are not properly identified either on the listing sheet or on the segment sketch apply the rules for listing to determine which is the correct unit to interview. For example, suppose a structure (address) is listed twice on the listing sheet but only the second listing is checked for interviewing. Further, suppose that upon examination both units within the structure are found to face the street. Applying the rules used for listing the left hand unit will be the unit to be interviewed.

Additional Instructions

1. Each unit is to be listed separately on the listing sheet.

2. The housing units shown on the segment sketch should always correspond to the number of units listed on the segment listing sheet. The segment sketch is most useful in identifying the housing units to be interviewed, but it can only be used when all units are properly identified.

E. Special Rules

1. Eligible Respondents

Any adult, 18 years of age or older, residing in a sample household or in a neighbor-respondent household (which is described later) is eligible for interview, providing he or she is, in the interviewer's opinion, competent to answer the questions.

2. Call-backs

If an eligible sample household member cannot be contacted on first call, make three additional attempts to find one at home in order to complete a questionnaire.

3. Substitutions

No substitutions for households designated as "in the sample" are to be made.

4. Exclusions

Hospitals, institutions, military barracks and other group quarters encountered while listing the segment will not be entered on the listing sheet or on the segment sketch sheet. They thus are automatically excluded from the survey.

5. Vacation Cottages and Homes

If vacation cottages and homes (which are not considered the permanent residences of the households living in them) fall in the sample of housing units for a segment, do not complete a Questionnaire 1 on the households in them. Just fill out the first page of Questionnaire 1, indicating it is a "vacation home."

INSTRUCTIONS FOR SPECIFIC ITEMS

I. Household Information Form

Purpose: This form is used to obtain detailed data on the family and relatives in each household. It provides the name, age, sex, marital status, race and ethnic group, relation to family head, education, and work experience on each person. It also furnishes basic data on the size, location, and type of housing, presence of sanitary facilities, and family income level. Since a carbon copy is made when the home interviewer records the name, age, and sex of residents, this form provides basic information for the dietary forms as well.

Completion: This form is to be completed on each household in the sample. Callbacks (at least three) are to be made in efforts to obtain a completed interview.

Respondent: The homemaker will usually be the individual most readily available and able to supply the information needed. The head of the household, whose cooperation is important, may not be available for interview.

Note: This form is the inside sheet (pp. 2,3,4) of the double-fold form which has the words "National Nutrition Survey" on the front page.

Item, Cols., and Description	Explanation	Code
A. Identification Codes.		
(1-2) State.	Enter State code shown on attached list.	Bureau of Census code.
(3-5) County.	Enter County code from list available to Survey Director.	Bureau of Census code.
(6-7) E.D.	Each Enumeration District is coded anew for each county.	Code each E.D. within each county.
(8-9) Household No.	This number is obtained from the list of housing units in each segment.	01 - First 02 - Second etc.

I. Household Information Form (cont'd.)

Item, Cols., and Description	Explanation	Code
(10) Family.	Enter code 0 if everyone in the household is related. If there are unrelated families or individuals, enter code 1 for the primary family or individual and use codes 2 through 8 for each additional unrelated family or individual.	0 - All related 1 - Primary family or individual 2 - Unrelated family or individual, etc.
(13) Dietary code.	This code is entered by the dietary interviewers.	0 - All families eat from same food preparation 1 - First family (Own separate food preparation) 2 - Second family (Separate food preparation) 3 - etc.
B. Address.	Enter the address corresponding to that on segment list of housing units.	(Not coded)
C. No. of Individuals in household. (23-24)	Enter total after listing names on page 3.	Direct code
D. Type of place. (25)	This classifies the area as urban or rural. Rural is also subdivided into farm and non-farm.	1 - Urban 2 - Rural farm 3 - Rural farm 4 - Rural non-farm
E. Public sewer or water. (26)	This information helps to identify rural areas as well as urban facilities.	Refer to code printed on form

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
F. Housing unit contains piped water. (27)	This provides a basis for evaluating facilities.	Refer to code printed on form.
G. Total number of rooms. (28-29)	This describes housing unit more specifically.	Direct code.
H. How many rooms are used for sleeping? (30-31)	Include only those used regularly by members of the household only.	Direct code.
I. What is usual language? spoken by adults? (32)	Ask this to make certain rather than guess.	Refer to code printed on form.
J. How long has head of household lived within 50 miles of this place?	This gives an indication of mobility patterns.	Direct code.
K. At age 16, did head live in. (35)	This item indicates whether urban or rural setting during childhood.	Refer to code printed on form.
L. At age 16, where did head live. (36-38)	Enter the State if childhood spent in U.S. If in foreign country as a child, enter name of foreign country.	State will be coded according to Census code. Foreign country to be coded later.
M. Control.	These items are to be used by interviewer as directed by supervisor for record of visit and also for callback visits.	(Not coded)
N. Description of housing unit.	This information is needed only for revisits. Omit this when the correct street number is given.	(Not coded)

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
0. Family and relatives living in household. (1-10)	List each related person in the household. If there are any unrelated persons living in the household, enter them on another interview form. The identification code (cols. 1-10) plus the Line No. (11-12) comprise the individual identification number for all survey records for that person.	Enter identification codes from Item A. "Identification Codes" on p. 1.
1. Line No. (11-12)	This Line No. identifies each person.	The Line No. itself is the code.
2. Name of related residents.	Print names clearly in pencil, pressing firmly to produce a clear carbon copy.	(Not punched)
3. Age at last birthday. (14-19)	For infants and for children under 36 months of age, enter age in months and days. For all others, enter age at last birthday in years. Use zeroes (00) for those columns not applicable.	Actual age as given by respondent.
Total unrelated individuals (21-22)	Sum all persons in the household who are not relatives.	Direct code.
4. Sex. (20)	Record as given.	Refer to codes printed on form.
5. Marital status.(39)	Record as given.	Refer to codes printed on form.
6. Race. (40-41)	Enter race and ethnic group only for respondent	Refer to codes printed on form.

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
7. Relation to family head. (42)	Select appropriate code for information given.	Refer to code printed on form.
8. Now in school. (43)	Consider summer vacation or holiday vacations as "now in school."	Refer to code printed on form.
9. Highest grade completed to date. (44-45)	Enter latest year completed. For business or vocational school after high school enter 21 for one year completed, 22 for two years completed, etc. For college enter 31 for one year completed, 32 for two years completed, etc. Enter kindergarten or day nursery as "other". Include infants and other pre-school children as 88.	Refer to code printed on form.
10. Work experience last year.		
A. Person worked. (46)	A "full year" consists of 40 weeks or more. Less than 40 weeks is a "part year." "Full-time" is 35 hours or more per week. Less than 35 hours is "part-time." If two or more jobs total 35 hours or more a week consider it "full-time." Include military service and unpaid assistance in a family business as work. Housework in the person's own home is labor, but is not counted as work experience.	Refer to code printed on form.

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
B. Major reason for not working full year, full-time. (47)	Use the reason given by the respondent.	Use code printed on form.
START CARD NUMBER 2		
P. Any relative who lives here now, but did not live here during 6 months of last year? (21)	Enter the subject's line number from Item 0.1. and his name. Enter code for reason in col. provided. It should read, "6 months or more."	Use code printed on form.
Q. Any relative who does not live here now, but did live here during 6 months of last year? (22-27)	Group together any persons by the reason given. Example below illustrates procedure.	Use code printed on form.

Example: A widowed daughter with two small children lived with the family for 8 months last year and then moved into separate living quarters.

Col.	No. of persons	Relationship	Col.	Reason (code)
22	3	Daughter and children	(23)	4

R. Was money received by any member of the household from any of the following sources? (28-43)	Enter code clearly to show last month or last year opposite each source. Omit one-time cash received such as sale of property, insurance, or prizes. Include all persons listed for Item 0. Family and relatives living in household.	1 - Yes 0 - No

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
S. Cash income of all persons in family, put together. (44-52)	Even though this will be only an estimate, it will still be useful. Emphasize that this is confidential information to be used for statistical purposes only. If foster children are present, show amounts paid for their keep as their income on separate schedule for unrelated individuals, not as income to the family housing them. If two families share quarters and family No. 2 pays family No. 1 for rent or food, do not show this as income for family No. 1. It stays with family No. 2. Income is total cash income from all sources received by all family members. It includes welfare payments, but excludes one-time cash receipts such as insurance compensation, prizes, or sales of property. The value of food or housing received as part of wages is excluded by the above definition.	Enter the sum of 3. Total income and 4. Total income from Item R. directly in boxes provided. Round entries to nearest 100 dollars for last year and to nearest 10 dollars for last month. Example: Family members earned $375 last month: (44) (45) (46) (47) 0 | 3 | 8 | 0 Example: Family members earned $4,225 last year: (48) (49) (50) (51) (52) 0 | 4 | 2 | 0 | 0
T. Do all, some, or none of this family travel seasonably in search of work such as harvesting fruit, vegetables, or grain crops or other seasonal labor? (53)	This question relates to migratory workers. Record the appropriate code in the box provided.	Refer to code printed on form.

I. Household Information Form (Cont'd.)

Item, Cols., and Description	Explanation	Code
U. Is the home....? (54)	Determine whether owned or rented first, then, if rented, type of rental.	Refer to code printed on form.
Comments	Enter here relevant observations by the interviewer that relate to accuracy, completeness, or reliability of the information supplied by the respondent.	(Not coded)

General coding instructions:

Every code box with a punch card column number shown in parentheses must have a code number entered. When a specific item is "unknown" either by the respondent or the interviewer use the number nine throughout the questionnaires for the Survey. Use 99 for double columns, 999 for triple columns, etc.

Clinical Appraisal of Nutritional Status

All individuals responding to the survey will undergo a detailed clinical appraisal of nutritional status. This appraisal will be made by means of a medical history, general physical examination, anthropometry, and dental examination. Six forms are involved: Pediatric Clinical History (Children Under 6 Years of Age)(Form 3-2); Pediatric Clinical Examination Record (Children Under 6 Years of Age) (Form 3-3); Clinical History (Adults and Children 6 Years of Age and Over) (Form 3-4); General Clinical Examination (Adults and Children 6 Years of Age and Over) (Form 3-5); Clinical Examination - Anthropometry (Form 3-6); Dental Examination (Form 6).

Specific instructions for obtaining and recording data are included on the Forms and at the end of this section. Additional comments follow:

Clinical History. This is not meant to be an exhaustive medical history leading to specific diagnoses. The intent is only to determine the presence or absence of documented significant illness which might adversely affect nutritional status. As in any medical history, questions must often be phrased in non-technical terms and in such a way that the subject understands what information is sought. The format for questioning must be flexible.

Clinical Examination. Due to the limitations imposed by survey conditions, a complete physical examination is impossible to perform. The clinical examination is intended to be a rapid survey, with primary emphasis on the presence or absence of key indicator lesions of the various nutrient deficiencies.

Definitions and Instructions for the Clinical Examination. Although some of the items are self-explanatory, others require comment or amplification, which follows. A series of color plates illustrating many of the lesions to be considered can be found in the ICNND Manual for Nutrition Surveys.

Hair

Dry staring: Dry wirelike, unkempt, stiff hair, often brittle, sometimes may exhibit some bleaching of the normal color.

Dyspigmentation (Pediatric form only): Definite change from normal pigment of the hair, most usually evident distally and best seen by carefully combing hair strands upward and viewing the orderly array of hair in good light. Dyspigmentation includes both change of pigment (usually lightening of color) and depigmentation. Not to be confused with dyed or tinted hair. Dyspigmentation is always bandlike in character and usually is associated

with some change in texture of hair in the depigmented band. In some ethnic groups, particularly Negroid groups, the pigment may be slightly reddish in color. In others, especially among straight black-haired peoples, the bandlike depigmentation ("flag sign") is common. Only rarely observed in adults.

Easily pluckable (Pediatric form only): Easily pluckable hair is that in which the shafts are readily removed with minimum tug when a few strands are grasped between the finger and thumb and gently pulled. In such cases there is a lack of reaction of the child, indicating a lack of pain associated with removing of the hair.

Abnormal texture or loss of curl (Pediatric form only): Changes in texture of the hair to a soft, silklike hair. Loss of curl self-explanatory.

Eyes

Thickened opaque bulbar conjunctivae (Adult form only): All degrees of thickening may occur. The blueness of the sclera may disappear and the bulbar conjunctivae develop a wrinkled appearance with increase in vascularity. The thickened conjunctivae may result in a glazed, porcelain-like appearance, obscuring the vascularity. Do not confuse with pterygium.

Angular lesions of eyelids (Adult form only):

Circumcorneal injection (bilateral): Increase in vascularity by new ingrowth of capillary loops, with particular concentration around the cornea in the absence of obvious infection, etc.

Conjunctival injection (bilateral): Generalized increase in the vascularity of the bulbar conjunctivae in the absence of obvious infection.

Xerosis conjunctivae: The conjunctivae, upon exposure by holding the lids open and having the subject rotate the eyes, appear dull, lusterless, and exhibit a striated or roughened surface.

Bitot's spots: Small circumscribed, grayish or yellowish-gray, dull, dry, foamy superficial lesions of the conjunctivae. Seen most often on the lateral aspect of the bulbar conjunctivae and in children. Usually bilateral. Not to be confused with pterygium.

Xerophthalmia: Xerophthalmia is recorded when the bulbar conjunctiva and cornea are dry and lusterless with a decrease in lacrimation. It is often associated with evidence of infection or, in extreme cases, keratomalacia.

Keratomalacia (Pediatric form only): Corneal softening with deformity, either localized, usually central part of lower half of cornea, or total.

Lips

Angular lesions: Record only if definitely present bilaterally when mouth is held half open. May appear as pink or moist whitish macerated angular lesions which blur the mucocutaneous junction. Angular fissures are recorded only when there is definite break in continuity of epithelium at the angles of the mouth.

Angular scars: Scars at the angles, which, if recent, may be pink; if old, may appear blanched.

Cheilosis: Different from ordinary chapping. The lips are swollen or puffy and appear as if the buccal mucosa extends out onto the lip. There may be desquamation. This category may be used to include vertical fissuring of the lips. If associated with herpes labialis, note under "Remarks."

Teeth

(See instructions in Dental Examination Section)

Gums

Atrophy, recession, inflammation: Atrophy and recession refer to loss of substance of interdental papillae resulting in unfilled space between teeth at gingival line. Inflammation refers to typical gingivitis.

Marginal redness or swelling: Marginal redness refers to a definite red border along the dental margin of the gum. Marginal swelling refers to a swollen border of the gum which may be spongy or firm.

Swollen red papillae: Red, congested, spongy, swollen interdental papillae. Record whether localized to small area or diffuse throughout whole dental area.

Bleeding gums: Abnormal gums which either bleed spontaneously or bleed upon slight pressure with a swab stick.

Tongue

Filiform papillary atrophy: The filiform papillae are exceedingly low or absent, giving the tongue a smooth or "slick" appearance which remains after scraping slightly with an applicator stick. "Slight" involves less than one-fourth of the tongue (tip and lateral margins only); "moderate" involves one-fourth to three-fourths of the tongue; "severe" involves over three-fourths of the tongue.

Fungiform papillary hypertrophy or hyperemia: Can be seen and is felt when a tongue blade is drawn lightly over the anterior two thirds of the tongue. Hyperemia refers to definite red papillae which give the tongue a berrylike appearance. Record as moderate or severe if over 50 percent of papillae are hypertrophied or hyperemic.

Geographic tongue: Irregularly outlined and distributed areas of atrophy, with irregular white patches resembling leukoplakia.

Fissures: linear lesions or cracks, with definite break in continuity of epithelium.

Serrations or swellings: tooth impressions at sides of tip, often noted when tongue is swollen.

Red, scarlet, beefy (glossitis): Entire tongue is red, angry in appearance, with or without denudation or fissures. Not just a modification of the natural color due to the loss of papillae. Associated almost always with subjective symptoms of hypersensitivity, burning, even taste changes.

Magenta colored: The color of alkaline phenolphthalein.

Face and Neck

Malar pigmentation (Adult form only): Areas of darkened, brown pigmentation over the malar eminences.

Nasolabial seborrhea: A definite greasy yellowish scaling or filiform excrescences in the nasolabial area which become more pronounced on slight scratching with the fingernail or a tongue blade.

Parotids visibly enlarged: Due to difficulties in assessing parotid enlargement, record as positive only if clearly visible and bilateral enlargement present.

Thyroid enlarged: The World Health Organization (WHO) criteria used for grading goiter are:

> Grade 0: Persons without goiter. By definition these are persons whose thyroid glands are less than 4 to 5 times enlarged.
> Grade I: Persons with palpable goiters. The thyroid is considered to be more than 4 to 5 times enlarged although not visible with head in normal position. Most of these will be readily visible with the head thrown back and the neck fully extended.
> Grade II: Persons with visible goiters. Persons with goiters which are easily visible with the head in normal position but which are smaller than those in Grade III. Palpation may be helpful in determining the mass of the gland, but is not needed for diagnosis.
> Grade III: Persons with very large goiters. The goiters of persons in this category can be recognized at a considerable distance. They are grossly disfiguring and may be of such size as to cause mechanical difficulties with respiration and in the wearing of clothes.
> (Perez, C., Scrimshaw, N. S., and Munoz, J. A., Technique of endemic goitre surveys. In Endemic Goitre; p. 369, see esp. p. 376, World Health Organization Monograph Series No. 44, Geneva, 1960.)

Fingernails

Clubbing refers to an increase in the angle at the base of the fingernail. Spooning indicates concavity of the outer surface of the nail. Ridging refers to the presence of multiple longitudinal ridges in the nail. The last two signs are seen in some cases of chronic iron deficiency anemia.

Skin

Follicular hyperkeratosis: This lesion has been likened to "gooseflesh" which is seen on chilling, but it is not generalized and does not disappear with brisk rubbing of the skin. Readily felt, as it presents a "nutmeg grater" feel. Follicular hyperkeratosis is more readily detected by the sense of touch than by the eye. The skin is rough, with papillae formed by keratotic plugs which project from the hair follicles. The surrounding skin is dry and lacks the usual amount of moisture or oiliness. Differentiation from adolescent folliculosis can usually be made through recognition of the normal skin between the follicles in the adolescent disorder. It is distinguished from perifolliculosis by the ring of capillary congestion which occurs about each follicle in scorbutic perifolliculosis.

Dry or scaling skin (xerosis): Xerosis is a clinical term used to describe a dry and crinkled skin which is accentuated by pushing the skin parallel to its surface. In more pronounced cases it is often mottled and pigmented, and may appear as scaly or alligatorlike pseudoplaques, usually not greater than 0.5 cm in diameter. Nutritional significance is not established. Differential diagnosis must be made from changes due to dirt and exposure and ichthyosis.

Hyperpigmentation: Asymptomatic, with no inflammatory component. It is seen most frequently on the dorsum of the hands and lower forearms, particularly where skin hygiene is poor. The skin is rough, dry, and often has a grayish cyanotic base. There is not the sharp line of demarcation at the border of the lesion such as one sees in pellagra.

Thickened pressure points (other than elbows and knees): Look especially at belt area, ischial tuberosities, sacrum and over greater trochanters. Other sites may occur as a result of a given occupation. Do not record when found only on elbows and knees.

Perifolliculosis (Adult form only): Congestion around the follicles which does not blanch upon pressure. (See discussion of follicular hyperkeratosis above.) Early ring of capillary engorgement around some hair follicles which does not disappear on pressure. It is more frequently encountered on the dependent parts such as the legs. Swelling and hypertrophy of the follicles may occur, at which time the skin becomes rough. Follicular hyperkeratosis and perifolliculosis may coexist.

Purpura or petechiae (Adult form only): Small localized extravasations of blood, red or purplish in color, depending on time elapsed since formation. Usually distributed at sites of pressure, and may be perifollicular.

Crackled skin (Adult form only): Definite scales larger in size than those seen in xerosis. It is often congenital and is most prominent in cool weather. It is non-nutritional in origin.

Pellagrous dermatitis (Adult form only): Record when symmetrical lesions typical of acute or chronic, mild or severe pellagra are observed. Record location.

Abdomen

Potbelly (Pediatric form only): Record if abdomen appears abnormally distended and enlarged, with due recognition of the usual contour of the young child.

Hepatomegaly: Record liver edges more than 2 cm below the coastal margin.

Lower Extremities

Pretibial edema: Record only if bilateral.

Calf tenderness (Adult form only): Record when definite bilateral evidence of painful sensation occurs upon squeezing the calf muscles firmly between the thumb and finger. Record only if moderate or severe.

Absent knee/ankle jerk (Adult form only): Record only if absent bilaterally with reinforcement.

Absent vibratory sense (Adult form only): Test with tuning fork at 128 vibrations per minute over the lateral malleoli. Record as positive only if absent bilaterally.

Scrotum

Scrotal dermatitis (Adult form only): The scrotum usually must be rotated to see the lesions. Differentiate from fungus infections which usually extend onto the skin of the groin adjacent to the scrotum.

Pulse Rate and Blood

Pulse rate (Adult form only): Count for a minimum of 30 seconds.

Blood pressure (Adult form only): Take on right arm, with individual in sitting position. Make reading upon disappearance of sound. Record data to nearest even unit.

Skeletal (Pediatric form only)

Beading of ribs: Record when there is definitely palpable and visible enlargement of the costochondral junctions.

Bossing of skull: Record when there is abnormal prominence or protrusion of frontal or parietal areas.

Anthropometry

The anthropometric examination consists of: (1) a series of 10 measurements in adults and children 6 years of age and over; (2) the same measurements, plus chest and head circumference, for children under 6 years of age.

Anthropometry is carried out by two individuals. One individual makes the actual measurement; the other records the data. Each individual should alternate freely between measuring and recording.

Recommended equipment for anthropometry is given in the Appendix.

A detailed consideration of the technics used in the anthropometric examination is given in the accompanying table.

Item	Instruments	Procedure
1. Weight (kg in tenths)	Balances for adults & children	Subject weighed in indoor clothing, less jackets, blazers, cardigans and footwear. Males weighed without shirt and undershirt and with pockets emptied. Both balances have to be standardized daily with test weights. The reading is taken to the nearest tenth of kg.
2. Clothing estimate	Balance	
3. Nude weight		Derived by subtracting clothing estimate from observed weight.
4. Stature (mm)	Measuring board (2 m capacity) or children's measuring table (1.2 m)	Height measurement is taken against the measuring board for all individuals able to stand. The individual stands with heels and back in contact with the board, without shoes, looking directly foreward and his head held straight. A right angle block is slid down the board until the bottom surface touches the subjects head. The subject is told to stretch to maximum height, leaving the heels firmly on the gound. The

		reading is taken to the nearest mm. Babies total height is taken on the children's measuring table up to the age of 2. The baby is kept flat on the table, legs perfectly straight against the left block and the right block is moved in to touch the baby's head. The reading is taken against the tape measure on the table. For this measurement an assistant is necessary.
5. Knee Height (mm)	Bench (44 cm) and right angle block; for children, measuring table and spreading caliper	A bench (44 cm high) is placed against the wall with a tape measure fixed against the wall, starting with "1" at the point where the bench ends. The subject stands at the right side of the bench with the right foot on the bench, and the left leg in a straight line with the tape. A right angle block is slid down until the buttom surface touches the patella, and then the reading is taken against the tape to the nearest 0.1 cm. For smaller subjects use the steps so that the right knee can always be flexed at a right angle. For babies, the knee height is taken using the spreading caliper, from the sole at the heel to the knee with maximum pressure to compress the fat.
6. Bicondylar diameter femur (mm)	sliding caliper	Subject sits erect, his feet resting on the ground with the right knee flexed at a right angle. Using the sliding caliper, measure the horizontal distance across the lateral surface of the right knee. Use maximum pressure to compress the flesh.

7. Bistyloid diameter wrist (mm)	sliding caliper	Subject stands or sits with his upper right arm hanging, elbow bent. Using the sliding caliper with maximum pressure to compress the flesh, the distance between the radial and ulnar styloid prominences of the right wrist is measured.
8. Biacromial diameter (mm)	Spreading caliper	Subject stands or sits erect, arms hanging to his side, relaxed position. Using the spreading caliper, measure the distance between the right and left acromial processes.
9. Calf circumference (mm)	Steel tape (cm)	Subject stands with his feet squarely on the floor. Holding the tape in a horizontal plane, the maximum circumference of the right calf is taken.
10. Arm circumference (mm)	Steel tape (cm)	Subject sits or stands with the right arm hanging relaxed. Measure midway between the right shoulder (acromial process) and elbow (olecranon process). Measure with the tape in a horizontal plane. Shirts must be taken off or sleeves rolled up.
11. Subscapular skinfold (mm)	Lange Skinfold caliper	The skinfold is taken under the right scapula following the natural fold of the skin. During the measurement, hold the skinfold with the left hand and measure approx. 1 cm deep with the caliper. Read to the next lower.
12. Triceps skinfold (mm)	Lange Skinfold caliper	With the subject's right arm hanging straight and relaxed the measurement is made of the skin and subcontanous tissue of the right upper arm midway between the shoulder (tip of acromion) and the elbow (tip of olecranon). The midpoint is found by measuring with a tape the distance between these two points and marking the middle with a light pencil mark. During the measurement, the skinfold is held with the left hand and measured approx. 1 cm deep with the caliper. The reading is taken to the next lower.

Measurements for Children Under 6 Years of Age:

1. Chest circumference (mm)	Steel tape (cm)	The subject stands erect, arms at his side, relaxed position. Holding the tape in a horizontal plane at the level of the nipples, the maximum circumference is measured during normal breathing. In babies a second person should assist.
2. Head circumference (mm)	Steel tape (cm)	Subject stands or sits. Measurement is taken with the tape passing just above the brow edges. Measure the maximum circumference of the head just above the ears.

APPENDIX

Equipment for Anthropometry

INSTRUMENT	SPECIFICATIONS	SOURCE
1 Balance	Detecto Physician Scale Hand Post Capacity 140 kg x 100 Model 449 R	Detecto Scale Inc. 540 Park Avenue Brooklyn, N. Y. 11205
2	Clinic Pediatric Scale Tray 22x14x3-2/8 inches Capacity 60 kg x 20 gr Model 1522	Continental Scale Corp. 5701 South Claremont Ave. Chicago, Ill. 60636
3 Test Weights	1 kg 2 kg 5 kg 2 x 10 kg 2 x 25 kg	Fairbanks Morse 5521 Navigation Blvd. Houston, Texas
4 Spreading Caliper	Capacity 30 cm wide Cat. No. 106 Silber & Hegner Zuerich	Silber & Hegner Co. 8 West 30th Street New York, N. Y. 10001
5 Spreading Caliper	Capacity 60 cm wide Cat. No. 108 Silber & Hegner Zuerich	Silber & Hegner Co. 8 West 30th Street New York, N.Y. 10001
6 Sliding Caliper	Capacity 25 cm wide Cat. No. 104 Silber & Hegner Zuerich	Silber & Hegner Co. 8 West 30th Street New York, N. Y. 10001
7 checking gauge	10, 20, 30, 50, 70, 100, 150, 200, 250 mm Cat. No. 219 Silber & Hegner Zuerich	Silber & Hegner Co. 8 West 30th Street New York, N. Y. 10001
8 Lange Skinfold Caliper	Capacity 60 mm Cambridge Scientific Inc.	Cambridge Scientific Inc. 527 Polar Street Cambridge, Maryland or Silber & Hegner Co. 8 West 30th Street New York, N. Y. 10001

9	Baby measuring table	Custom made by carpenter metric Capacity 120 cm	
10	Bench	44 cm high custom made by carpenter	
11	Height measuring board	Capacity 2 meters custom made by carpenter	
12	step	2 levels, 11 and 22 cm high custom made by carpenter	
13	wooden triangle	right angle custom made by carpenter	
14	steel tape	1 meter, 2 meter Keuffel & Esser Co. Cat. No. 860356 (1 m) Cat. No. 860358 (2 m)	Keufel & Esser Co. 1701 Walker Ave. Houston, Texas
15	Water level	5 inch pocket level Sears Cat. No. 9G 3979	Sears & Roebuck Co.

WRISTBONE X-RAY

The determination of wristbone X-ray is an important part of the National Nutrition Survey. In order to produce satisfactory X-rays, the Nutrition Program has contracted with Dr. Stanley Garn, Center for Human Growth and Development, The University of Michigan, to provide standardization of the portable X-ray unit and training for the field operators. A description of the unit to be used is attached, as well as general instructions for assembling and operating the unit. A series of specific instructions has been developed by Dr. Garn, including some general safety precautions. However, it is essential that the instrument be tested under the field conditions and that it be shielded in a manner which meets the regulations of each individual state. Dr. Garn and his staff are prepared to assist in these safety evaluations. Background information from other surveys is available. Since regulations vary from state to state, acceptable shielding procedures in one state may not be satisfactory in other states.

Regulations Regarding Radiation Safety

1. With an output of 40 mr at the base, air dosage, there is not more than 1 mr measured dosage on the outside of the tube-head shield.

2. At three feet from the central ray, marked by the cross on the base, the air dosage is below 0.5 mr per exposure.

   The instrument is therefore safe under the conditions given, but at no time must the milliampere setting be allowed to exceed 20 Ma.

3. To prevent over-heating, not more than 60 radiographs should be taken per hour (60 x 50PKV x 20 Ma x 3 sec = 180,000 heat units).

4. The two-millimeter aluminum filter must be in place at all times.

5. The technician must stand a minimum of four feet from the machine, must wear a lead-rubber apron, and all persons regularly using the machine must be given the protection of an independent badge service.

6. Lead rubber should be placed under the baseboard and, furthermore, no subject should be seated so as to allow legs or thighs in the direct beam path.

General Procedure for Taking X-rays

1. Write (print) on the corner of the film the following:

   Date
   Name of subject, sex, age
   Number of subjects

2. Place the film on the base. Make sure that the vertical and horizontal lines are in line with those of the base.

3. Place the left hand of the subject on the middle of the film. Make sure that the wrist is also included. Pass the left hand of the subject through the lead shield and place it on the middle of the film. NOTE: Make sure the fingers are slightly separated and the hand including the wrist rest slightly on the film.

4. Set the timer as follows: (This should be determined for each machine based on results of developed X-ray.)

   1 second for children between one month to 5 years of age.
   1½ second for children between 6 and 10 years of age.
   2 seconds for children between 11 and 15 years of age.
   2½ seconds for subjects between 16 and 20 years of age.
   3 seconds for adult subjects.

5. Press the push button of the timer until the timer stops.

X-ray Film

At the present time, we are contemplating the utilization of X-omat RPS film. This film can be processed in automatic equipment. Detailed information on this film and its processing should be obtained from Dr. Garn. Facilities to process film locally are necessary in order to ensure that satisfactory films are being produced on a day to day basis.

20-80 PORTABLE X-RAY UNIT

UNCRATING AND MECHANICAL ASSEMBLY

Unpack unit carefully and be sure to check items with the packing list.

Units shipped with carrying cases will be packed in these cases, as normally used.

1. To assemble the tubestand, place the wooden base flat on a table.

2. Place the lower end of the tubestand column into the base bracket, so that the threaded stud enters the hole in the base bracket. Tighten the column in position with the lock knob provided.

3. With the crank, as shown in figure 1, place the carriage on the tubestand so that the lower roller rides against the flanges of the tubestand column and the upper roller rides against the bar.
   Move the carriage down until it engages the hook on the elevating screw of the column.

4. To place the x-ray tubehead in position on the carriage, insert the tubefork shaft into the hole on the carriage. With the tube fork shaft angled down slighly, push in until the end of the shaft finally passes the second obstruction. When this happens, you will be able to see the end of the shaft by looking between the upper edge of the carriage and the column. When the weight of the tubehead is allowed to rest on the fork, the tube fork shaft will seat itself in the carriage so that it can not come out unless you lift the weight of the tubehead from this tube fork shaft.

The tubehead is positioned for height by turning the small crank at the top of the tubestand column. Focal distance is measured and read on the scale of the tubestand column. Use the top edge of the tube carriage as the index point.

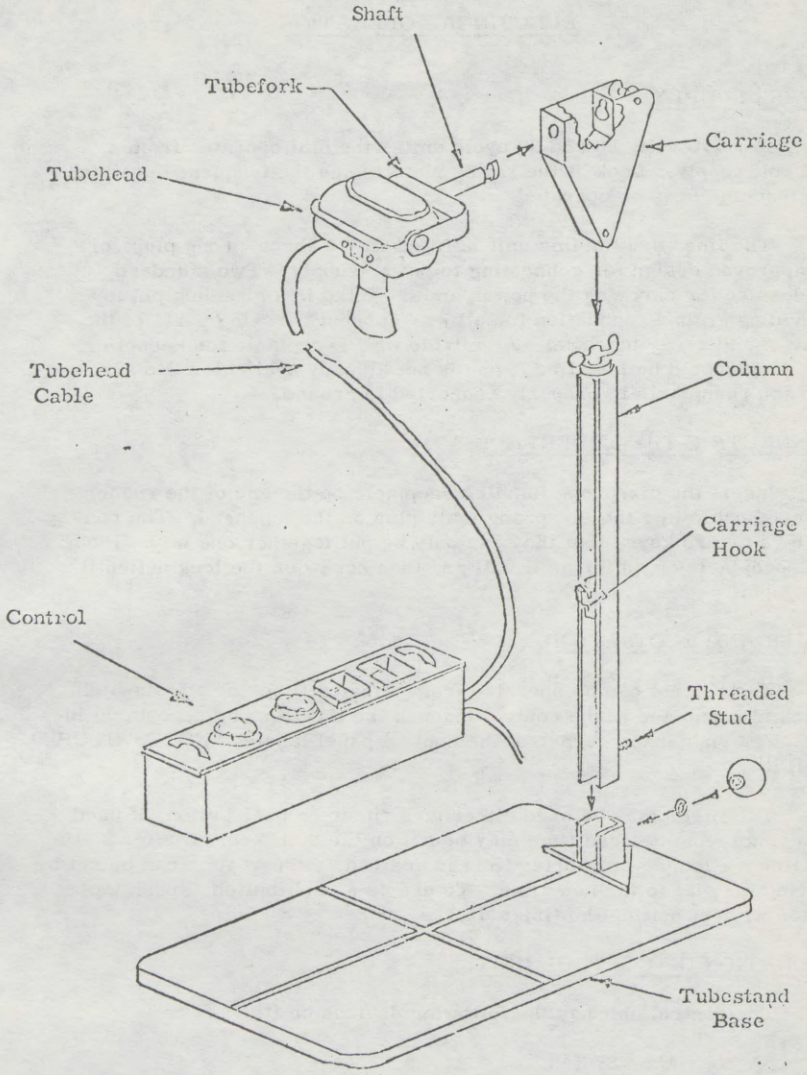

Shaft
Tubefork
Carriage
Tubehead
Tubehead
Cable
Column
Carriage
Hook
Control
Threaded
Stud
Tubestand
Base

FIGURE 1

ELECTRICAL OPERATION

POWER SUPPLY:

For 110 volt, 50 and 60 cycle units, the unit operates from a 115 volt supply. Look at the rating plate to see the frequency at which the machine is to be operated.

The line cord for this unit is fitted with a three-prong plug, of an approved design for connecting to power supply. Two standard blades are for carrying the power and the third is a grouding pin for providing ground connection for all non-current carrying parts of the control and x-ray tubehead. A suitable wall receptacle for accepting this plug should be installed if one is not already avaliable. Be sure that the receptacle is properly connected to ground.

CONNECTING THE TUBEHEAD:

Insert the six-prong female receptacle on the end of the rubber covered cable into the six-prong male plug on the tubehead. The connectors are so keyed that they can only be put together one way. Push the receptacle on as far as it will go, then screw on the lock nut until it is tight.

TIMER AND FOOTSWITCH:

The control can be operated from either a timer or a footswitch which is connected to the control through the three-prong receptacle in the lower right-hand corner of the control panel labeled "FOOTSWITCH TIMER".

The timer may be used either as a timer or push button. If used as a timer, the desired time may be set on the dial face. If after setting the timer a longer or shorter time is desired, the new time can be set by moving the dial to the new time. To use as a push-button, push the button without setting the timer dial.

OPERATION OF CONTROL UNIT:

The control unit has the following devices on it:

Main Switch.
Light Switch for the meter lights.

OPERATION OF CONTROL UNIT
Continued

Receptacle for either a timer or a footswitch.
Receptacle for 110 volt operation of auxiliary components.
Knob for controlling a filament circuit
Knob to set the kilovoltage

The kilovolt meter is of the load-on type -- that is, it reads correctly only when the machine is producing X-rays. It will be noticed that when the timer button is pushed, the kilovoltmeter reading decreases slightly. This new reading indicates the correct kilovoltage. The amount that the reading decreases depends on the milliamperes. If the drop is very great, it may be that the power line to which the machine is connected is not adequate for the machine, and a heavier one will have to be installed. However, this will not affect the accuracy of the meter.

The scale on the kilovoltmeter is calibrated to read correctly at from 0 to 5 MA. When operating above 5 MA. the operator must make allowances for the drop in kilovoltage in the transformer. This decrease in kilovoltage drop does not show on the meter. The rule for determining the kilovoltage is as follows:

FOR EACH 5 MA. ABOVE 5 MA. SUBTRACT 2.5 KVP. FROM THE READING ON THE METER.

For example: If when the X-ray button is pushed the milliammeter reads 10 MA. and the kilovoltmeter reads 75 KVP. this would mean, (using the above rule) that the actual kilovoltage was 72.5 KVP.

Another example is obtaining readings of 20 MA. and 60 KVP. with "X-rays on". The milliamperage is 15 greater than the 5 for which the meter is calibrated so the actual kilovoltage would be: 60 - 3 x 2.5 or 52.5 kilovolts.

ELECTRICAL OPERATION
(Continued)

WARNING: Do NOT make adjustments of kilovoltage with the kilovoltage control while the machine is producing x-rays.

A tubehead rating chart is supplied with each unit. It should be consulted before making exposures so that the capacity of the tube is not exceeded. The purpose of the chart is to determine the maximum time that the tube can be operated continuously at a desired milliamperage and kilovoltage. If this chart is disregarded there is danger of overheating and melting the target.

WARNING: Do not go over 20 MA. if the tubehead is a type GR-A which is made for use at 60 cycles. Do not exceed 15 MA. if the tubehead is a type GR-K which is made for use on 50 cycle.

The heat generated at the target will travel through the copper anode of the tube than into the oil in the head and eventually it will pass into the air from the tubehead. The heating of the oil causes it to expand. The expansion is taken up by a rubber bellows inside the tubehead. However, if the oil becomes too warm, the bellows will reach the limit of its expansion and pressure can build up in the head to a point that will cause it to leak.

In order to be sure that the bellows will not reach the limit of its movement, the tubehead must not be operated at individual exposures with such frequency that the heat will exceed 90,000 heat units in a half-hour period.

Heat units are defined as the product of kilovoltage, milliamperes, and the time in seconds -- the three factors determining the heat generated. An example is as follows:

An exposure at 70 KVP. and 10 MA. for one minute generates 70 x 10 x 60 = 42,000 heat units. Two such exposures could be made in half hour with a safety factor.

20-80 OPERATION PROCEDURE

1. Plug timer into receptacle on face of control if radiography is to be done, or plug footswitch in for fluoroscopy.

2. Set kilovoltage control knob so that the kilovolt meter reads approximately the kilovoltage called for in the technique charts for the technique desired. (Do not adjust this knob while the machine is producing x-rays -- that is, while either the footswitch or timer is being operated.)

3. Press either the footswitch or timer and set the machine for the milliamperage called for in the technique chart for the technique desired, then release the timer or footswitch.

4. Operate the machine again while watching the kilovolt meter and observe the reading. This reading is the actual kilovoltage if you are using 5 MA. or less. If you are operating over 5 MA. subtract 5 kilovolts for each additional 10 milliamperes over 5 MA. That is, for 10 MA. subtract 2-1/2 KVP.; for 15 MA. subtract 5 KVP.; and for 20 MA. subtract 7-1/2 KVP. This will be the actual kilovoltage at these various milliamperages.

   For example: If the reading on the meter, when the timer is operated, is 70 KVP., and the milliammeter reads 15 MA., the actual kilovoltage is 65 KVP. If the technique chart calls for a higher or lower kilovoltage, re-adjust the kilovoltage with the kilovoltage control knob but do not do the adjusting while the machine is producing x-rays.

   The kilovoltage is adjusted in steps so it will not always be possible to obtain the exact kilovoltage called for. In this case, it is generally best to use the kilovoltage setting that is on the high side of desired kilovoltage.

5. The technique charts give information about positioning the patient. The only other requirement for the machine is setting the timer. Set for the time called for in the technique chart. If you accidentally set the timer for a longer time, the timer setting knob can be moved back to the desired time. Always press the timer button quickly to the limit of its movement.

NATIONAL NUTRITION SURVEY PROTOCOL

LABORATORY EXAMINATION

General

A. Description of Sample. Fifty percent of the households which undergo complete dietary evaluation will be selected at random. All members of these households will undergo complete biochemical evaluation. Thus, the subsample for biochemistry will consist of 25% of the total number of households being surveyed (50% of a 50% subsample = 25%), and should approximate 25% of the total individuals surveyed.

B. Determinations. At the minimum, complete biochemical evaluation consists of: on blood, hemoglobin, hematocrit, vitamin A and carotene, total serum protein and electrophoresis, vitamin C, serum folate, and red cell folate (if serum folate is low); on urine, creatinine, riboflavin, thiamine, urea nitrogen, iodine, glucose (qualitative) and protein (qualitative). Methodology to be employed, and an outline for sample processing, is given below.

C. Special Groups. In addition to the 25% subsample described above, certain special groups must undergo complete biochemical evaluation. These are: (1) all pregnant and lactating women; (2) all children up to 36 months of age.

D. Additional Tests. Certain subjects are to have serum iron and iron binding capacity performed, as follows:

(1) All anemic individuals in the 25% biochemistry subsample
For purposes of the survey, anemia is defined as:

	Hct	Hb
Males	<40	<14
Females, not pregnant or lactating	<36	<12
Children, age 3-12	<33	<11

(2) All pregnant and/or lactating females.

(3) All children up to age 36 months.

Groups (2) and (3) are to have serum/whole blood folates also.

E. Additional Hematology. It is strongly urged that hematocrit and hemoglobin be determined on all subjects in the survey population. These determinations are mandatory if serum is to be banked for future use.

Methodology for Biochemical Evaluation

Methods for biochemical determinations are as follows:

A. Procedures to be carried out in the participating State laboratories:

1. Hemoglobin by the cyanmethemoglobin method.
2. Hematocrit by the micro-method.
3. Total serum proteins by the biuret method (may be automated).
4. Serum protein electrophoresis using the Beckman microzone-cellulose acetate system.
5. Serum vitamin C by the dinitrophenylhydrazine method.
6. Plasma Vitamin A and Carotene by the Carr-Price method using trifluoroacetic acid chromogen.
7. Urinary creatinine by the picrate method. Must be automated.
8. Urinary urea nitrogen. May be automated.
9. Urinary thiamine. Automation unacceptable.
10. Urinary riboflavin by modified Slater-Morrell method. Automation unacceptable.
11. Urinary glucose by "stix" method. Confirm positives with Benedict's test.
12. Urinary protein by "stix" method. Confirm positives with heat and acetic acid test.

More details and specific references for these methods are given in the ICNND Manual for Nutrition Surveys.

B. Procedures to be carried out at the USAMRNL Laboratory, Denver:

1. Plasma vitamin C by the micro-method when venous blood is unavailable.
2. Plasma vitamin A and carotene by the micro-method when venous blood not available.
3. Serum and whole blood folates.
4. Serum iron and iron binding capacity.

C. Procedure to be carried out at Boston Medical Laboratory, Inc.

1. Urinary iodine.

Quality Control Procedures for Biochemical Evaluation

Quality control procedures are of two broad categories: intersurvey and intrasurvey.

A. Intersurvey Quality Control

Intersurvey quality control (control between surveys) will be achieved through the following:

1. Use of certain biological standards from a central supply, to be furnished by the Nutrition Program:

   a. vitamin A
   b. carotene
   c. hemoglobin
   d. Versatol
   e. bromphenol blue
   f. vitamin C

2. Insistence upon conformity in analytical methodology. (See previous section)

3. Use of stable homogeneous serum and urine pools distributed to participating laboratories for monitoring laboratory--to laboratory comparability. Samples of serum and urine pools will be distributed to all state and city laboratories conducting surveys at any one time on a regular schedule. These National Nutrition Survey Reference serum and urine samples will be inserted into the samples from the field and determinations will be conducted for appropriate constituents immediately after they are received. Assays will be conducted as outlined in Methodology for Biochemical Evaluation and reported to the Nutrition Program office.

B. Intersurvey Quality Control

1. Control within a survey will be accomplished by use of stable homogenous serum and urine pools. Several packages of a single lot of commercially prepared lyophilized serum and urine reference material will meet this requirement. The serum and urine pools will be analyzed several times at the start of the survey and a quality control chart will be prepared as described in the ICNND Manual for Nutrition Surveys, pp. 107--111. The pool will then be divided into subsamples to be analyzed daily to insure that the laboratory is "in control." The daily subsample must be inserted into the samples from the field so that the sample will be "blind" and the laboratory analyst will not know which sample is the check sample.

2. Attention of the analysts and laboratory chiefs should be directed to Chapter IX of the ICNND Manual, "Suggested Interpretative Guides," especially Tables 1 to 4. Any consistent or marked deviation beyond the high and low values outlined in these tables should be regarded with suspicion by the analyst and should suggest to the analyst that he recheck either the analytical procedure or the calculations. (The absolute values given in the tables should be converted to instrument readings for the particular instruments used by the laboratory by the laboratory chief so that the analyst will be able to respond immediately to any questionable results).

Outline for Processing Blood and Urine Samples

A. Adult Blood Sampling Techniques (>2 years old)

1. Anticoagulated blood:

One 7 ml vacutainer tube containing EDTA, B-D #4735 (old number - 3202Q).

Yield - ± 5 ml blood
± 2.5 ml plasma

a. Transfer 0.2 ml of whole blood for folate determination into a glass (i.e., Pyrex disposable) tube containing 1.8 ml of 0.05 M phosphate buffer pH 6.1 containing 50 mg ascorbic acid per 100 ml buffer. Stopper and freeze the diluted sample immediately and maintain frozen at all times including during shipment to USAMRNL (Denver). Glassware must be scrupulously clean.

b. Microhematocrit (0.1 ml blood)

c. Hemoglobin (0.04 ml blood)

d. Centrifuge remaining whole blood

e. Transfer 2.0 ml plasma for carotene determination and analysis for Vitamin A using the trifluoroacetic acid-chloroform chromogen.

2. Coagulated blood:

One 20 ml plain vacutainer tube B-D #4787 (old number - 3208).

Yield - 10-15 ml blood
5 - 7 ml serum

a. Remove clot and/or centrifuge.

b. Transfer 3.0 ml serum to scrupulously clean glass tube and freeze at -20°C for shipment to USAMRNL (Denver). This must be kept frozen during shipment. Indicate on tube, e.g., by color-coded tape, whether specimen is for serum iron and iron binding capacity determination (anemic subjects) in addition to serum folate/whole blood folate determination.

c. Aliquot 0.5 ml serum for serum protein determination and cellulose acetate electrophoresis.

d. Slowly pipet 2.0 ml serum into exactly 8.0 ml of ice-cold 5% trichloroacetic acid for vitamin C determination by the dinitrophenylhydrazine method. Samples must be kept frozen in TCA during storage (-20°C), and the samples should be analyzed as soon as possible.

e. Any remaining serum should be stored frozen locally for eventual use in a serum bank.

B. Infant Blood Sampling Techniques (<2 years old)

1. Use heel stick - collect blood directly from puncture in 3 six inch heparinized capillary tubes (Scientific Products #B 3095-2 or equivalent), 1 six inch plain capillary tube (Scientific Products #B 3095-1 or equivalent), 1 twenty lambda Sahli pipette for hemoglobinometry, and 1 microhematocrit tube.

a. Serum from plain capillary tube used for total serum protein determination and electrophoresis.

b. One heparinized capillary tube is sealed (not centrifuged), frozen and shipped frozen to USAMRNL for measurement of whole blood folic acid levels.

c. The remaining two heparinized capillary tubes are centrifuged and the plasma pooled and placed in a 6 X 50 mm test tube. From this tube pipette 50 lambda of plasma into another 6 X 50 mm test tube; add 150 lambda of 3% metaphosphoric acid solution; mix; freeze (do not centrifuge); stopper and ship frozen to USAMRNL for determination of the vitamin C level. (If the sample of plasma is limited, then use only 25 lambda of plasma plus 75 lambda of metaphosphoric acid.)

d. The test tube containing the remaining plasma should be stoppered, frozen, and shipped frozen to USAMRNL for vitamin A determinations.

CAUTIONS: Protect samples from heat and light; freeze as soon as possible; stopper well; and carefully label all samples. Do not use plastic containers as this may cause interference in the vitamin A determinations.

C. Procedure for Urine Samples

1. Use combistix to determine protein and sugar; confirm positives with Benedict's reagent and heat and acetic acid, respectively.

2. Aliquot as follows:

   1.0 ml for urea nitrogen (automated method)
   1.0 ml for creatinine (automated method)
   10 ml for thiamine (ICNND method) (automation not acceptable)
   6 ml for riboflavin (ICNND method) (automation not acceptable)
   5.0 ml for iodine (to be shipped elsewhere for analysis)

3. Dr. Howerde Sauberlich (USAMRNL) has requested that any remaining urine (10-25 ml) be sent to him frozen for vitamin B_6 and various mineral determinations.

DIETARY STUDIES

Dietary studies constitute an essential part of any complete nutrition survey, providing essential information on nutrient intake levels, sources of nutrients, food habits, and preparation practices and attitudes. Under conditions where clinical observations are insensitive for detecting basic nutritional problems, nutrient intake studes are essential. Nutrient intake data offer direct means of estimating dietary levels for several nutrients for which routine laboratory or clinical tests have not yet been developed. The solution of problems thus uncovered depends upon knowledge of eating habits and the availability of food in conjunction with a sound program of food technology.

Although both clinical examinations and biochemical tests provide direct means of studying the nutritional status of the individual, the basic information collected in dietary studies is necessary for planning desirable changes in nutritional practices. Dietary studies give information which is needed for modifying existing economic, agricultural, and food management policy programs.

For these reasons dietary studies include the collection of information concerning food habits and customs, food supply and seasonal variations, food procurement and distribution, methods of food preservation and preparation procedures. Information is collected also on infant and child feeding, school and institutional feeding practices, economy of food use, unique nutrient contributions of special food items and nutrient content of unusual foods of significance. In addition, the amount of specific foods ordinarily consumed, as well as the adequacy of the nutrient content of food actually consumed, is also obtained.

Dietary Component

The dietary component of this survey is designed to provide a description of food consumption by the total household and of selected sub-samples. Since the overall objective is to describe the nutritional status of "groups" as contrasted to "individuals" it was decided that a 24-hour recall would provide as reliable data as a record of longer duration. The recall data with the additional frequency and general information will make it possible to estimate nutrient intake and provide an indication of the nutritional quality of the diets consumed. These data will also assist in the interpretation of the clinical and biochemical results and be of value for planning subsequent follow-up programs.

Details relative to securing data, recording, processing and interviewing appear in the specific procedures and guidelines that follow.

The common protocol provides for the population to be divided into the following sub-samples and data collected as indicated:

1) One-half of households (approximately 1000)

   a) general identifying data — Dietary Form #1
   b) general purchasing and preparation data — Dietary Form #2
   c) 24-hour recall of everything consumed by the total household from the home preparation source (not to be allocated by individuals) — Dietary Form #3
   d) Frequency of intake of selected food groups by household — Dietary Form #4
   e) 24-hour recall on all children 0-36 months in these households. — Dietary Form #6

2) Remaining one-half of households (approximately 1000)

   a) 24-hour recall of everything consumed the previous day by any male or female 60 years of age or older. — Dietary Form #3

3) a) All pregnant and/or lactating females 24-hour recall — Dietary Form #3A
   b) All males (12-16) and females (10-16) 24-hour recall — Dietary Form #5

General descriptive data of the community basic to planning follow-up programs will be collected on a geographical basis. Information should describe such things as:

a) Food availability
b) Welfare programs in operation
c) School health programs
d) School feeding programs
e) Food prices on staple items
f) Health facilities
g) Institutional care facilities
h) Educational facilities

Dietary Forms 1-6 with specific guidelines are attached as Appendix _____. A suggested guide for collecting the general community information is also included.

PERSONNEL AND EQUIPMENT

The personnel requirements for conducting the dietary phase of the nutrition survey will vary with the time schedule and place of data collection. Additional time will be required if dietary data is collected within the home setting and may necessitate more personnel.

1) Each survey should have a designated Dietary Director with experience in field survey procedures. Training in nutrition and/or dietetics plus ability and experience in training and supervising dietary interviews is necessary.

2) Assisting the Dietary Director will be the dietary interviewers. If possible, the number should be restricted to 10-15 for standardizing techniques and more efficient collection procedures. It is desirable to have the same interviewers throughout the survey. Experience in interviewing and an understanding of nutrition and local food patterns is desirable. Dietitians, nutritionists and home economists constitute a desirable manpower source. In selected instances and with appropriate training and supervision students and public health nurses may be effective interviewers. The use of lay persons as interviewers is discouraged.

The following averages of time required for the dietary interviews can be used to estimate the number of personnel required.

a) For completing the Dietary Forms 1, 2, 3, 4, on Households, including one subsample (either an infant 0-36 months or a pregnant respondent) averages 45-60 minutes.

b) All individual 24-hour recalls range between 15-30 minutes depending upon respondents ability to answer questions.

Dietary Equipment and Supplies

Dietary Record Forms, pencils, paper pads, ballpoint pens, manila folders or envelopes for records.

Clipboard for each interviewer plus 3 extra.
Individual pencil sharpeners
U.S. Department of Agriculture Handbook No. 8, 1963
U.S. Department of Agriculture House and Garden Bulletin No. 72
1 Copy Master Dietant Table
Lists of Foods in Dietant Table (copy for each interviewer)
Graduated, Standardized food models (one set per interviewer)
Guidelines for Dietary Data Collection (one set per interviewer)

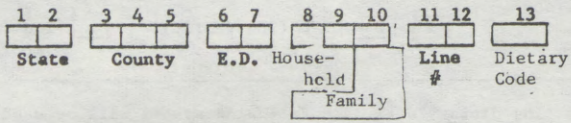
GENERAL GUIDELINES

It is important for each Dietary Director and dietary interviewer to understand the system of identification and the necessity for each person to retain the same code throughout each component of the survey.

For general purposes - including the enumerator's first contact in the home when the Household Information Form is completed, and for the clinical, dental, and biochemical data, persons who live under a "common roof" are classified according to whether they are "related" or "non-related."

For dietary purposes, persons are classified according to whether they eat from a "common food preparation source" without regard for relationship.

Assignment of Identification Code: At the time of the initial interview, the enumerator will complete Household Information Form which is attached to Dietary Form No. 1 as an insert. According to preassigned numbers, the enumerator will complete the first 10 columns of the Identification Code as follows:



Columns 1-7 are completed according to pre-assigned numbers. Columns 8-10 identify the individual household. Column 10 will always be zero (0) unless there are unrelated persons dwelling under the same roof. In that case column 10 would be used to denote the first (or primary family) and a "1" inserted. A separate Household Form would be completed on the unrelated individual or family and a "2" placed in column 10. Should a third unrelated family or individual live within this same dwelling, then another Household Form would be completed and a "3" placed in column 10.

If muliple related families reside in the same dwelling unit, column 10 is completed with a Zero and the enumerator will list all persons on the same household form.

Since it is very possible that unrelated persons may eat from the same food preparation, or even that 2 related families considered by the enumerator to be a single household (or family) may prepare meals separately, it is necessary to assign a "Dietary Code." Column 13 will be used for this.

The following situations may be encountered and since the enumerator will not inquire about meals, the dietary interviewers must assign the dietary code. (For illustrative purposes, we will assume this is household number 10, and show each possible situation as it would be coded.)

Possible Household Occupants	Coded by Enumerator (columns 8, 9, 10)	Dietary Code (column 13)
1. Single Family	[1] [0] [0]	[0]
2. Two or more related families: (eat from same food preparation).	[1] [0] [0]	[0]
3. Two or more related families: (separate food preparation)	[1] [0] [0]	[1] (1st family) [2] (2nd family etc.)
4. Two or more unrelated families: (same food preparation).	[1] [0] [1] (1st family) [1] [0] [2] (2nd family)	[0]
5. Two or more unrelated families: (separate food preparation).	[1] [0] [1] (1st family) [1] [0] [2] (2nd family)	[1] (1st family) [2] (2nd family etc.)

For purposes of collecting dietary data, the following system will be used:

1) Any household with an even number in column 9 will be assigned to the "first half" of the households; dietary data will be collected on this group if the dietary code is "zero" or "1". Any individual or group (family) whose dietary code is "2" or above will not be included for dietary data regardless of code number.

2) In the event that the household has more than one subsample (0-36 months or pregnant/lactating), this order of priority will be followed if time does not permit collecting data on each individual.

   1st Infant 0-36 months
   2nd Pregnant/lactating
   3rd Second infant

(Where more than one infant is in the 0-36 months age group, the following method of selection will be used: if column 9 is either 2 or 4, take the youngest infant, if column 9 is a 6 or 8 take the older.)

VIII. DIETARY FORM NO. 1

General Household Information

Purpose: To describe the individuals that constitute the household with reference to age, sex status, meal pattern and special dietary prescriptions.

Completion: To be completed on each household in the first-one-half of households. Refer to general instructions for identification code.

Respondent: Will, in general, be the homemaker for the household. Information sought will necessitate that informant know entire household, habits, etc.

Note: The dietary interviewer will previously have received this Household Information Form, listing all persons.

Once the Dietary Interviewer determines from the respondent whether this is a single or multiple household for dietary purposes, names and line item numbers should be verified and dietary code assigned to each individual. If additional persons (related or non-related) consumed one or more family-defined meals from that source yesterday, draw a heavy line and list them by name, completing all other information to degree possible.

DO NOT skip any line between 1-15.

Column Number	Explanation	Code (if any)
Reading across top of page from left to right.		
1-10	Identification will have been completed by enumerator.	
11-12	For households always enter code 88.	
13	Refer to general instructions. Do not leave blank.	
14-15	Enter respondents line no.	
16-21	Date of Recall. NOTE: This is not date of interview. Refers to the date for which all recall data applies.	01...12=Jan-Dec 01...31=Day of Mo 68=code last two digits for year. Ex. 1968=68

Column Number	Explanation	Code (if any)
64-65	Enter YOUR assigned code number	01, 02,...10
76	Use code appearing on form to indicate completion or reason not completed. To be filled in AFTER interview.	Printed on form
77-80	These columns are precoded and printed. For key punch operators use only.	

22-27	Record age at last birthday on all household members and guests as it is given by respondent. Do not probe for months or days. If age of guest unknown, record an approximate age provided by responder.	Example: Yrs. Mo. Days 0 0 27 0 5 0 0 5 2 17 0 0
28	Sex and pregnancy status must be recorded for each person listed on lines 1-15. Be certain pregnancy and/or lactation recorded accurately for trimester.	Code appears on the form.
13	Assign zero to all persons unless there are more than one food preparation arrangements.	See general instructions.
33-36	This column is extremely important as it forms the basis for comparing with nutrients and amounts required by this specific household. NOTE: Food such as lunches carried from home source are considered to be meals eaten at home.	Refer to code printed on form.
37	Use code to record the usual home meal pattern.	Appears on form.
38	Record by code if any household member is on a special diet. States desiring to write in "other" diets for their own use may do so. These will not be coded.	Code appears on the form.

Column Number	Explanation	Code (if any)
39	Code. YES ONLY if a doctor prescribed the special diet or if the doctor delegates a nurse to prescribe a diet (this could be done in a clinic or home visit) consider as prescribed by the doctor. This column is not an attempt to assess adherence; if the subject is supposed to be on a special diet but for some reason did not follow it for the past week, still code YES.	Code appears on the form.
40-43	Use columns to record the length of time the subject has been on the prescribed diet. Code the answer to indicate years or months since physician first prescribed the diet.	Code actual numbers of years/months.

IX DIETARY FORM NO. 2

General

Purpose: To describe the households food sources, facilities for preparation, and ascertain some idea of the amount of income available for food. These data will be particularly helpful in planning follow-up programs. For example one cannot relate the presence or absence of certain cooking facilities to nutriture, but such information would be needed in planning education programs aimed toward better food preparation practices.

Completion: To be completed on each household in the first one-half of households.

Respondent: Will, in general, be the same respondent as for Form No. 1 - the homemaker.

Column Number	Explanation	Code (if any)
1-21	Same as form No. 1	
22-27	Six general sources of food are listed. Place 1 opposite the usual source of the food used. Record 0's in all other spaces. It is possible that more than one source may be an important source. If so, place 1 opposite each source.	
28-53	This set of items is to secure a description of the magnitude of home-produced foods. Record actual figures as requested. If none produced, write in 0.	Use actual numbers of pounds, weeks, etc., as indicated
54-57	These items are to determine usual household purchasing habits with regard to type of establishment and method of payment. It is possible that of the four types of establishments shown, one or more may apply. If so, be certain to circle appropriate answer. Do not code a source that is only used occasionally. Supermarket = 3 check out clerks or more "Farm" store = "Company" type store or commissary (not military) "Neighborhood" store = Delicatessan, carry-out, etc. "Other" = any local variations including non-profit cooperations.	Circle either 1 - NO 2 - CASH 3 - CREDIT 4 - CASH AND CREDIT

Column Number	Explanation	Code (if any)
58	This is intended to mean whether or not the household has been "certified" to purchase food stamps. The respondent's reply must suffice. (Note; a household may be eligible but not certified)	Circle one of the possible answers.
59	For determining if respondent utilizes stamps if they are available.	Circle one of the possible answers.
60-63	Insert actual dollars (not cents) you pay if stamps are purchased. This is not the purchasing value of the stamps.	Circle either 0000 or insert dollars
64-67	Indicate in dollars the values of the stamps purchased.	
74-75	For tabulation clerks only.	Precoded
76	Insert appropriate code regarding completion of form.	Code is on the forms.
77-80	For tabulation clerk only.	Precoded
22-26	Get best approximation for actual food expenditure. Work space is for interviewers convenience if needed.	Actual amount. in dollars (not cents)
27	Self-explanatory.	Circle one answer only.
28-36	These items describe preparation and storage facilities as reported by the respondent.	
	(10a.) Insert number of surface units that function. If wood stove, approximate units. (If respondent has a one burner unit and uses an electric frying pan constantly, code 2 units).	
	b. use respondents opinion	Circle one answer
	c. use respondents opinion	Circle one answer
	d. use respondents opinion	Circle one answer
	e. use respondents answer	Circle one answer
	(11) This refers to whether the	Circle one answer
	(12) facilities are shared with	Circle one answer
	(13) another "household."	Circle one answer

Column Number	Explanation	Code (if any)
64-65	Insert number assigned to you as an interviewer.	
74-75	Tabulation use only.	Precoded
76	Assign appropriate code	Printed on form.
77-80	Tabulation use only.	Precoded

X. DIETARY FORM NO. 3 and NO. 3A

Purpose: This 24-Hour Recall Form is used to obtain a record of food and beverage consumed by the respondent during the 24-hours of the day previous to the interview. The form has been designed so that it may be used with three different types of respondents. The data will then be processed to provide a record of the nutrient intake of either the household or of the two types of individuals on whom the form will be completed.

Completion: (1) Form 3 will be completed on the first one-half of the households. The household consists of all related or all nonrelated persons residing in the dwelling unit who ate from the "common" home prepared supply (or carried a meal from the source), plus any visitors who ate a family-defined meal from that source. For this group (the household) record only food and beverage consumed from home source.
(2) Form 3 will also be completed on any person 60 years of age or older residing in the second one-half of the households. For these individuals, record all food and beverage irregardless of source.
(3) Form 3A will be completed on all pregnant and/or lactating women over 16. (If pregnant and/or lactating under 16, use Form No. 5.) For these individuals, record all food and beverage irregardless of source.

Respondent: (1) The person responsible for the household's food preparation.

(2) The individual on whom data is being collected.

(3) The individual on whom data is being collected.

DIETARY FORM NO. 3-HOUSEHOLD RESPONDENT

When the recall is being taken on the household, it is not necessary to allocate amounts consumed to specific individuals. Neither is it necessary to secure and record information on meals prepared or eaten outside of home.

It is important to remember that the total amount consumed and not amount prepared should be recorded. Also, even though some of the household may have had a portion of their meals elsewhere for the day of the recall you need not be concerned. This factor will be corrected according to the information you record on Dietary Form No. 1. Columns 33-36, MEALS EATEN YESTERDAY.

In helping the respondent recall amounts, keep in mind that pets may consume significant amounts of leftover food. Amount of leftover subtracted from amount prepared may not be amount consumed by the household. Keep this in mind where there are pets.

It is necessary to remind the respondent that you are interested in yesterday's intake not in what usually is consumed. During the interview it will be helpful to use various household member's names in probing for intake such as, "did Johnnie have anything to eat or drink when he came home from school yesterday?"

When taking the recall it is usually easier for the respondent to tell you the menu or name the dishes eaten and then have you ask afterward what ingredients were used to make the dish. Sometimes stopping for details of the recipe becomes confusing.

It is necessary to record accurately whether an item is RAW or COOKED so that the appropriate code number can be assigned. At the end of the recall you may find it helpful to read it back and ask if there was anything forgotten, candy, cocktails, etc.

Note in REMARKS if faddism, serious feeding problems, drastic deviations from normal, etc. were observed.

Should the food and beverage consumed take more space than is allotted on Dietary Form 3, attach a second sheet, being certain all identifying data is completed as on the first sheet.

REFER TO SECTION FOLLOWING THIS ON USE OF FOOD MODELS, RECORDING, AND CODING.

Column Number	Explanation	Code (if any)
Reading from left to right, across entire top of page.		
1-10	To be completed as explained for other forms.	
11-12	If recall is one Household insert 88. If an individual use line No. from Form 1.	
16-21	Complete as on other forms.	
22-23, 28	Complete if respondent is an aging individual. Leave blank if recall is for a household.	
77-80	Precoded for tabulation clerks only.	
63	Day of the week of recall.	01=Sunday 07=Saturday
64-65	Insert number assigned to you as a dietary interviewer.	
76	Fill in pertinent to completion.	Code on form
77	Circle appropriate sample type.	
78, 79, 80	Precoded for tabulation clerks only.	

Column Number	Explanation	Code (if any)
24	Ingestion period will be coded after the interview.	Code printed on the form.
25-29 30-44	The food consumed will be recorded in accordance with instructions in the following section, it is mandatory that food item be recorded accurately and concisely so that appropriate code numbers can be assigned later in accordance with Dietary Director's decision.	See section on Recording and Coding.
45-48	Time of day will not be tabulated. It is for assistance in arriving at ingestion period. Probing for exact minutes is not necessary.	8:00 A.M. 9:15 A.M. 12:00 noon etc.
22-26	If the 24-hour recall is being taken on a household these question will not be asked. If the respondent is 60 years of age or older, answer each question.	Circle answer.
74-75 77-80	For tabulation clerks use only.	Precoded

Dietary Form No. 3A

This is a replica of Form 3 with the exception of the pre-coded (for tabulation clerks only) information and question 22-26. Therefore, since it is a 24-hour recall form to be used with any pregnant and/or lactating females the same instructions should be followed as when taking a household or "aging" recall. For the questions, complete as follows:

Column Number	Explanation	Code (if any)
22	Note any change, quantitative or qualitative	Circle answer.
23	If more than one person told the respondent to make the change, circle the one that appears first, for example, suppose the doctor and a family member told respondent to make the change circle doctor.	Circle one answer.
24-25	List brand name if known. This will be for local use only and not tabulated.	Circle one answer.

26	If a nurse in a clinic has "routine orders" from the doctor that all pregnant women are to take a supplement, code as doctor prescribed.	Circle one answer.
27	If respondent is consuming more than one of the items listed, circle the one she consumes most frequently.	Circle one answer.
74-75, 77-80	Tabulation use only.	Precoded

XI DIETARY FORM NO. 4

Frequency

Purpose: To describe the usual pattern of food usage of selected food groups and of some individual items. The results can help determine how indicative the 24-hour recall was of the usual pattern.

Completion: To be completed on each dietary household in the first one-half of households.

Respondent: Will be completed with same respondent as for Forms 1, 2, and 3 - usually the homemaker.

Estimated time: 10 minutes.

General Instructions: This form is not a recall of the previous day. It is the usual frequency of usage. Insert numbers to indicate the number of times served and circle either D (daily), W (weekly), M (monthly), or Y (yearly). If never served insert zero. If respondent cannot supply answer, code 99 for "don't know."

Because of the format of this form, directions will (in general) be given according to item number rather than column number. Guidelines are given as each item appears in consecutive order.

ITEM	EXPLANATION
1	Milk - Frequency response is based on the number of times milk is served for cereal as well as beverage. Chocolate and other flavored milk drinks are included here.
2	Poultry - Fresh, frozen, canned.
3	Fish - Fresh, frozen, canned, or dried.
4	Mixed Meat, Fish, Poultry Dishes (Refer to food groups 15 of Alphabetized Food Group Table supplied each Dietary Director. This will refer to casserole-type mixed dishes.
5	Meats - Refers to all types such as pork, veal, beef if served as "meat" in contrast to a mixed dish. Include luncheon meats and meat used in sandwiches.
6	Eggs - Include eggs used in custards, puddings, etc.
7	Cheese and cheese dishes - souffles, cheese sandwiches, etc.
8	Soups and gravies - (Refer to food group 7 of above described food table. Exclude broth, bouillion and consomme without additional protein and/or carbohydrate.)

ITEM	EXPLANATION
9	All dried or matured peas, beans, nuts, including peanut butter.
10	Cereals and grain products - include all cereals, prepared or otherwise. Do not attempt to assess amounts. If at one meal both bread and rice served, consider this one time.
11 a	Fruits and Vegetables - High in Vitamin C. Refer to your state's list representing local selections for this category of foods. Items included contain 35 mg. or more of Vitamin C per average portion size appropriate to the individual item. Fresh, frozen, canned, dried juices.
11b	Vegetables high in Vitamin A - Refer to your state's list representing local selection for this category of foods. Items included contain 2500 I.U. or more of Vitamin A per average portion size appropriate to the individual item. Fresh, frozen, canned, dried juices.
12	Include all other fruits and vegetables - fresh, frozen, canned, dried, juices.
13	Pastries and other desserts - Include all types - milk desserts such as custards or ice cream, pies, cakes, sweet buns, etc.
14	Jams, jellies, candies - all types.
15	Sweetened beverages - cola type, kool-aids, bottled, canned, or home prepared. (a) Artificially sweetened - all types if sweetened artificially. (b) Coffee and/or tea. (c) Beer, ale, or homebrew (d) Wines (e) Whiskey, gin, vodka, rum - any highballs, cocktails, etc., using these.
16	Snack Foods - include usual "snack type" foods. An in-between meals piece of fruit or sandwich is not to be classifed as "snack food".

Column No.	EXPLANATION	Code (if any)
74	For tabulation clerk only	Precoded
77	For tabulation clerk only	Precoded
22-24	"Eating together" refers to eating at the same time - perhaps some may eat on T.V. trays - others at table, etc.	Circle one of the answers.
25-30	Meals out refers to meals eaten from a source other than the household. A lunch carried from him, eaten out, is NOT considered "out".	Insert actual numbers of persons
31-32	Fill in the total number of persons in the household as obtained from form no. 1. Do NOT include guests in this number	Insert actual number.
64-65	Insert number assigned to you as an interviewer.	Own coded number
74-75	For tabulation clerk only.	Precoded
76	Insert appropriate answer regarding completion of the form.	Code on form.
77-80	For tabulation clerk only.	Precoded

XII. DIETARY FORM NO. 5

(24-Hour Recall)

Purpose: This form is to determine the previous days total (food and beverage) intake, some general questions relative to food habits, and specific questions for any pregnant respondent who is in this age group. ALL FOOD AND BEVERAGE (regardless of source) SHOULD BE RECORDED.

Completion: This form is to be completed on:

1. All males 12 - 16 years of age.
2. All females 10 - 16 years of age.

Respondent: The boys and girls identified above. It is suggested that they be interviewed apart from the mother or "mother-figure" to avoid parental influence.

Refer to the specific preceding instructions for directions regarding the way to record and code food items. The instructions are the same for all 24-hour recall recording and coding.

Column Number	Explanation	Code (if any)
	(Reading left to right across top of the form.)	
1-15	Refer to previous instructions regarding coding identification. In most cases subject and respondent will be the same. Complete for both.	
16-20	Date of Recall (Not interview)	As previously
22-23	Insert age in years of respondent at last birthday	Actual years of age
28	To determine sex and pregnancy status	Circle as appropriate
77-80	For tabulation clerk only	Precoded
63	To determine day of week for which recall is made. NOT day of interview	1 = Sunday 7 = Saturday
64-65	Insert number assigned to you as a dietary interviewer	
76	Insert appropriate answer regarding form completion	Code is on form
77-80	For tabulation clerk only	Precoded

Column Number	Explanation	Code (if any)
24	This will be coded after you take recall and time. The ingestion period is used to indicate the general time at which food was consumed rather than assessing a name such as lunch, breakfast, supper, etc. If, for example, a respondent can only tell you what he ate but not approximate the time, code as "total day".	Code is printed at bottom of the form.
25-29	Each item consumed will be coded after the interview per Pre-arrangement of dietary director.	Master Dietant Form
	Food and Beverage Consumed - Record as accurately as can be determined what individual consumed.	Refer to specific preceding instruction.
	Work Area is for any computations you may wish to make.	
30-44	Record total food and beverage consumed.	Refer to Section on use of food models and recording and coding food and beverage intake that precedes this.
45-48	Time of Day. Record actual time. This necessary for later inserting. food ingestion code.	Ex. 11:30 A.M. 12:00 Noon

Column Number	Explanation	Code (if any)
49	Source of food. H = Home Supplies (including packed lunches) Sc = Any school meal (include day camp) regardless of method of payment. W = Work performed for food (exclude school meals) P = Self purchased exclusive of school lunch. Does include vending machine items at school. O = Other	Circle only one. Code appears on form.
	(Questions at right hand side of page --)	
22	(1) School Attendance	Circle one answer
23	(2) Lunch program refers to any organized type of lunch program. Canteen type or vending machine type service is not considered a lunch program.	
24	(3) Employed is interpreted as the respondent receives money for service performed. Full time-35 hrs. or more/wk.	Circle on answer.
25	(4) Usual pattern.	Circle one answer.
26	(5) If subject is eating more than one non-food item such as those listed, determine which he eats most frequently.	Circle one answer.
27-28-29	(6,7,8) Self explanatory	Circle one answer.
30-31	(9&10) Are to be answered if the respondent is pregnant.	Circle only one answer for each.
64-65	Insert number assigned to you.	
76	Complete using code appearing on form.	
77-80	For tabulation clerks only	Precoded

XIII. DIETARY FORM NO. 6
(0-36 mos.)

Purpose: To determine the previous day's intake as well as some general data pertinent to early food habits of the subject.

Completion: To be completed on all males and females 0-36 mos. of age who are in the first 1/2 of the households. (Subjects 37 mos. of age and over excluded). See general guide lines for setting priority if there is more than one infant in this age group.

Respondent: The person responding for the household; probably the homemaker or mother.

Column Number	Explanation	Code (if any)
1-10	Refer to previous instructions.	
11-12	This will be line number for subject on whom recall is taken.	
13	Assign same dietary code as for family even if infant is breast fed.	
14-15	Respondent will usually be the mother.	
16-23	Per previous instruction.	
24-27	Insert age of subject.	Mos. 01-12 Days 01-31
28	Sex of subject.	Circle one
77-79	Tabulation Clerk use only.	
80	Insert appropriate vitamin/mineral code from Page 2, Question 5	Code is on form.
63	Day of Week-To determine day of week for which recall is made, NOT day of interview.	
64-65	Insert number assigned to you as interviewer	
76	After interview, insert appropriate code.	Code on form
77-79	Tabulation Clerk Use only.	
80	Insert vitamin/mineral code again.	

Part A

22-23	For breast fed infants.	Circle 00 or write in appropriate no.
24	For breast fed infants.	Circle one answer
25-26	For bottle fed infants.	Circle 00 or write in number.

Column Number	Explanation	Code (if any)
27	For bottle fed infants.	Circle one answer
28	For use relative to dry skim milk "Donated" = "Commodity"	Circle one answer

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Part B

This section of the form is to record yesterdays intake of all formula or milk consumed from a bottle. (Any other milk from cup or glass is recorded in Part C.) Occasionally the mother may use part of this on the infant's cereal. It is not necessary to separate this from the calculation. Assume it was consumed from bottle.

24	Ingestion period	Pre-coded
25-29	Food Item Code - The most common formula items are pre-coded.	Circle one
		or
	If the item used is not pre-coded, each item consumed will be coded after the interview per pre-arrangement of dietary director.	Master Dietant Form
	Formula Item - Record as accurately as can be determined what was used to prepare the formula.	
	Work Area - Used for computations to determine the total volume of formula and what the infant consumed.	Refer to example for specific instructions
30-34	Record number of units of the item. This shall always be a numerical entry.	
35-39	Record the unit such as cup, ounce, gram, or designated food model letter (appearing on model). This shall always be an alphabetic entry.	
40-44	TO BE USED ONLY IF PART OF FORMULA IS CONSUMED.	

Specific Instructions:

First: Determine type of milk used. If this was a commercial formula of any type, write in brand name. (If the brand used is not listed in the Master Dietant File, the Coder should contact Gloria Hankins for code number and procedure relative to nutrients). Once brand has been determined proceed as follows, see diagram:

Under Work Area:

(a) Write in total amount milk used to mix formula by the circled type of milk used, e.g. used 1 can evaporated of 14 1/2 oz. size.

(b) By water, write in water used, e.g. added same amount of water as milk.

(c) Write in the amount of sugar, sirup, or other additions by the circled type of additive used in formula, e.g. used 2 TB. sugar.

(d) By total formula, sum the formula volume.

Note: Sugar, sirup, or other additive is not totalled in with total volume.

(e) Fill in Col. 30-34 and 35-39 as shown in diagram. This may be completed at the office.

Note: Water and total volume are not recorded for processing in these columns.

(f) You previously recorded in Part A, the number of bottles the baby took. Ask at this point if baby consumed all of the formula.

1. If the answer is yes, continue to Part C of form.

2. If answer is no, inquire how much he took from each bottle.

Example:
1 bottle - 6 oz.
1 bottle - 3 oz.
1 bottle - 6 oz.
1 bottle - 4 oz.
1 bottle - 4 oz.
Total: 23 oz.

This may be computed in work area as shown in diagram. We see that the baby consumed 23 oz. of the 29 oz. prepared. To arrive at the percent consumed, compute as follows:

$$\frac{\text{Amount consumed}}{\text{Total formula volume}} = \text{percent consumed}$$

For this example: $\frac{23}{29} = .79$

Since baby consumed .79, complete column 40-44 as shown in diagram. This will indicate to the computer to calculate 79% of the 14.5 oz. of milk and 79% of the 2 tablespoons of sugar for nutrient determinations.

Computation of total oz. baby consumed and percent consumed may be completed at the office.

DIAGRAM

Formula Item	Work Area		Amount Prepared		Amount Consumed if less than Total
			I	II	III
			30-34	35-39	40-44
Milk Fresh Whole		.79			
		29 23.00			
Evaporated	14.5 oz.	203	14.5	oz.	X.79
		270			
Condensed	1-6 oz.	261			
	1-3 oz.				
Dry Skim	1-6 oz.				
	1-4 oz.				
Commercial Formula	1-4 oz.				
	23 oz.				
Water	14.5 oz.				
TOTAL FORMULA VOLUME	29 oz.				
Sugar	2 TB.		2	TB.	X.79
Sirup, Corn					
Other (specify)					

Part C

Part C will be used to record all food and beverage consumed yesterday other than that taken from the bottle.

Column Number	Explanation	Code (if any)
24-48	Recall for the household or other individual 24-hour recall. To be completed exactly as explained. Refer to 24-HOUR RECALL RECORDING PROCEDURES.	
49	T=Table Food. Baby eats from regular table source that others used. H=Home Prepared - especially for the baby. B=Baby Food - Commercially prepared. J=Junior Food - Commercially prepared.	Circle only one. Code appears on form.

Note: It is not necessary to record brand name of commercially prepared foods.

Top of page, left to right, complete as described for page one.

Middle portion of page provides additional space for recall if needed.

Column Number	Explanation	Code (if any)
29	(3) To determine if the recall day was a typical one.	Circle one answer.
	(4) This will be filled in for local use only. Individual surveys can tally and use as desired.	
	(5) Brand name is for local use only, as described above.	Circle answer and transfer to top of page one, both columns 80.
30	Refers to the vitamin/mineral supplement.	Circle one answer
31-46	These are all self-explanatory	Where indicated record actual age and circle either D W M Y. Circle 99 for not yet.
74-75	Tabulation clerk use only.	
76	Insert appropriate answer.	Code on form.
77-80	Tabulation clerk use only.	

MALNUTRITION AT HOME AND ABROAD

The results of nutrition surveys abroad and their significance to programs for the alleviation of malnutrition in the United States.

I. The Problem.
II. The Facts.
III. Recommendations.
IV. Appendix.

ICNND[1] NUTRITION SURVEYS AND REPORTS

Country	Date survey initiated	Final report available
1. Iran	January 1956	August 1956.
2. Pakistan	do	September 1956.
3. Korea	June 1956	April 1957.
4. The Philippines	February 1957	November 1957.
5. Turkey	April 1957	April 1958.
6. Libya	June 1957	December 1957.
Alaska	February 1958	August 1959.
7. Spain	April 1958	November 1958.
8. Ethiopia	September 1958	September 1959.
9. Peru	April 1959	December 1959.
10. Ecuador	July 1959	July 1960.
11. Vietnam	October 1959	October 1960.
12. Chile	March 1960	August 1961.
13. Colombia	May 1960	December 1961.
14. Taiwan	September 1960	Do.
15. Thailand	October 1960	February 1962.
16. Lebanon	February 1961	May 1962.
17. West Indies	August 1961	June 1962.
American Indians	do	December 1964.
18. Burma	October 1961	May 1963.
19. Uruguay	March 1962	Do.
20. Jordan	April 1962	Do.
21. Bolivia	May 1962	June 1964.
22. Malaya	September 1962	September 1964.
23. East Pakistan	March 1962	May 1966.
24. Brazil (Northeast)	March 1963	May 1965.
25. Venezuela	May 1963	June 1964.
26. Nigeria	February 1965	March 1967.
27. Guatemala	do	
28. Paraguay	June 1965	
29. El Salvador	September 1965	
30. Nicaragua	January 1966	
31. Costa Rica	April 1966	
32. Honduras	September 1966	
33. Panama	January 1967	

[1] Effective July 1, 1965, ICNND became Nutrition Section, Office of International Research, National Institutes of Health and on Aug. 1, 1967, the official designation was changed to Nutrition Program, National Center for Chronic Disease Control Bureau of Disease Prevention and Environmental Control, Public Health Service, Bethesda, Md.

THE PROBLEM

Malnutrition and hunger have been found to be widespread in the United States and comparable in extent and seriousness to conditions that exist in many underdeveloped countries. The resources that were developed to deal with the problems of malnutrition in foreign countries and the lessons that were learned in these programs are applicable to the situation in the United States. Congressional action is needed to define responsibilities and to appropriate funds for the necessary programs. While malnutrition in underdeveloped countries may take many years to correct, a similar condition in the United States is intolerable, and should be promptly eliminated.

THE FACTS

1. *ICNND program.*—Since 1955 nutrition health surveys, including medical biochemical, dietary examination, and the evaluation of local resources for food production, processing, and distribution, have been completed in 33 countries. These surveys were started under the auspices of the Interdepartmental Committee on Nutrition for National Defense and more recently have been continued by its successor organization, the Nutrition Program of the Public Health Service. The primary objectives of the surveys were to define major problems of malnutrition and to develop practical recommendations for self-help. The in-

dividual countries participated in the conduct of the surveys and, with some assistance, have carried most of the responsibility for corrective measures.

2. *Survey results.*—Serious conditions of malnutrition have been found in large population groups in all the countries that were surveyed. The general picture is one of multiple deficiencies of vitamins, Calories, and proteins. The most common and striking result is retardation of the growth rate of children beginning at the age of six months. Widespread deficiencies have been observed in vitamin A, riboflavin, and thiamine. Anemia, due to iron deficiency, is common and goiter also occurs widely throughout the world due to lack of iodine. Malnutrition is associated with and is intensified by bacterial infections and parasitism.

The principal sufferer is the youngest child in the family who is displaced from his mother's breast by the arrival of a new baby. The damage done to the weanling is apparently irreversible and affects his performance throughout life. Spacing of births with longer intervals between them would provide a tremendous improvement in nutrition as well as in other aspects of child development.

3. *Consequences of malnutrition.*—The consequences of malnutrition are incalculable. It is the leading cause of high infant mortality, a vital statistic that is shamefully high in the United States. The peace of the world and the stability of governments depend on a more equitable distribution of adequate food supplies. The strength of the armies of our allies rests upon the nourishment of their troops. Hunger and malnutrition reduce the productivity of labor and, in this way, retard economic development.

4. *Causes of malnutrition.*—The underlying causes of malnutrition are ignorance and poverty. The importance of education is emphasized by the fact that good nutrition is obtainable even with low incomes if a wise selection of foods is made. More specific causes of malnutrition include the priority that food receives in the family budget, competing expenditures for alcohol and other items, sanitary conditions in the home, inadequate facilities for storage and cooking, and food preferences not related to nutritional needs. Lack of motivation of the mother is a primary cause of malnutrition in cases where she is either not aware of the importance of the problem or does not know that her attention and effort can bring about meaningful improvements.

In countries where diets are based largely on cereals, low thiamine intakes are usually associated with the use of polished rice and refined wheat flour. Inadequate riboflavin is frequently observed in diets that are low in animal products. Deficiencies in both of these vitamins can be remedied at a low cost by the enrichment of rice and wheat flour. Vitamins A and C can be provided in adequate amounts by increasing the consumption of certain fresh fruits and vegetables. The solution of the problem of protein malnutrition lies in determining a number of sources of well-balanced protein which need not be of animal origin. Iodization of salt is frequently the most practicable measure for combating goiter. Further research is needed on the causes and treatment of nutritional anemia.

5. *Overseas recommendations.*—Recommendations that have been made to the participating governments include: (1) Measures to increase the supply of fish and animal products, (2) Enrichment of rice and wheat flour, (3) Iodization of salt where feasible, (4) Increased consumption of fruits and leafy green and yellow vegetables. Stress has been laid on the need for nutrition education, directed to teachers in the primary and secondary schools, workers in the field of health, home economics and agriculture, and above all to the mothers through maternal and child health clinics. Instruction in home gardening and in practical methods of home preservation of foods has also been urged.

Recommendations for improving the food supply have related to modifications in agricultural production and industrial food processing, and the storage, distribution, and marketing of foods. An important contribution of food technology to nutritional status can be obtained by the development of protein supplements in forms that are inexpensive and acceptable. In all developing countries there is a need for establishing food science laboratories in view of the key role of food science in improving the nutritional value of foods and sanitary practices in food handling.

Governments have been urged to emphasize food crops sometimes at the expense of cash crops, better utilization of local resources which bring about country development has been stressed, locating new industry in villages rather than relocating villagers in the cities has been attempted as far as possible and in addition small farmers have been encouraged to have salable surpluses so that essential food crops for the family unit can also represent cash crops.

The recommended programs for nutritional improvement have called for the participation of many people of diverse specialities. Above all, the government departments of Agriculture, Health, Education, and Welfare must each have a vital interest in nutrition and must be willing to work together. Governments have been urged to establish National Food and Nutrition Committees with the function of coordinating a comprehensive program for the elimination of hunger and malnutrition.

6. *Followup activities.*—Since the beginning of its program the ICNND (now the U.S. Nutrition Program) has exerted a continuing influence in the 33 countries where the surveys have been conducted. Nutritional activities were assisted because a cadre of workers was trained during the surveys and the laboratory equipment was left behind after the surveys. Periodic follow-up visits have been made to the countries for discussions of nutrition problems with scientists and government officials. Numerous research projects have been given modest financial support and arrangements have been made for the training of foreign nutritional scientists in American institutions. The U.S. Nutrition Program has also organized and supported a number of regional nutritional symposia with technical representatives from all the countries in major regions.

The U.S. Nutrition Program is frequently called upon to give advice and assistance to the Agency for International Development and to the United Nations agencies. The consultants to the U.S. Nutrition Program have constituted a man-power pool from which the above agencies have drawn most of the key technical personnel in their food and nutrition programs.

More recently, the U.S. Nutrition Program has sent reconnaissance teams to Peru, South Korea, and the Philippines to determine the feasibility of organizing comprehensive food and nutrition programs with partial U.S. support. The Republic of the Philippines was the first country to institute such a program involving participation of various government departments and the appointment of a leading U.S. nutritional scientist as advisor to the Director of the U.S. Mission.

7. *Post-survey progress.*—Since the completion of the surveys, great progress has been made in many of the countries. Some examples of outstanding achievements will be cited here, although a more detailed listing can be found in the Appendix. Programs to combat goiter through the iodization of salt have been set up in a number of South and Central American countries and in Taiwan. In Columbia the incidence of goiter has fallen from forty two percent in 1960 to less than five percent in 1965. Vitamin A is now added to all shipments of nonfat milk powder going to northeastern Brazil. A test, conducted in Jordan, has shown that a stable form of Vitamin A can be added to wheat flour with the effect of reducing the incidence of blindness caused by Vitamin A deficiency. A successful research project in Jordan has demonstrated the necessity for trace amounts of chromium in the diets of children receiving hospital treatment for protein-Calorie deficiency. Since this discovery, the usual high mortality of children in kwashiorkor clinics has been practically eliminated. A strong research and training program in nutritional sciences has been established in the American University of Beirut in collaboration with Columbia University. A research and training program in food science has been set up in the College of Agriculture in the Philippines in collaboration with Cornell University and with support from the Ford Foundation and the Agency for International Development. As a result of survey findings, Pakistan has modified its five-year plan for agricultural production to increase the amount of legumes to be produced. Nutrition institutes in both East and West Pakistan have also been established.

8. *Lessons learned in international nutrition programs.*—During the time that nutrition surveys were being conducted abroad, little attention was paid to the incidence of hunger and malnutrition in the United States. Funds are now available to support surveys in this country and the first two, in Louisiana and Texas, are nearing completion. Although the results have not been completely tabulated and analyzed, it is clear that malnutrition exists in the United States to a shocking extent. Many of the lessons that have been learned abroad can be applied to the shaping of programs in the United States.

We now know that the weanling child constitutes the most vulnerable population group. In spite of their great value, too much reliance should not be placed on school lunch programs, which do not begin until after irreparable damage may have been done to the preschool child. The interrelations between nutrition and birth control, and nutrition and sanitation suggest the need for

coordinating the work in these three areas of public health. Success in improving the health of infants and small children will depend on reaching the mothers and gaining their active interest.

Measures to combat malnutrition must be based on a knowledge of food patterns and attitudes related to foods. For example, programs abroad have emphasized the development of high protein foods based on plant products. Where these appear to be upgraded animal feeds, they have found limited acceptance. In the United States, where milk is available and its value in child feeding widely recognized, great caution should be exercised in trying to introduce substitutes.

It has become clear that nutrition programs must be tailored to fit the specific conditions that are reported in the surveys. Corrective measures will differ in urban and rural areas, among different ethnic groups and in different geographical parts of the country.

There is a need for research and demonstration to determine the most effective methods of disseminating information and to develop food products tailored to special needs. For example, much remains to be learned about ways of incorporating iron in the diet.

Since malnutrition occurs in the presence of bumper crops, it is not basically an agricultural problem. Alleviation of malnutrition will not be brought about by a general increase in agricultural production but rather by a selective increase in the production of certain products, coupled with an educational program to increase their acceptance and consumption by the public. Such measures as increasing the protein content of staple crops could be of tremendous nutritional significance. Improvements in agricultural (and marketing) efficiency that would lead to price reductions would aid the lower income groups in getting balanced diets. Incidentally, it must be recognized that government price-support programs, while benefiting farmers, are a handicap to low-income consumers. Perhaps the fair solution to this problem will depend on some form of food subsidy for low-income citizens.

Since malnutrition is a health problem and not primarily an agricultural problem, the responsibility for a national nutrition program should be assigned to the Department of Health, Education, and Welfare. At first glance, it might appear that since food is needed, the Department of Agriculture should determine what foods should be provided. However, when the Department of Agriculture makes the decision, experience has shown that the foods supplied are those in surplus and are not necessarily the foods which are most needed.

The goal of nutrition is the improvement of health and the responsibility for coordinating the national program should be placed with the Department of Health. This can be done without lessening the valuable contributions that Agriculture is making in such programs as food and school lunches.

Above all, it is clear that a broad, coordinated approach has to be made to the problem of malnutrition. The homemaker must be taught and assisted, not only in feeding her family, but also in home sanitation and in controlling the frequency of births.

RECOMMENDATIONS

In view of the extent and seriousness of malnutrition in the United States, it is recommended that a National Nutrition Center be established in the Department of Health, Education, and Welfare. The Center should be the agency to deal with all problems related to nutrition and health in which the United States Government is involved.

It should be divided into two major branches, one concerned with domestic problems and the other concerned with international nutrition programs, giving technical support to the Department of State (AID), Department of Agriculture, Department of Defense, and other Government agencies involved with overseas nutrition programs. The branch for domestic programs should establish liaison with the fifty states so as to give them technical support and advice and to assist them scientifically and financially with the development of respective state programs.

In view of the multidisciplinary character of the problem of malnutrition, an Interdepartmental Steering Committee for Nutrition in National Welfare should be established. It should be administered by a highly ranked officer in the Executive Department with sufficient authority to command the cooperation of the separate Government departments in a unified and comprehensive national program for the elimination of malnutrition.

APPENDIX

Subject: Followup programs and progress following the ICNND nutrition surveys.

I. Near East

Iran.—Within six months after completion of the Iranian nutrition survey in 1956, the Shahi canning plant was reopened for the purpose of processing meat and vegetable products initially for a field ration. Since then the Government of Iran, in cooperation with private industry, has established numerous food processing plants throughout the country. Food standards and quality inspection were established by the Veterinary Corps. In addition to the Armed Forces Nutrition Institute, a Public Health Nutrition Institute was established. These two research and training institutions are conducting research, applied demonstration programs and training of nutrition personnel to serve throughout the country. In the late fifties through the support of the Armed Forces, a modern poultry production industry was established. By improving the nutritional value of the Armed Forces ration, the training day for the troops was lengthened from four hours, imposed by inadequate nutrition, to a full eight-hour training day.

In 1965, a joint collaborative research project directed towards a study on growth and development of pre-school children and an investigation of trace minerals requirements in the Shiraz area was established by the Nutrition Program in collaboration with Dr. James A. Halsted of the U.S. Veterans Administration, the Food and Drug Administration and special consultants from university staffs of the United States. In 1965, the research and demonstration project which involved village studies was supported primarily from U.S. funds and during the past year more than half of this support was obtained from the Iranian Government. It has stimulated the establishment of a United States-Iran science program. Numerous Iranian students from the Armed Forces and from civilian universities who have received training in nutrition and allied health sciences are now actively directing the nutrition research programs in Iran. The cost of training these students was borne primarily by the Government of Iran with the Nutrition Program assisting in placing students in U.S. universities in developing their curricula for graduate training and, where needed, assisted them in obtaining scholarships and fellowships. Without fail, each trainee has returned to Iran and is actively engaged in the field of his training.

Pakistan.—As a result of the stimulus of the 1956 survey of the Pakistanian Armed Forces, the Government of Pakistan requested assistance from the ICNND to train local personnel in conducting an extensive nutrition health assessment study in both East Pakistan and West Pakistan. This was accomplished through a Public Law 480 grant thru NIH. The survey of nutritional status in East Pakistan was conducted over a 2½ year period and included over 25,000 people. The findings which revealed serious problems as regards protein and vitamin A malnutrition in children were immediately reported to the food planning council of Pakistan. It was on the basis of these findings and recommendations that the five year agriculture program was immediately revised to place high priority on increasing the production of legumes and also to encourage additional production and consumption of green and yellow vegetables and fruits as a source of vitamin A. Based on the local food habits, customs, and foods available, educational material was prepared for use by village extension, education and health center personnel for educating the population on proper child care health and feeding. A simple film on proper feeding of East Pakistinian children was developed and was made available for showing with similar type films on family planning. As a direct result of the nutrition survey program in East Pakistan an institute of nutrition was established in conjunction with the Department of Biochemistry at Dacca University. For the first time, an opportunity was created for medical students to do biochemical clinical research on major nutrition health problems in East Pakistan. Currently over 20 graduate students are participating in nutrition research projects in this department. Based on East Pakistan nutrition problems, a series of lecture and curricula guides were developed for incorporation into the curriculum for medical students at the university.

The Federal Government also established in 1963 a nutrition laboratory as part of the National Health Laboratory at Islamabad in West Pakistan. The first assignment was to conduct a similar comprehensive nutrition survey of the population in West Pakistan. This study was completed in 1967. Again, its findings were instrumental in developing long-range programs for combatting malnutrition through village aid programs and work is progressing on the develop-

ment of special food supplements for pre-school child feeding based on local indigenous foods. Although there is still much to be done to overcome the nutrition problems in both East and West Pakistan, much progress has been made from virtually a zero state. Much credit must go to President Ayub Khan and his energetic Directors General of Health who have, in the past ten years, consistently supported and encouraged programs in improving the nutrition of the general population. Currently, steps are under way to establish one or two pilot demonstration community projects directed toward combatting malnutrition, in combination with programs on family planning.

The University of Dacca Nutrition Institute has recently been selected to serve as the central communication center for nutrition information and programs for the "Far East." This recommendation evolved from the Third Far East Nutrition conference which was held in the Philippines in 1967.

Lebanon.—The nutrition survey in Lebanon was conducted in 1961. Following the survey, a nutrition research program was established at the American University at Beirut. Dr. Calvin W. Woodruff, formerly from Vanderbilt University and a member of the ICNND nutrition survey of Ethiopia accepted the position as Chairman of Pediatrics with initiation of special programs in the field of infant nutrition. In addition, a contract was awarded by NIH to Columbia University to further assist in establishing a joint training program for nutrition personnel between Columbia University and the American University of Beirut. Numerous research findings have been reported in the field of vitamin A deficiency, goiter and Kwashiorkor in children. Also a food composition table for Lebanon was prepared and a formulated infant food was developed, tested and is now being commercially produced.

Since part of the survey was directed toward the refugee population, improvements in the ration allowance and feeding procedures for feeding refugees were made in collaboration with UNRA. It has also been since this time that the Near East Medical Conference has systematically devoted a large portion of their annual program to nutrition. Personnel from the American University at Beirut have also been involved in a collaborative nutrition research project conducted in the near east area by WHO on vitamin A deficiency and anemia.

Jordan.—Following the nutrition survey in 1962 the Jordanian members of this survey conducted a longitudinal study of the nutritional status of over 1,000 preschool children with special emphasis on problems related to growth, retardation, anemia and vitamin A deficiency. These findings were reported in the Journal of Tropical Pediatrics I–III, December 1965. The Jordanian Government, at the time the survey was conducted, established an interdepartmental Committee on Nutrition for Jordan. This committee has continued to function as a central focal Government agency to formulate nutrition policy for the Government. They, in turn, funded the survey of preschool children, established a Department of Nutrition in the Ministry of Health, supported training of three key nutritionists to staff this department, collaborated with WHO on the vitamin deficiency and blindness study in Jordan, and instituted broad nutrition education programs for mothers through their maternal and child health clinics. Following the pre-school child survey, a special research project was established former Minister of Health, Dr. Majaj at Queen Victoria Hospital to study the etiology, causes and preventive measures for the severe malnutrition afflicting infants found predominantly in the refugee camps. This research was instrumental in discovering that a large number of kwashiorkor infants, although properly renourished regarding protein, failed to recover and died due to hypoglycemia, and this could be prevented by the administration of the trace element chromium. This discovery has virtually eliminated the high mortality of hospitalized severely malnourished infants.

In conjunction with support from AID a test pilot project was established to evaluate the effectiveness in adding stable vitamin A wheat flour as a possible means of combatting the serious vitamin A problem in Jordan. This project is currently under way and if successful the Government of Jordan has indicated its willingness to underwrite the cost of enrichment of all flour in Jordan. The ICNND furnished the technical specialists to assist in establishing the food standards and procedures for flour enrichment.

II. Far East

Korea.—Since the nutrition survey in Korea in 1956, the Government of Korea has conducted numerous additional nutrition surveys in the civilian population, has sent numerous students to the United States for additional training in biochemistry and clinical nutrition and food technology. The excellent progress in

improving not only food production but the nutritional health of their population has been an outstanding example of applying improved practices in the field of nutrition. It is especially noteworthy to observe the comprehensive programs which include a nutrition, control of infectious diseases, and family planning which were initiated simultaneously. The success of these programs is documented in reduction of infant mortality, reduction in rate of population growth and the improvel nutritional status of the civilian population.

Taiwan.—A resurvey of the nutritional status of the Taiwanese Armed Forces in 1960 revealed considerable improvement in the nutritional status of their troops in comparison to that found in the first survey conducted by the U.S. Army Surgeon General's office in 1954. Taiwan has made tremendous strides in improving nutrition through a comprehensive approach which involved nutrition training, research, education, and close coordination with food production and processing. For an island that has had the largest population explosion in the world, increasing from 3.7 million to over 10 million in the period 1947–1964, a truly dramatic improvement in nutrition health of the population occurred. During the same period, food production increased dramatically so that by 1964 Taiwan became a food exporting country, while at the same time improving both quality and quantity of their own diet. Again, this was accomplished by close coordination and cooperation among the Ministeries of Agriculture, Industry, Health, Finance, and Education. Likewise, their investment in training youth in the many disciplines necessary for both economic and social development including nutrition and health has paid off. Currently there are numerous research projects which have significance not only to Taiwan but to the world which were initially stimulated by small research grants supported by the ICNND. These projects have dealt with a study of the relationship of nutrition to infectious diseases, the relationship of maternal nutrition to child growth and development, and eradication of goiter through iodization of salt and clinical evaluation of the protein supplements as a substitute for milk for feeding infants and preschool children. Currently, these projects are supported primarily from Taiwan funds and are being conducted in collaboration with the Naval Medical Research Unit #2 at Tapei.

Philippines.—Since the initial survey in the Philippines in 1957, progress in the field of improvement of nutrition and health has continued to move forward at a greater and greater pace. The Philippines Institute of Nutrition which served as the key supporting group of the original survey is truly one of the outstanding active nutrition institutes in the world. They have directed the majority of their efforts to developing community action programs throughout the islands in nutrition, education and consumer protection. Over fifty nutritionists have been trained overseas in nutrition with the majority of them back in active employment with the Government of the Philippines. The Institute has had an active role in food and health legislation for the Philippines. Applied nutrition programs are also supported by UNICEF, WHO, and FAO. The Philippines was the first country selected for the establishment of a comprehensive nutrition program to be supported jointly by U.S. AID and the Government of the Philippines. It was also the first foreign aid mission which has created a post of Special Nutrition Adviser to the Mission Director. Currently this post is held by an outstanding nutritionist, Dr. R. W. Engel, Associate Dean for Research, College of Agriculture, Virginia Polytechnic Institute.

In addition, an AID research grant was awarded to Cornell University Food Technology Department to establish, in conjunction with support from the Ford Foundation, a regional food technology training laboratory. Special research is being directed towards developing infant foods from local protein sources, especially coconut milk and soy products. Demonstration projects are being initiated in different areas of the islands which involve development of mother craft centers, community and school gardens which incorporate an active local education campaign on child care and feeding. These projects are demonstration training areas showing effective organization of community action programs for the entire region in the Far East. The Nutrition Program in conjunction with the Rice Institute which developed a high yielding strain of rice, is an example of the fact that nutrition improvement must rely on more than mere increased food production of a cereal crop to be effective in insuring and promoting adequate nutrition for the child and mother.

Vietnam.—Following the survey in 1959, a nutrition laboratory was established in the Ministry of Health. Practical nutrition education brochures were developed by the Vietnamese for use by midwives, the medical profession and teachers. The Armed Forces were especially alerted to the critical nature of the nutritional health of their combat forces. This, in turn, was relayed to the U.S. officials.

Recommendations for immediate supplementation of diet to avoid serious outbreaks of debilitating and even death-causing nutritional deficiencies were pointed up. In addition, recommendations were developed and made to indicate the feasibility of developing their own combat ration. Repeated conferences in 1960–62 with authorities were unsuccessful in pointing up the urgent need of (1) assuring that the combat force effectiveness would be greatly impaired unless properly fed, and (2) that an underfed, malnourished population could very well be hostile. This was neither appreciated nor implemented by the U.S. Mission and military personnel in charge.

Thailand.—Following the nutrition survey in Thailand, FAO and UNICEF supported the development of numerous education materials based on the food habits, customs and food availablity of the Thai. These were directed primarily toward combatting infant malnutrition. Numerous Thai students received additional training in the field of biochemistry, clinical nutrition and food technology. The Nutrition Institute of the Ministry of Health continued active programs in nutrition training, research and development of applied programs. In 1966, in conjunction with the University of Maryland and support through ARPA a combat ration was developed by the "Food Processing Organization" of Thailand. The personnel, plant and expertise which resulted from this project is now available and is currently working on the development of special infant food formulas directed primarily to the poor rural populations. Following the survey an NIH grant was awarded to Dr. Paul Gyorgy to assist in developing applied nutrition programs in villages and also to collaborate with the U.S. Nutrition Program, formerly ICNND, in studying the identification, cause and high incidence of bladder stones found in the northeast area of Thailand. The U.S. leader of the bladder stone project was Dr. Van Reen of the Naval Research Unit who also received a grant through the ICNND. It was just recently discovered that probably the predisposing cause of the high incidence of bladder stones is due to a phosphorous deficiency in the soils and food in this area. This finding may again have greater relevance to findings in other areas of the world where this is a major health problem.

In addition, NIH in conjunction with Rockefeller Foundation, is supporting the establishment of a clinical nutrition research unit at the new medical school in Cheng Mi. Prior to the establishment of this research unit, the University of Illinois, having the support of an AID contract for the medical school, initiated a study on the etiology of anemia in this area and substantiated the findings of the ICNND project in Jordan which indicated that vitamin E was essential for recovery of the severe anemia usually associated with Kwashiorkor in infants. The follow-up research projects supported by both ICNND and NIH have received great assistance from the U.S. Army SEATO Laboratory at Bangkok and the U.S. Army Medical Research and Nutrition Laboratory at Denver.

Burma.—Following the nutrition survey in 1961, a nutrition laboratory was established as a part of the school of public health and medical college in Rangoon. Two research projects were negotiated under an NIH PL 480 agreement. These projects are in essence the only collaborative U.S. projects active in Burma and are directed towards the anemia and goiter problems uncovered during the survey.

Malaysia.—Since the nutrition survey in 1962 the nutrition unit of the Institute of Medical Research has continued to work in the field of applied nutrition with special attention to problems of nutrition in pregnancy and the development of inexpensive protein food supplements with an extensive project investigating the contaminations of foods with aflatoxin. They are continuing a systematic surveillance study for detecting nutritional inadequacy.

Another key accomplishment of the surveys in the Far East has been the development of Far East Symposia on Nutrition which have been held in Saigon in 1962, Taiwan in 1965 and the Philippines in 1967. These symposia record the progress and problems that the countries have in nutrition and were attended by the ten countries listed above and, in addition by nutritionists from Indonesia, India, Australia and Japan. The progress and programs which have been initiated in these countries are more than can be summarized above and are given in the proceedings of the three Far East symposia.

III. Africa

Ethiopia.—The nutrition survey of Ethiopia was conducted in 1958 at a time in which there was one native Ethiopian doctor and one MS biochemist out of a total population of 20 million people. Nutrition as a science or as a health program was unheard of. Of all the countries that the ICNND had worked in and

considering their stage of development, in no country has it been more rewarding than here to see the tremendous progress in the field of nutrition and health improvement and the recognition of nutrition in proper feeding of children as an essential ingredient to social and economic development. No country to date has utilized the survey findings from the standpoint of agriculture production, technology, health and education to the extent that Ethiopia utilized the report for developing programs in all the areas mentioned. The ICNND was instrumental in assisting the training of over 15 specialists in the field of nutrition and health who, without exception, returned to Ethiopia and are now in key positions in colleges and Government. Although U.S. AID did not actively support the development of follow-up programs it was again greatly reassuring to see the influence that the survey report and our continued follow-up visits had in stimulating the Swedish Government to select Ethiopia as the one country for their major input in giving assistance to improve nutrition and health. Since 1961, the Swedish Government has invested approximately one-quarter million dollars annually in establishing a pediatrics nutrition group in Ethiopia to assist in developng and delivering nutrition services at the local level. In turn, they have developed local infant foods and are actively assisting the Ethiopian Ministry of Health and Agriculture in improving the nutritional status of the rural populations. In 1967, an ARPA grant was awarded to Ethiopia through the former ICNND Nutrition Program to assist in the development of field ration for Ethiopian Armed Forces, and at the same time to determine the capabilities of utilizing civilian processing plants for developing manufactured foods especially for the pre-school child.

IV. Central and South America

During the period 1959 to 1965, nutrition surveys were conducted in ten South American countries and since 1965 in all six of the Central American countries. In the ten South American countries laboratories, equipment and supplies were furnished to reinforce ongoing nutrition institutes in four countries and to establish a focal point for creation of nutrition institutes in the other six. In all ten countries an interdepartmental committee on nutrition with responsibility to coordinate and develop broad country programs on nutrition was established. Some of these have been more effective than others. Outstanding examples of effective coordinated programs have resulted in Colombia, Chile, West Indies, Peru and Uruguay. Seven of the countries have been actively engaged in developing special protein rich foods for infant feeding. Perhaps the most successful again being the program in Colombia in which a number of products currently on the market are reaching a fair number of the real needy population groups.

Programs to combat goiter through salt iodization have been implemented in Colombia, Chile and Uruguay with Colombia reducing the prevelance of goiter from 42% in 1960 to less than 5% in 1965. The Nutrition Program in conjunction with PAHO has initiated an experimental test study to determine the efficacy of injecting an iodine oil solution into all adolescent girls in the Andes regions of Peru and Ecuador where salt iodization is at the present time not feasible. Currently this appears to be an effective preventive measure.

All the countries have taken an active role in initiating programs to reach the mother and pre-school child. Prehaps the most effective programs to date are under way in Colombia and Chile. Colombia has invested her own funds in providing special nutrition training to each one of the health officers assigned to their major public health regions who, in turn, have been responsible for training nurses and village aid workers in applied nutrition education to reach the mother and pre-school child. The program to date can very well serve as a training facility for other countries desiring to truly launch a comprehensive public health nutrition program.

The University of Santiago in Chile has collaborated for the past five years in projects supported by the Nutrition Program through AID and NIH funds in developing infant formulas from high protein seeds and fish flour. The research group headed by Dr. Mockenberg recently reported on the dramatic findings regarding the influence of undernutrition in the 1–3 year old child as it influences growth and mental and neurological development. Their research has been greatly instrumental in convincing the Government authorities in Chile of the absolute necessity to take immediate steps to prevent the results of malnutrition in the pre-school child. Likewise, these data can serve in the same capacity throughout the world.

Follow-up research projects have continued or have been supported in many of the other countries: Ecuador, Peru, West Indies, Uruguay, Bolivia, Brazil and Venezuela. Just one example of key contributions to our knowledge was a study conducted in northeast Brazil to validate the efficacy of adding vitamin A to skim milk powder. This study clearly proved that vitamin A could be absorbed and utilized in a low fat diet in field conditions to prevent deficiencies, especially ocular lesions occurring in infants fed predominantly on skim milk powder without other sources of vitamin A. This study served as one of the instrumental findings in persuading the U.S. Department of Agriculture and AID to enrich all skim milk powder with vitamin A and D that was to be used for donation of food to the developing countries.

Central America.—The Central America surveys conducted during the period 1965–1967 were done in collaboration with PAHO and the Institute of Nutrition in Central American countries. Although these surveys have just recently been completed it is indeed rewarding to note the interest that has been stimulated by the Department of Health, Agriculture and Education and the key politicians in each one of the countries studied and to note that even prior to submission of the final report numerous action programs directed towards improving the nutritional status of their people has been undertaken. For example, it is for the first time now hopeful that iodization of salt will be implemented in the five countries that currently did not have salt iodization under way. Guatemala being the exception.

Secondly, three of the countries have already initiated the development of pre-kwashiorkor clinics which are directed towards demonstrating to the mother the necessity and the know-how of properly feeding the child so as to prevent development of kwashiorkor and that in many cases this can be done by better utilization of the local foods that are available and within her economic reach.

NUTRITION PROGRAM

Personnel for ICNND program

Over 500 U.S. scientists and technicians from 42 universities, 7 private foundations and 12 Government agencies have participated in the ICNND nutrition surveys and follow-up programs in 33 developing countries. Personnel were specialists in either medicine, dentistry, veterinary science, biochemistry, nutrition, food technology, and agriculture. In addition, 19 senior medical students participated in the surveys having an opportunity to receive training in nutrition assessment techniques and to learn first hand the opportunities in the field of public health and nutrition. In addition, 6 young physicians have served two years or longer on assignment with ICNND as part of their military obligations nutritional health research problems identified during the surveys in Pakistan, Egypt, Jordan and Guatemala.

Approximately 100 local scientists and technicians of the developing countries worked side by side with their U.S. counterparts in carrying out the surveys and in conducting follow-up programs.

To date, 22 of the countries have sent students for advance training in nutrition or related fields primarily to the United States through fellowships or scholarships supported by DoD, AID or HEW, or from local country funds.

National counsels or commissions on nutrition to direct and coordinate country nutrition programs have been established in 26 of the countries. Obviously, some have been more effective than others. Outstanding examples of active nutrition policy and planning groups are functioning in The Philippines, Thailand, Taiwan, Iran, Pakistan, Turkey, Ethiopia, Colombia, Chile, Bolivia, Peru and, recently, each of the Central American countries and Panama are actively engaged in organizing national nutrition commissions and also activating applied programs directed to combat child malnutrition.

Funding

Of the 33 country nutrition surveys, 25 were conducted during the period 1956–1964 at a cost of $4.7 million of which approximately $2.9 million was from the Department of Defense, the remainder being furnished primarily from National Institutes of Health. Since 1964, an additional 8 countries were surveyed and 7 nutrition research projects supported at an additional expenditure of $4.1 million with $2.9 million being furnished by the Advanced Research Projects Agency of the Department of Defense and the remainder by U.S. AID.

The CHAIRMAN. Thank you very much, Dr. Schaefer. I wonder if you would remain on. We are going to call Dr. McGanity. Could you stay with him for his testimony?

Dr. McGanity, we will be glad to hear from you at this time.

STATEMENT OF DR. WILLIAM J. McGANITY, CHAIRMAN, DEPARTMENT OF OBSTETRICS AND GYNECOLOGY, UNIVERSITY OF TEXAS MEDICAL BRANCH, GALVESTON, TEX., ACCOMPANIED BY DR. ARNOLD E. SCHAEFER, CHIEF, NUTRITION PROGRAM, DIVISION OF CHRONIC DISEASE PROGRAMS, REGIONAL MEDICAL PROGRAMS SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. McGANITY. Senator McGovern, it is indeed a pleasure to be with you this afternoon and report on what we consider an important segment of the national results.

If I might have some of the lights off, I would like to do this with a series of slides and bring your attention over to the screen.

In prefacing remarks I would like you to recall that our sample in Texas represents 4,500 of the 12,000 that Dr. Schaefer has reported.

You will also notice that in our data there are differences with some of the rates of the prevalence of the findings, however, the general pattern of our findings are not different from the national results.

Several questions have come up in this morning's discussion, and also this afternoon's, which possibly we can put into a bit of perspective in terms of some of our data.

At this particular point in time, we are utilizing the facilities of three computers in order to try to answer some of the questions in which I know that you gentlemen are vitally interested.

From a scientific point of view, the questions of age/sex relationships of the data are much more important, as the first step, than the economic considerations.

Yet, from your point of view, I think you would violently disagree with me.

This is an illustration in point.

I would also like to comment in introduction a bit about the team activities, because this to me was the real story of the Texas nutrition survey and its success.

Four thousand five hundred individuals did volunteer to participate in our survey. We stayed rigidly within the random sample. As a result of this, we in Texas will be able to do the types of projections, interpretations, conclusions, and recommendations that you are seeking.

I will report about 80 percent of our data. The Rio Grande Valley data, which was done in November, is in processing. I have some of this information, but not the complete data.

If you would direct your attention now to the map, figure 1, this is to indicate to you again the type of sampling that was involved.

There were 26 counties; 103 ED's; [1] and 50 individual communities.

I believe Senator Cook suggested this morning that this was primarily a rural sample. This is incorrect. It is primarily an urban sample.

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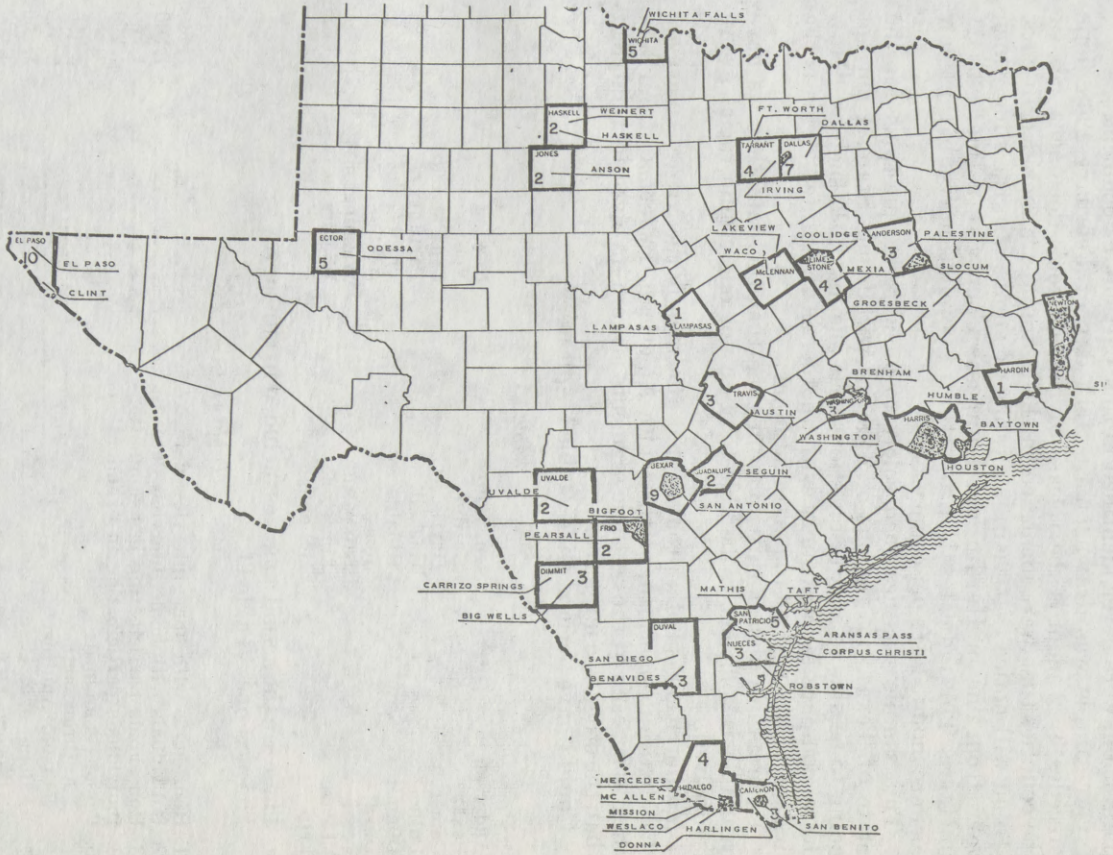
[1] Enumeration districts.


WICHITA FALLS
WICHITA
5
MASKELL
WEINERT
2
HASKELL
JONES
2
ANSON
FT. WORTH
DALLAS
TARRANT
DALLAS
4
7
IRVING
LAKEVIEW
COOLIDGE
ANDERSON
PALESTINE
3
WACO
LIMESTONE
MEXIA
SLOCUM
MCLENNAN
2
1
4
GROESBECK
EL PASO
10
EL PASO
CLINT
ECTOR
5
ODESSA
LAMPASAS
1
LAMPASAS
BRENHAM
HARDIN
1
TRAVIS
3
AUSTIN
HUMBLE
WASHINGTON
HARRIS
BAYTOWN
HOUSTON
UVALDE
UVALDE
2
BEXAR
9
GUADALUPE
2
SEGUIN
SAN ANTONIO
BIGFOOT
FRIO
PEARSALL
2
DIMMIT
3
CARRIZO SPRINGS
BIG WELLS
MATHIS
TAFT
SAN PATRICIO
5
ARANSAS PASS
NUECES
3
CORPUS CHRISTI
DUVAL
SAN DIEGO
BENAVIDES
3
ROBSTOWN
4
MERCEDES
HIDALGO
CAMERON
MC ALLEN
MISSION
WESLACO
HARLINGEN
SAN BENITO
DONNA

In the counties identified in "Hunger, U.S.A.," 30 of which were in the State of Texas, all of those were rural.

This is something that I would never understand, that our large metropolitan areas of our State, let alone several States elsewhere in the Nation, were never identified in that particular document.

Our sample was drawn on the 15th day of February 1968. This precedes by 2 months the release of that citizen's document. Six of the counties that were identified in their sample are included in ours.

You will notice that there is a range of numbers in the slide which vary from one in Hardin and Lampasas County to as many as 11 in Harris. This indicates the proportion of population risk in these low socio-economic ED's per county.

This sample was designed solely to answer the questions for the State of Texas, not regions or counties within our State. I am not going to be able to answer questions that one may ask, such as, "How do we compare in our county with another in the State?" This is the first question I will get tomorrow at home.

I can assure you at this point in time that the data that we have available is sufficient to be able to state not one ethnic racial group is involved.

Malnutrition is not a problem that affects only the Negro American, the Mexican American, or the white American. In terms of our biochemistry, each of those ethnic segments is more involved in a nutrient than the other two might be.

Could I have the next slide—table I—please.

Table I

Anderson	Guadalupe	Newton
Bexar	Hardin	Nueces
Cameron	Harris	San Patricio
Dallas	Haskell	Tarrant
Dimmit	Hidalgo	Travis
Duval	Jones	Uvalde
Ector	Lampasas	Washington
El Paso	Limestone	Wichita
Frio	McLennan	

These are the actual counties included in our survey.

The next one—Table II.

Table II

1. Households with home interview data	1,740
2. Individuals with home interview data	7,300
3. Households participating in examinations	1,250
4. Individuals participating in examinations	4,290
5. Persons examined:	
Anthropometric	4,150
Visual/Auditory	3,520
Bone age	1,560
Biochemistry	3,850
Medical history and physical	4,120
Reproductive history (female)	1,420
Dental	3,360
Dietary:	
(*a*) pattern	1,730
(*b*) recall	1,700
Socioeconomic (family data)	1,110

This indicates the number of individuals that are included. You can see that 1,740 families were entered in the study, encompassing 7,300 individuals. The average family size was 4.2 persons. This is above the national average of 3.7 persons per family.

Seventy-one percent of this preselected random sample volunteered to participate in all phases of the study. This was less than we had hoped for in the beginning, but I can assure you gentlemen it was a hard-earned 71 percent.

The individual examination measurements are listed. You will note that the anthropometric measurements, the medical and physical, the biochemical, the dental, have the greatest number of observations.

The socioeconomic data are on a family, not an individual, basis.

The next slide—table III—reveals that we have a range of $1,800 to $42,000 annual cash income in our population. Final figures revealed that 60 percent had less than $3,000 cash income per year. Eighty-four percent had less than $5,000. Twenty percent had less than $1,200.

TABLE III.—PERCENT/CASH INCOME/HOUSEHOLD SIZE

Number per household	Total	1	2	More than 2	Total
Number	995	169	199	627	995
Income per year	Percent	Percentage distribution			
Up to $1,200	20	49	17	34	100
$1,200 to $2,999	40	16	25	59	100
$3,000 to $4,999	24	5	15	80	100
$5,000 to $9,999	14	4	14	82	100
$10,000 and over	2	0	33	67	100
All categories	100	17	20	63	100

Notes:
(1) Range: $180 to $42,000 per year.
(2) 20 percent up to $1,200 per year.
(3) 60 percent up to $3,000 per year.
(4) Up to 2 percent $10,000 or more per year.
(5) 59 to 80 percent of families with $1,200 to $4,999 income had 3 or more members.

The intent of this table is to show the concentration of one- and two-person families in the less than $1,200 and the over 50 percent that are in the over $3,000 range with three or more person households.

The next slide—table IV—gives our employment pattern. Fifty percent of the male participants were fully employed last month as well as last year on a full-time basis.

TABLE IV

[In percent]

	Males	Females
Employed full time/full month or year	50	13
Employed part time/part month or year	13	14
Student	7	12
Primary homemaker	1	20
Retired	7	3
Ill or disabled	3	2
Not eligible (under age)	2	26
Work not available/other	7	3
Unknown	11	7

If one looks at only the eligible males, over 80 percent of all eligible males were employed in either a part-time or full-time capacity.

You can see from the slide that there were retired individuals, students, and underage individuals.

The female pattern is to the right, and as you would anticipate, major full-time employment is less.

The next slide (table V) gives the breakdown of our population, in the first column by E.D. (that is, the enumeration district) characteristics and then by the actual families participating.

TABLE V

[In percent]

	E.D.'s	Families
Mexican Americans	45	50
Negro Americans	38	35
Non-Latin white Americans	15	14
Mixed or other	2	1

You will note that they are relatively close by E.D. characteristics or by families.

The next slide (fig. 2)[1] is another means of representation of what Dr. Schaefer showed on the national data.

The growth curves represent for the zero to 5-year-old groups the pattern of growth by height and weight for boys, and in the next one (fig. 3) for girls our growth data pattern parallels very nicely that we were shown in the national survey data.

The lower line is the 16 percentile. Our pattern revealed in these groups, 6 to 9 months of growth retardation against the expected 50-percentile line.

The next two slides (figs. 4 and 5) put this in relative perspective, as compared with our Central American data.

The top line in both figures represents the 16 percentile. That is standard used in Central America. These growth curves first by height, and next by weight, indicates that in contrast to our 6 to 9 months growth retardation they have from 18 to 24 months growth retardation.

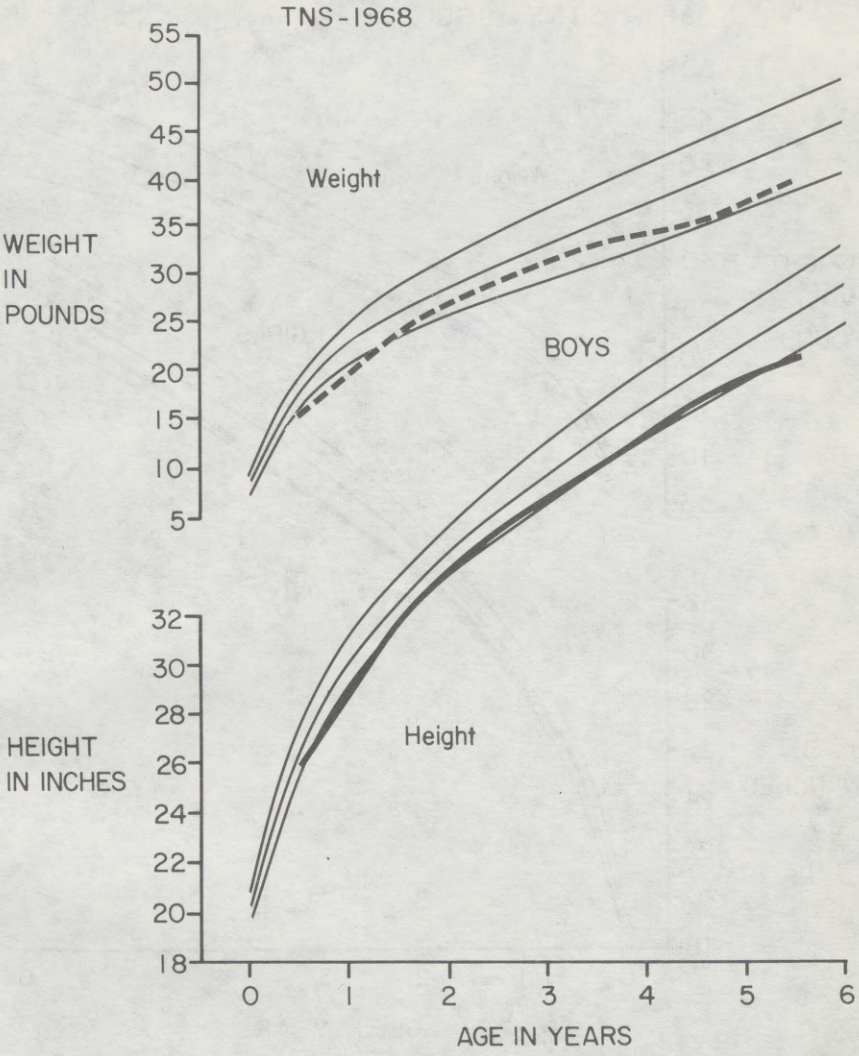
The next slide (fig. 6) illustrates a changing pattern, as children grow beyond the sixth year of life. They grow until they are 17 years in girls, 20 to 22 years in men. There is some improvement as they enter the school years to be noted.

The height is less so, but you will notice that the weight pattern has definitely changed, moving toward that 50-percentile line, so that at this point they are a little shorter (about the 40 percentile) but clearly at the 50 percentile for weight.

The next slide (fig. 7) for girls, showed the similar pattern through 17 years. From that point weight takes off. After we reach the age of 25, the reverse pattern occurs. There is an ever-increasing incidence of obesity, which is caloric excess, occurring beyond that age, particularly in the female.

The next slide begins the series of slides in which I would like to put physical lesions that we saw in this morning's movie into perspective as far as the examinations actually found in Texas.

[1] Figures on following pages.

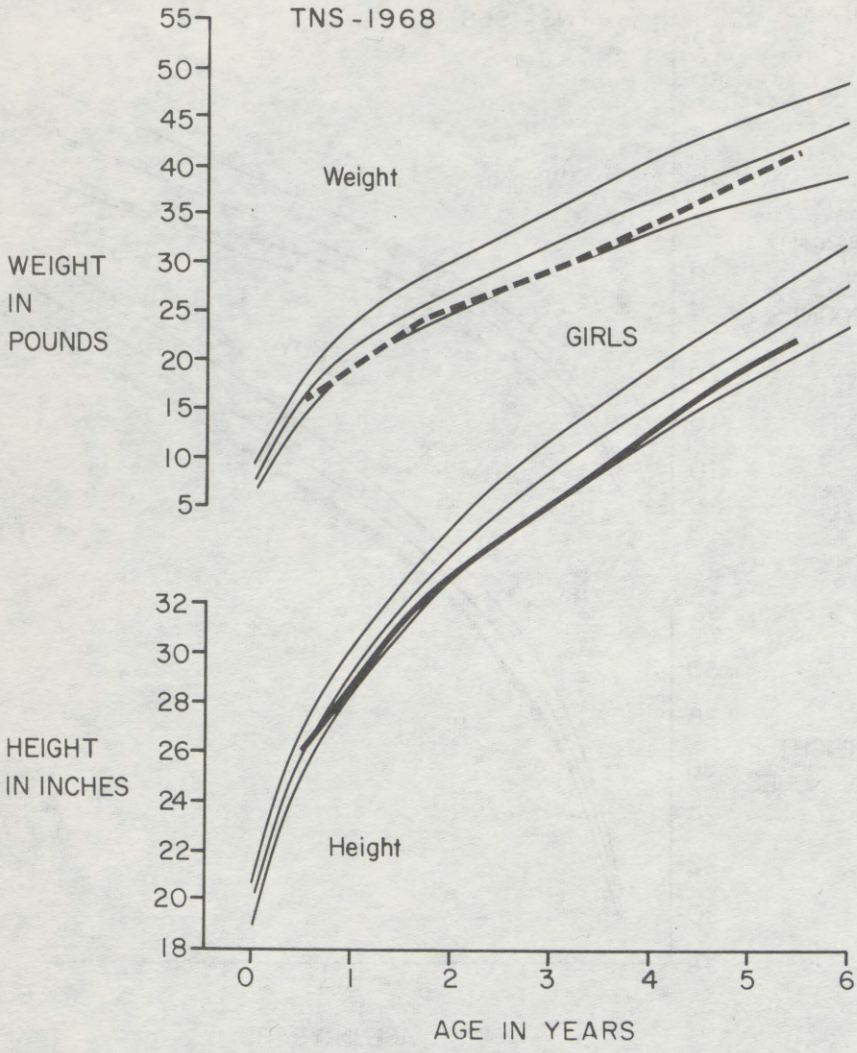


We had two of the seven cases of what might be called overt manifestations of starvation. We had a marasmic child, and we had a pre-kwashiorkor child. Neither one of which, parenthetically, were in the San Antonio area.

Both of these were situational in origin. In the one instance, an approximately 7- or 8-month-old child, the mother had lost her husband a few weeks after delivery, had undergone a very severe post partum depression, and had not used the facilities that were available in either health or welfare within her county in order to prevent this.

Senator ELLENDER. Why didn't she, Doctor?

Dr. MCGANITY. For the simple reason that she was staying housebound, essentially, letting her neighbors do her shopping, and it wasn't



until her children returned to school that the visiting nurse found out what was going on.

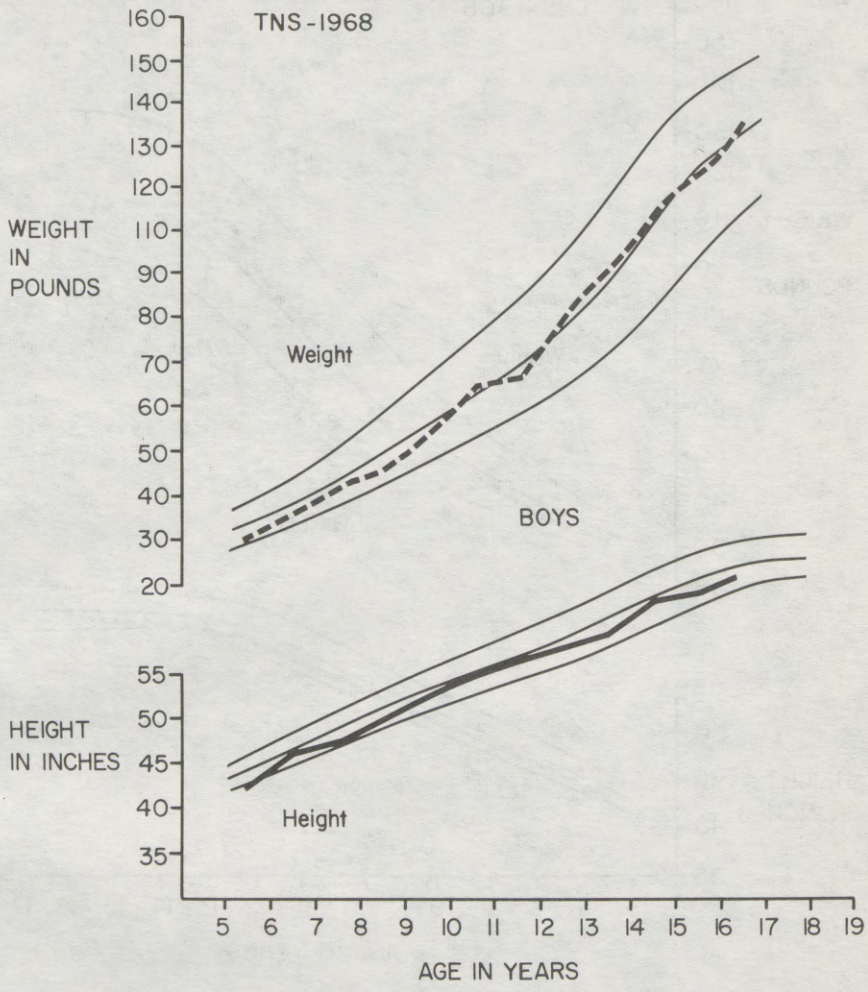
You bring up a point, Senator Ellender, which I think needs to be mentioned.

Our survey was done primarily during the summer months, and a second segment done in the fall, in November. We will have a chance to look at the seasonal pattern changes.

We will repeat a portion of our work in March and April in order to clearly identify the seasonal pattern. At the same time our data do not reflect any input or impact of the school-lunch program, because school was out during the majority of the period of survey activities.

School was in the fall, and was under full implementation.

This is the marasmic child that you saw in the film.



The next slide illustrates the sparse, abnormal hair.[1]

The next illustrates staring hair and a narrow band of decolorization—flag sign.

The next one is a Latin Central American slide showing the protein/calorie malnutrition sign, in which hair growth is perfectly normal before, and the band relates to the period of disability.

In almost all of our international work, there has had to be a participating illness to induce prekwashiorkor—an acute gastrointestinal disease, measles, or something of the kind.

The next slide illustrates atrophy of the tongue related to iron and B vitamins. The next, sandpaper-like lesion related to vitamin A, the next one, a minor degree of it—the more moderate or slight degree of the lesion.

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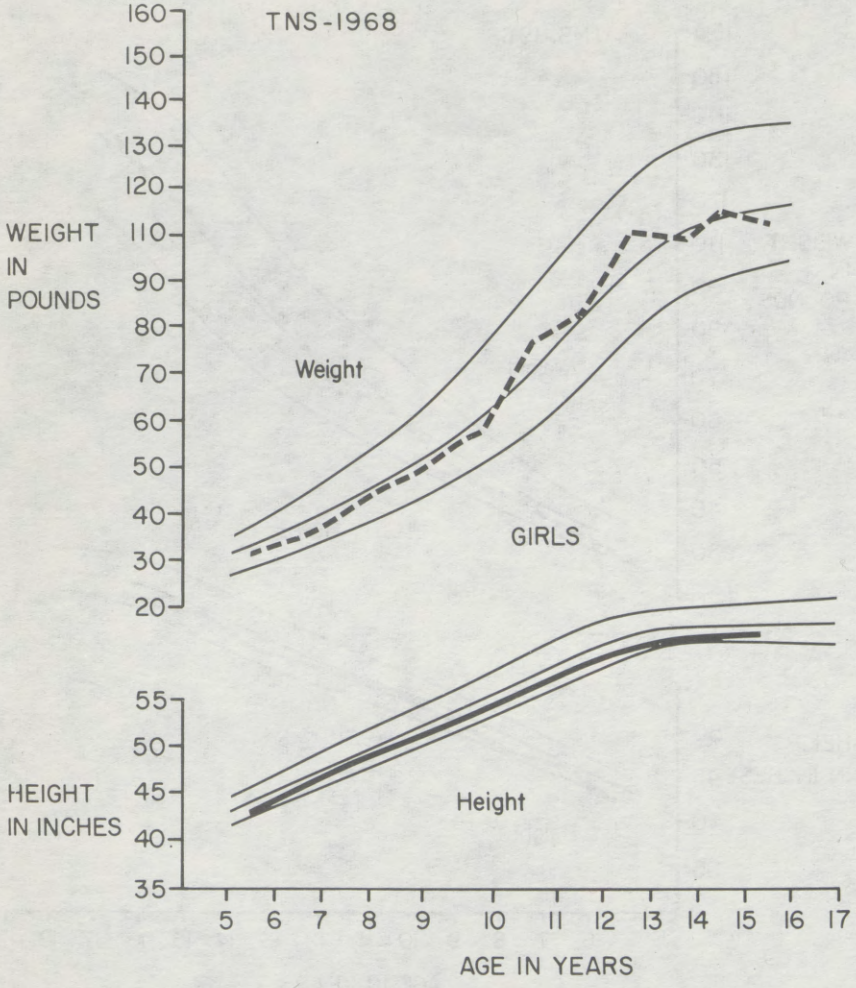
[1] Pictures not printed were not submitted for the record.



This later type is what we saw predominantly.

The next shows bowlegs. The next one a case of nutritional rickets. Note the right wrist, there is enlargement which you can see, and the bowlegs in this particular child. Signs of vitamin D malnutrition.

The next slide shows the gum lesion related to vitamin C.

The next one shows the angular lesion at the corner of the mouth due to lack of riboflavin.

This is the type of goiter we saw. Five and a half percent of our population did have an enlarged and visible thyroid gland, not just palpable, but visible. This is what is called grade 1, and 90 percent of our subjects had this grade.

The next slide illustrates the grade 2 variety of which we had 10 percent. We had very few of the big variety that you would see walking across the street.



FIGURE 7.—19-month-old twins—Weight 11 pounds; 6 pounds at birth (Louisiana, 1968).



FIGURE 8.—Marasmic malnutrition (Texas nutrition survey, 1968)

Putting this all together (table VI) you will notice that the abnormal hair findings are primarily in children, 2 percent.

TABLE VI

	Symptoms	Percentage
Protein/calorie	Abnormal hair; color/texture	2 percent of children.
Iron or B vitamins	Filiform papilllary atrophy of tongue	5 percent of total.
Vitamin A	Follicular hyperkeratosis of skin	2 percent of total.
Vitamin D	Enlarged wrists	2 percent of children.
Vitamin C	Diffuse swollen red gums; papillae of gums	3 percent of total.
Riboflavin	Angular lesions of lips; glossitis of tongue	1 percent of total.
Iodine	Visible enlargement of thyroid gland	5 percent of total.

Where we used the percent of total, the difference between boys or children and adults is not appreciable. Five percent with the filiform papillary atrophy of the tongue, 2 percent with follicular hyperkeratosis of the skin, 2 percent with enlarged wrists, 3 percent with the swollen red gums, 1 percent with the angular lesions of the lips, and a little over 5 percent with the enlarged thyroid gland.

This is a comparative slide (table VII) between two studies of the clinical lesions that I have personally been responsible for, the Texas study and the Montana Indian study in 1961.

TABLE VII.—COMPARATIVE PERCENT CLINICAL LESIONS PER TOTAL POPULATION

	Texas, 1968	Montana, 1961
Filliform papillary atrophy of tongue	5	9
Follicular hyperkeratosis of skin	2	4
Diffuse swollen red gum, papillae of gums	3	6
Angular lesions of lips	1	2
Glossitis of tongue	1	1
Visible enlargement of thyroid gland	5	12

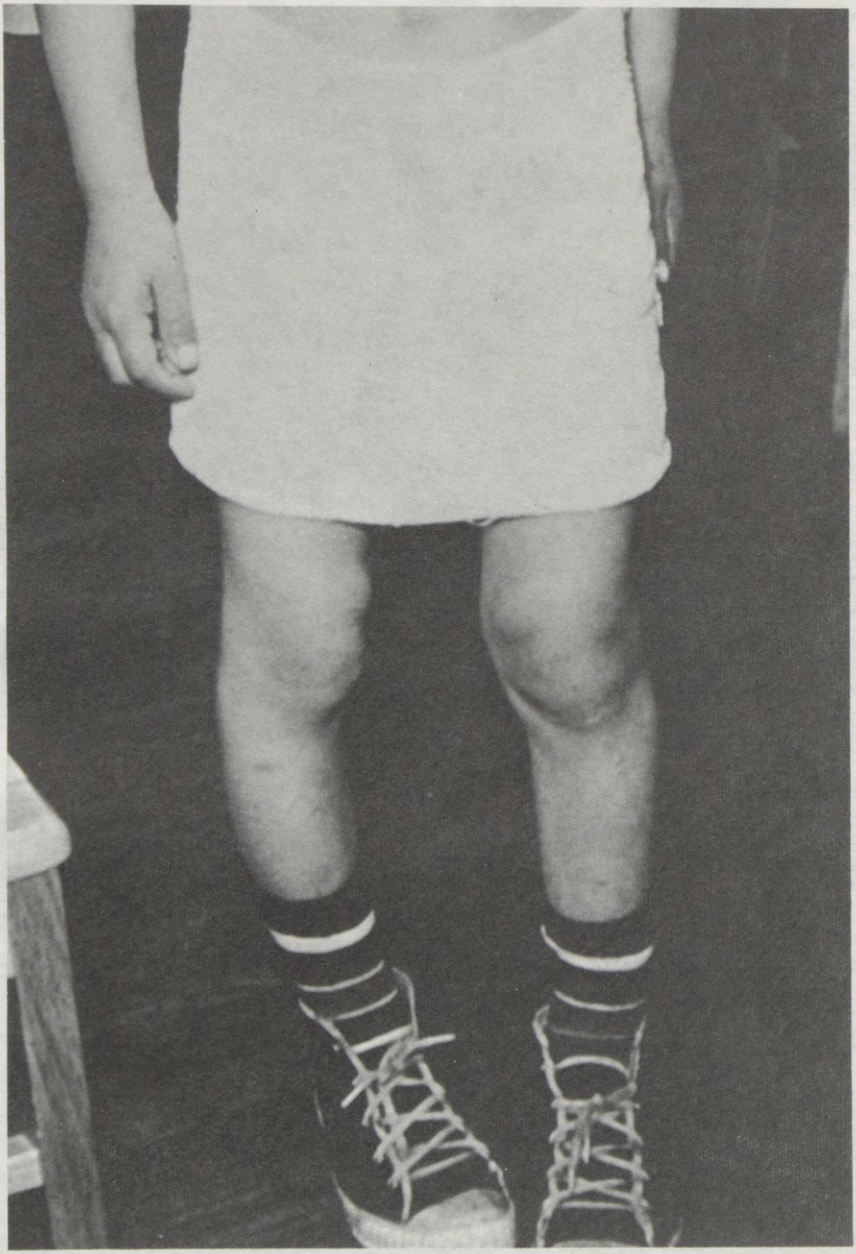


FIGURE 9.—Nutritional rickets—Bowed legs (Texas nutritional survey, 1968).



FIGURE 10.—Nutritional Rickets—Bowed Legs and Enlarged Right Wrist (Texas Nutrition Survey, 1968).

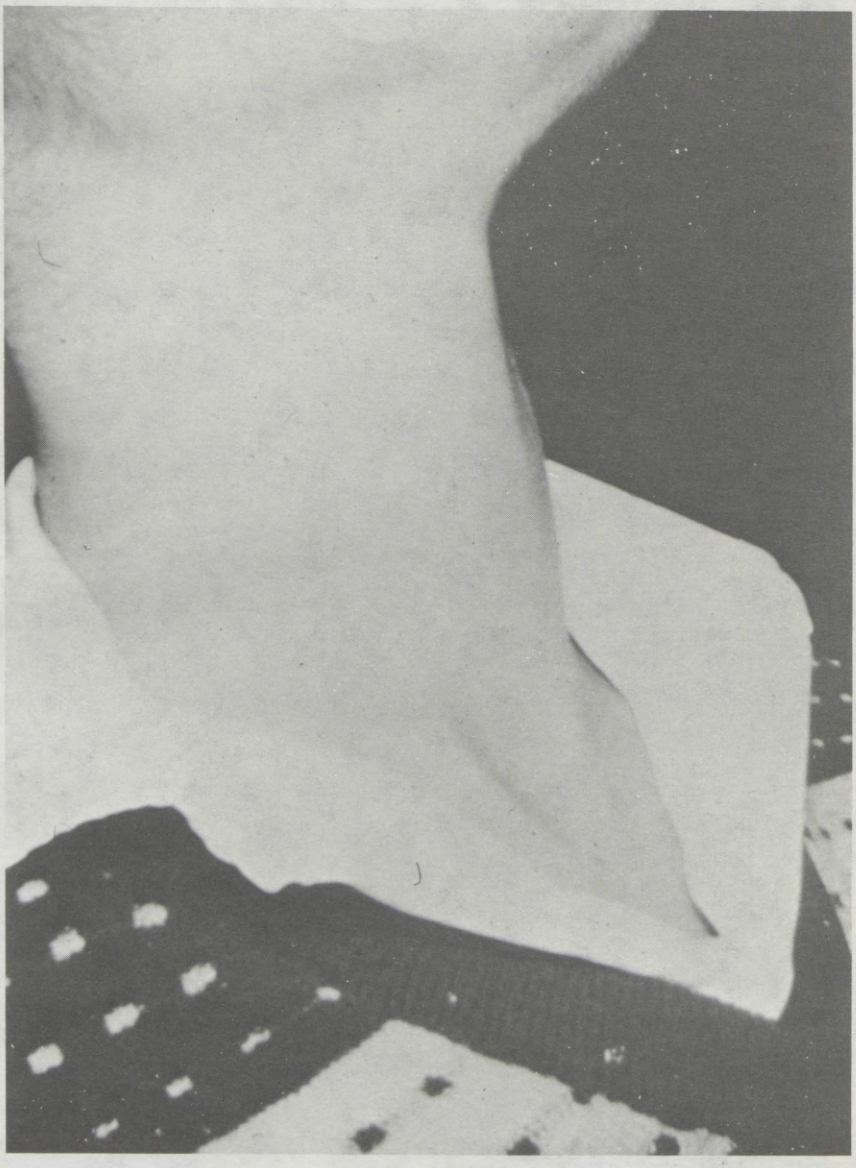


FIGURE 11.—Grade I Goiter—Iodine Malnutrition (Texas Nutrition Survey, 1968).

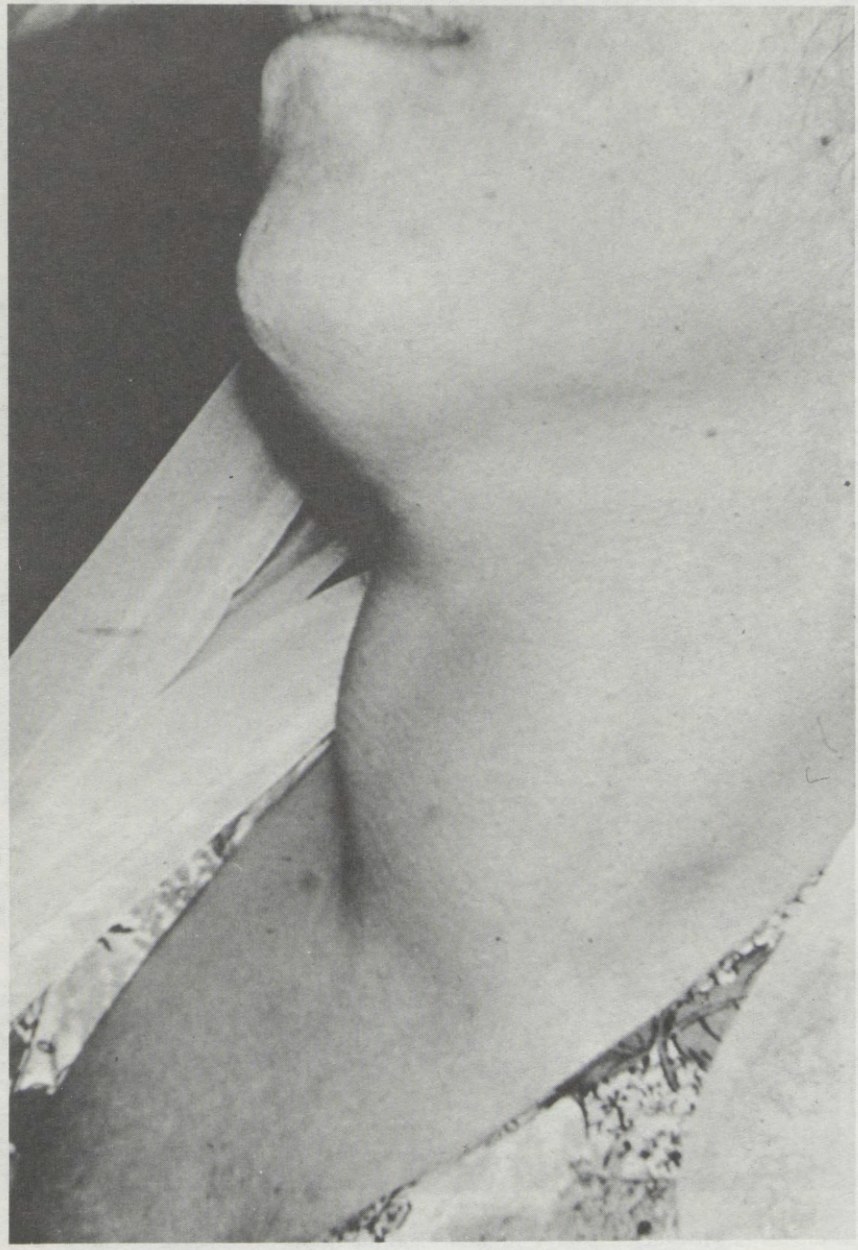


FIGURE 12.—Grade II Goiter—Iodine Malnutrition (Texas Nutrition Survey, 1968).

Senator YARBOROUGH. What was the other study?

Dr. MCGANITY. The Montana Indian study in 1961.

In this, using exactly the same indexes, the comparison between the clinical manifestations found in Texas and the clinical manifestations found in the Indians on these reservations in 1961 differ only in relationship to thyroid enlargement, in which, on the Montana Indian reservation the incidence was 12 percent instead of 5 percent.

The next slide illustrates the dental situation, and there has been clear attention drawn to this this morning.

Because of your questions, I would like to focus particular attention on the school-age group in this data.

In the next series we will look specifically at them.

The next slide indicates a type of fluorosis. We are a naturally fluoridated State. Our water supply carries near preventive levels in many communities of our State, without the addition to the water supply.

The type of white chalk marking along the lateral side, along not the front teeth, but the lateral, gives the indication of the first level of fluorosis pigmentation in the teeth, and the next slide indicates the type that Senator Yarborough well knows, that, in our State, we will see this in west Texas. Here excess that is responsible.

Now, the next slide (table VIII) will illustrate a situation that all of the children did have their teeth through the 16th year of age.

TABLE VIII.—NUMBER AND PERCENT WITH TEETH

Age group	Number examined	With 1 or more natural teeth	
		Number	Percent
Total, 5 years and over	2,211	2,010	90.9
5 to 9	461	461	100.0
10 to 16	559	559	100.0
17 to 24	209	208	99.5
25 to 34	170	167	98.2
35 to 44	199	187	94.0
45 to 54	184	158	85.9
55 to 64	194	146	75.3
65 and over	235	124	52.8

In contrast, 10 percent of our total sample didn't have any teeth.

The next slide (table IX) illustrates the fact that in our population our incidence of dental decay is about 66 percent of what the national health survey presented.

TABLE IX

	Total DMF	Decayed	Missing	Filled
Examined persons, 17 and over	14.9	6.3	7.6	1.0
National average, 18 to 79 years [1]	20.4	1.2	13.5	5.7

[1] PHS Publication No. 1000, series 11, No. 7.

I think this is suggestive evidence that the natural fluoridation is having some protective impact.

However, when we look at the decay rate, we had six times as many decayed teeth as the national health survey did, and only one-sixth as many filled teeth in our mouths.

The next slide (table X) indicates that in this 5- to 16-year-old group, approximately 90 percent of them had need for dental care of one sort or another, either in the decayed or missing situation, and less than half of one tooth was filled in these children's mouths.

TABLE X.—DMF TEETH PER PERSON AND PERCENT OF DENTULOUS PERSONS WITH DMF TEETH

Age group	DMF[1] total	Decayed	Missing	Filled	Percent with DMF teeth
Total, 5 and over	10.1	5.2	4.3	0.6	96.3
5 to 9	1.5	1.3	.2	(2)	89.4
10 to 16	7.0	6.0	.6	.4	97.5
17 to 24	11.6	8.7	2.1	.8	98.6
25 to 34	14.3	8.0	4.8	1.5	98.2
35 to 44	15.3	7.1	7.1	1.1	98.4
45 to 54	15.8	6.0	8.6	1.2	100.0
55 to 64	16.4	5.0	10.6	.8	99.3
65 plus	15.7	3.6	11.3	.8	99.2

[1] As used here, the total DMF score is the sum of all decayed and filled teeth, both permanent and primary, plus all missing permanent teeth.
[2] Less than 0.05 teeth.

The next slide (table XI) indicates the incidence of periodontal diseases of a severe nature, being much less the younger the age.

TABLE XI.—PERIODONTAL DISEASE

Age group	Percent of persons with teeth		
	With periodontal disease	Without pockets	With pockets
Total, 5 and over	45.4	26.9	18.5
5 to 9	8.9	8.9	
10 to 16	35.2	34.1	1.1
17 to 24	50.0	39.4	10.6
25 to 34	53.3	36.5	16.8
35 to 44	66.3	34.2	32.1
45 to 54	81.6	31.0	50.6
55 to 64	85.6	21.9	63.7
65 plus	87.1	20.2	66.9

The next slide (table XII) indicates that in spite of this, even in these 5- to 16-year-old children that between one-quarter and a third of them had one or more teeth in need of being extracted, where the decay process had advanced to that degree.

TABLE XII.—NEED FOR EXTRACTIONS AND FILLINGS

Age group	Percent of persons with teeth		
	Needing fillings or extractions	Needing fillings	Needing extractions
Total, 5 and over	92.6	91.8	33.6
5 to 9	87.4	87.2	34.5
10 to 16	91.5	91.2	25.2
17 to 24	97.6	97.1	31.3
25 to 34	96.4	96.4	35.3
35 to 44	94.7	94.1	41.2
45 to 54	89.9	86.7	39.9
55 to 64	91.8	90.4	40.4
65 and over	81.5	76.6	43.5

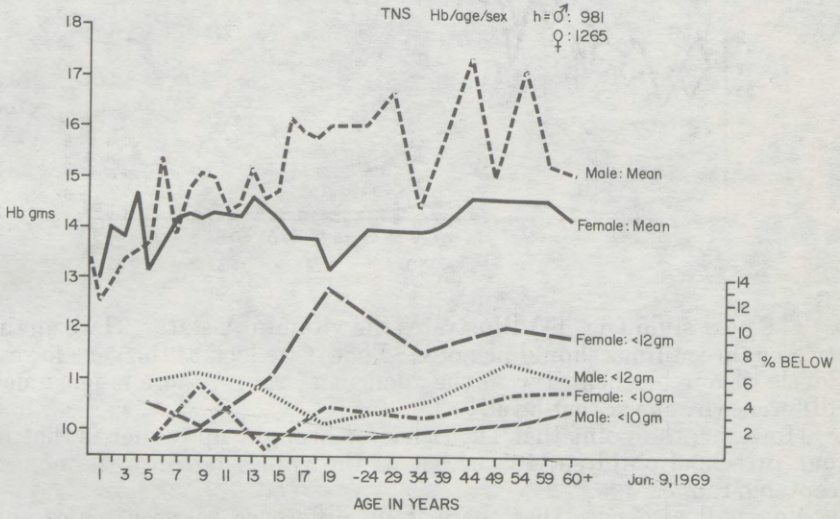
The next slide (table XIII) is the indication from the data on which the earlier statement had been made that 1 in 14 of the individuals over 10 years of age had sufficient difficulty with teeth that it interfered in their consumption of food.

TABLE XIII.—TROUBLE BITING OR CHEWING

[Persons 10 years and over]

	With some trouble	All foods	All firm foods	Selected foods only
Number	312	86	38	188
Percent	17.8	4.9	2.2	10.7

The next slide (fig. 13) illustrates something which I think may be of some importance. Our data does not indicate that the hemoglobin status is worst in the preschool child.



In contrast, if you look at those lines, and the top line is for males, and the female is the lower, there has always been known that male levels of hemoglobin are higher than female. That is demonstrated.

If you look at the green line, and the yellow line, these are the ones that fall under 10 grams of hemoglobin, and there isn't a doctor in this house or in the country that would not consider that this is clear-cut anemia, and in need of medicinal attention.

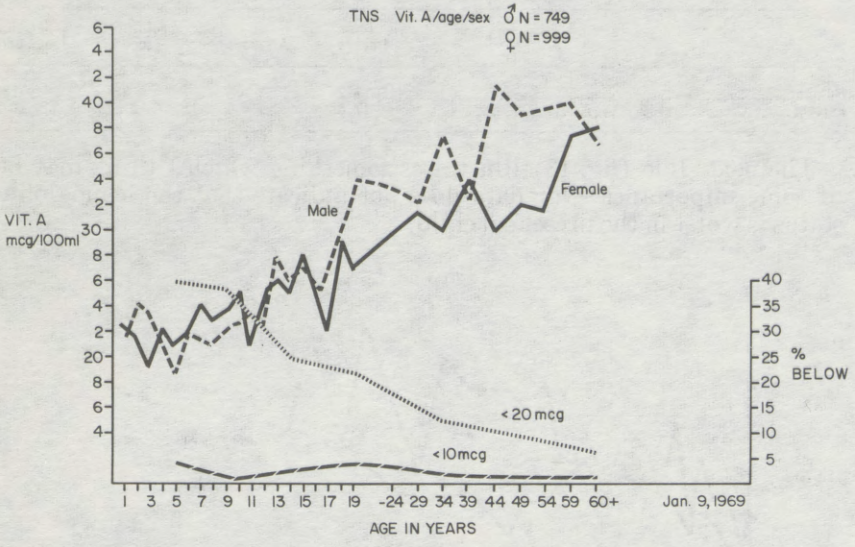
The trend indicates a peak in the 5- to 9-year-old group in this "deficient" range, and then a progressively increasing incidence of anemia as age advances.

The CHAIRMAN. Doctor, what are those percentages that are in the category that you say are clear-cut anemia cases?

Dr. MCGANITY. I will come to that, sir, in about two slides, if I may hold off.

The CHAIRMAN. All right.

Dr. McGANITY. If we use the level of "low," which is nonacceptable, you will seen an important peak occurring in the young women 13 to 19 years of age, just as they come into their menstrual phase. The blood loss occurring on a regular monthly basis then becomes an important contributing factor. This is the highest incidence of "low" values, that we have in our Texas data.



The next slide (fig. 14) illustrates the vitamin A status. Here again two or three things should be noted: That if we look at the very lowest levels of our biochemistry in the "deficient" range, there is not much difference by age at that level.

However, the point that Dr. Schaefer brought up earlier is that in our preschool children, 40 percent of the values fell into the nonacceptable range.

You will also note that there is no difference between males and females, and that there is an increase in vitamin A that is related purely to age as a physiological process.

The next slide (table XIV) summarizes what Senator McGovern was asking about.

TABLE XIV

[In percent]

	Deficient	Low	Acceptable
Hemoglobin	3	8	92
Hematocrit	4	22	78
Plasma Carotene	0	1	99
Plasma Vitamin A	2	18	82
Serum Vitamin C	4	12	88
Total:			
Serum Protein	7	16	84
Serum Albumin	3	19	81
Urinary Thiamine	1	9	91
Urinary Riboflavin	6	19	81

I think it is important to look at the right-hand column first, that even in this sample population 80 to 90 percent of our population fell into the "acceptable" range.

There are, however, from 8 to as high as 19 percent of our population that have nonacceptable biochemical levels. The more severe degree is indicated in the "deficient" range.

I have used the criterion of less than 10 grams of hemoglobin for that. The level of this in the deficient range through all the rest of the items is in the same level of severity.

The next slide, table XV.

TABLE XV.—COMPARATIVE "LOW" BIOCHEMISTRY PER TOTAL POPULATION

[In percent]

	1968, Texas	1961, Montana	1965, Guatemala	1966, Honduras	1965, Salvador	1966, Nicaragua	1966, Costa Rica
Hemoglobin	8	9	3	5	4	2	4
Plasma Carotene	1	4					
Plasma Vitamin A	18	62	11	22	23	8	17
Serum Vitamin C	12	1	4	2	8	1	2
Total:							
Serum Protein	16	2		10	4	3	8
Serum Albumin	19	3					
Urinary Thiamine	9	7	25	11	2	14	49
Urinary Riboflavin	19	16	33	11	12	4	4

These reveal the "low" biochemical levels by percent for Texas, Montana, and each of the Central American countries. The six Central American countries were from randomly selected rural communities. It was not directed at the particularly lowest socioeconomic group within those countries, but our data from Texas is of the same order of magnitude as far as the incidence of percent "low" values by the individual nutrients that we have shown you in the past few moments.

The next slide (table XVI) provides us limited dietary data we have at this particular time. We have some dietary pattern information. We have also food purchase pattern information.

TABLE XVI

[In percent]

	Mexican American			Negro American			Non-Latin white		
Use per day	<1	1 to 15	>15	<1	1 to 15	>15	<1	1 to 15	>15
Legumes	41	21	38	89	10	1	87	10	3
Meats	59	26	15	55	19	26	53	28	19
Poultry	96	3	1	93	6	1	96	4	0
Eggs	15	75	10	32	64	4	28	66	6
Cereals	29	28	43	12	83	5	7	31	62
Tortillas	33	20	48	99	0	1	98	2	0
Vitamin A	80	18	2	79	19	2	72	25	3
Vitamin C	49	37	14	58	35	7	33	53	14
Milk	7	19	64	25	19	56	11	31	58
Pastries	75	21	4	88	11	1	60	35	5

The only difference in dietary pattern frequency that has turned up at this stage of our analysis is that the ingestion of legumes and tortillas, as would be expected, is much higher in the Mexican-American than it is in the other segments of our population.

However, the ingestion of all of the others do not reveal a clear ethnic pattern for meats, poultry, or vegetables.

From this, and our food purchase data, the 26-package basket which was based on the frequency which items were purchased in the store, these two complement each other, and would clearly support our biochemical and clinical evidence relating to the problem of iron, vitamin A, vitamin C, riboflavin, and also to calcium. All three parts fit together.

In summary, using the valid premise, that an adequately fed population, meeting the recommended dietary allowances of the National Research Council, one would not anticipate finding any biochemical or clinical evidence of malnutrition. We did find it in our survey.

It is also important that we in Texas not try to interpret or extrapolate our data to other socioeconomic groups within our State and, conversely, I would beg of you gentlemen not to extrapolate the Texas data to a national program or a national situation until many more States are in. We will not have the sound, hard facts that we now have in Texas.

We have approximately 3 more months of computation work to be completed before we will be able to seriously interpret and make recommendations for Texas.

A plan has been set up within our State in which the four agencies of State government, agriculture, education, welfare, and health, will be brought together with representatives of the professional education and health community, advisers at the national level, and representatives of agriculture, food, and the food industry to begin the interpretation and the recommendations.

The final thing I would like to return to is the degree of involvement that was necessary in order to accomplish this task: 88 team members, 25 of whom were professionals, 51 of whom were in the allied health field. The average age was 22 years of age. It was a young team.

Of those young people, 30 of them have revolunteered to do the next survey in the next State, wherever it may be.

Almost a half of this young team have either consolidated their interest in the biomedical fields, or have changed their major because they were drawn from areas of majors that are not involved.

A third of our team was bilingual.

Most impressive of all was that over 600 local and State individuals at the community level had to give of their time and their efforts in order to make it possible. It was a team effort.

Thank you, sir.

The CHAIRMAN. Thank you very much, Dr. McGanity. That is most helpful in reinforcing and enlarging on the material that Dr. Schaefer has made available to the committee.

I wonder if, on the basis of the Texas survey, you could give the committee any general estimate as to the percentage of people that you have surveyed who are suffering from what you would call serious malnutrition.

Presumably, we have a more accurate picture on Texas than we do any of the other States.

I realize that even that survey is not as full as you would like.

Dr. MCGANITY. With the understanding that we are talking about nutritional deficiency disease of an overt nature, we have less than

30 cases out of the 4,500 that are involved in the whole process of serious malnutrition such as protein/calorie, rickets, grade II thyroid, and the like. We saw one chronic old healed pellagrin.

As we move into biochemical evidence that is an entirely different thing.

Let me try to put this in perspective. I don't think any of you gentlemen would try and do a diabetic survey by going around and examining people. You know enough about medicine to know that you have to test the urine, and you have got to do a blood sugar level.

Nutrition has had the same difficulty in our country. We have not used all of the dimensions in order to assess the problem. You can't do it alone by dietary survey. You can't do it alone by clinical examination. You have to have both plus biochemistry.

Until we utilize the biochemical nutritional dimension to the same extent that we do a blood sugar, we can't move forward with nutritional status evaluation.

We have not had a comprehensive randomly designed data in our country on which to base a judgment.

Classical overt disease we saw: two protein/calorie problems, both of which were situational in nature; a few cases of rickets, and one chronic pellagrin. We found no beriberi, no scurvy, no xerophthalmia—clinical deficiency of vitamin A—or anything else.

The CHAIRMAN. I think we have some confusion over these terms when we try to get at the number of people who are really serious cases.

I don't mean people ready to die within 24 hours but what percentage of people are really in serious need of improved diets?

Dr. MCGANITY. On the basis of the biochemical evidence, a maximum figure of 7 percent which fall into the "deficient" range. This varied from 1 to 7 percent overall with most nutrients in the 4 to 5 percent "deficient" level.

Let's not get confused about "anemia," it is not all nutritional. Dr. Schaefer made this point this morning. An individual who is bleeding will have a low hemoglobin, and you have to stop the blood before you can start to treat him or her.

The anemia situation that occurs in the young child up through the age of 12 years and in the male all the way through his life, is a problem related to diet predominantly. It is in the woman who bleeds once a month. She loses 30 milligrams of iron every month with an average menstrual period. This is the extra demand for which she has to have an additional iron source. The national recommended dietary allowance recognizes this. The recommendation for males is 10 milligrams per day, and for the female is 18, in order to provide the necessary margin of safety for the woman.

The CHAIRMAN. In your judgment, Dr. McGanity, what would be the relative importance of low income as over against lack of education in explaining the nutritional deficiencies that you found in Texas?

Dr. MCGANITY. We haven't got the critical sort that answers this question at the present time. Anything that I would give you would be judgmental.

I personally believe they are interrelated, and that both are interacting.

I would also be of the opinion that in terms of the availability of food within the budget that a low-income person could spend, that there would be some restriction imposed, because of costs of food on the market basis.

I would like to bring up one other thing which this reminds me of that I did not mention.

I think in our State, at least, this question of being on the dole or on the handout or on welfare rolls, as all of us who have lived in the State know, we are a proud people, and this pride goes down to the individuals that were involved as participants.

We would not have succeeded in our sample if we had conveyed at any time that this was a survey of poverty, because the majority of the people who were involved in this sample even the 60 percent with an income level of less than $3,000, do not consider themselves as members in poverty. There was not a family or an individual who in terms of coming to the examination did not come in their "Sunday-best-go-to-meeting" clothes.

We had two opportunities to be in the homes of these individuals. One was in the home interview phase, and the second, the driver at time of calling for them to bring them to the examination center.

I can say that regardless of the external conditions of the home, it was as neat, as tidy and clean as could be made under the circumstances.

The CHAIRMAN. Were they reluctant to talk about hunger problems, about their dietary needs?

Dr. MCGANITY. In terms of being able to do this, we did not ever once use the term "hunger" in our evaluation.

Because of the communication pressure that had been applied to our State, with particular reference to one community, we could not have operated and gained any cooperation.

The CHAIRMAN. Let me ask this, Doctor. You made reference in your statement to other surveys, I believe, in which you had been involved. Was that in Central America?

Dr. MCGANITY. The ones that you will have data on, sir, will relate to Central America.

I have now been involved in 14 of the 33 that Dr. Schaefer's group has mentioned.

The CHAIRMAN. Involved in other countries?

Dr. MCGANITY. Right.

The CHAIRMAN. Is your conclusion the same as Dr. Schaefer's with reference to his point that you found conditions in the Texas survey comparable to conditions that you found in some of the developing countries elsewhere?

Dr. MCGANITY. There are variations, sir. The severity of growth retardation is greater in the developing countries. We have it to some degree.

The percentage incidence of some of our clinical lesions is about the same as Central America.

I can give you comparative data, as an example, in the angular lesion, this lesion in the corner of the mouth.

We have seen this in the Middle and Far East as high as 16 percent of our population. We have seen goiter as high as 45 to 50 percent. But in terms of the Central American data, our findings are very comparable to the rural data from Central America, and the biochemistry

is in the same order of magnitude. There are individual variations, but overall very similar (table XV).

The CHAIRMAN. Just one final question, and then I want to yield to Senator Yarborough.

At this point, what is your general impression of the effectiveness of the food assistance programs in Texas?

We directed the same question to Dr. Schaefer. This is both as to the composition of the food in our commodity distribution programs, the availability of foods, and the operation of those programs which you were able to observe in the course of this survey.

Dr. MCGANITY. Sir, I wish there were a simple answer to this, but it is not simple.

In our State we had 26 counties. Twenty-two of these counties did have programs, either the food stamp or the food commodity.

At the actual time that we were doing the survey, only two counties had the food stamp program in operation, the other 20 being involved in the commodity program.

There are four counties that had not availed themselves of the Federal and State's program. The State program is available. We have a program, but, remember, it is not only a state commitment. There is the county commitment. There has to be matching money and service to get the food, transport it, store it, and issue it at the county level.

Four of these counties had not chosen in their wisdom to do that.

The CHAIRMAN. So there was no food program at all?

Dr. MCGANITY. There was no food program at all in four counties.

The CHAIRMAN. Were there school lunch programs in those counties?

Dr. MCGANITY. In all of the counties, in all of the school districts, save one that we operated, there was a school lunch program.

There were very few school breakfast programs. They are just coming into existence. One of the witnesses that Dr. Schaefer told us will be testifying tomorrow, I believe, will comment further on the breakfast portion of it.

The school lunch program did cut across all lines. In our population, from the data that we have available at this moment, 1 in 8 of our students who were in the public schools did not utilize the program at all.

The CHAIRMAN. Is that because they couldn't afford it?

Dr. MCGANITY. No. It can be on the other side, because they can afford it too well, because you can see both extremes of this. Some of them would be going home for lunch. They lived close by, and didn't have to stay in the school for lunch.

In terms of our families, I believe the figure is approximately 50 percent of the students utilized the program the full 5 days per week that were available.

But, remember, our data reflects mainly that collected during the summer, very little from the fall. The summer is in a period of time when there was not the impact of the school lunch program.

We will be able to compare our fall and spring data, and hopefully measure, in the children, the impact of the school lunch as we see changes in our biochemical data.

The CHAIRMAN. Can you also, Doctor, get a comparison on the nutritional levels of the people that were surveyed in counties that

have either the commodity distribution program or the food stamp program as against those counties that do not have either of the food programs?

Dr. McGANITY. Yes, we are set up to do this. The data are just not available yet, sir.

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Thank you, Mr. Chairman.

Dr. Schaefer and the other witnesses, I regret that I was not able to get back from Texas in time to hear your testimony this morning. I have a brief digest of it, which I have reviewed. I have, however, had an opportunity to hear part of Dr. McGanity's testimony, and I have read the parts that I didn't hear.

Dr. Schaefer, I understand that you testified this morning that only 8 percent of the surveyed families participated in either food stamp or food donation plans. Does that survey, then, include all families, those of affluence as well as well as those of middle income, or are you speaking here of 8 percent of those who needed food?

Dr. SCHAEFER. I would prefer to flip this to Dr. McGanity.

Dr. McGANITY. The 8-percent figure is for the whole sample.

If you look at the less-than-$3,000-income level, it is only 16 percent of the families in that group were beneficiaries of the food stamp program or the food commodity program.

Senator YARBOROUGH. You mean in families with less than $2,000 gross income per family per year, only 16 percent of those participated in any kind of food program?

Dr. McGANITY. One correction. It is less than $3,000 per year.

Senator YARBOROUGH. Less than $3,000?

Mr. McGANITY. Only 16 percent participated.

Senator YARBOROUGH. What about the $2,000? You had data that you gave us earlier in your testimony about the families with less than $2,000 per year income. Or was that $1,200?

Dr. McGANITY. $1,200.

Senator YARBOROUGH. Of the families with less than $1,200 per year income for the entire family, and the families with over three members, what percent of those participated in the food stamp program or any other food program?

Dr. McGANITY. I can't answer that question at this time, sir. I haven't got the data sorted that way.

Most of our data to bring here had to be done by machine or hand sorts, and we made a decision at the $3,000 level. We will have the data at a later time.

Senator YARBOROUGH. Why, in your opinion, did so few of the families of very low income, and in need of food, participate in these programs in Texas?

Dr. McGANITY. Well, I didn't quite finish my earlier comments about the complex nature.

I need to go back and bring in two other features. One is the fact that of the people who were certified and eligible to participate in either program during the month of July, which we chose to use as our reference point, only about 60 percent of those who were certified and eligible chose to utilize the programs.

Senator YARBOROUGH. Only 60 percent of those certified. Did you have entire counties where they were many people in poverty where no one was certified?

Dr. McGANITY. Well, we at least have four counties, sir, which don't have any program whatsoever.

Senator YARBOROUGH. Why didn't they have some kind of program?

Dr. McGANITY. The way I understand our situation within the State, that it is predominantly failing at the county level to implement the options that are available at the State level.

Senator YARBOROUGH. It takes some initiative or some willingness at the level of county government to participate in the program, for individual counties to participate for the people with the very low level of food supply?

Dr. McGANITY. That is correct.

Senator YARBOROUGH. And, Dr. McGanity, how long have you been at the University of Texas Medical School?

Dr. McGANITY. Nine years, sir.

Senator YARBOROUGH. So you have some general familiarity with Texas, apart from this mere survey of a few months, have you not?

Dr. McGANITY. Yes.

Senator YARBOROUGH. Your students come form all over the States?

Dr. McGANITY. Yes, sir.

Senator YARBOROUGH. And in that capacity, you knew something about this problem before you undertook this survey, did you not?

Dr. McGANITY. Yes, and in contrast to some of the things that Dr. Schaefer said this morning, I am not sure we were quite as surprised, because we had some data from the same socioeconomic groups groups who were pregnant and in the teenage group, which would give us in terms of the biochemical and the dietary data the same order of magnitude of the problem, using the same techniques.

If you will remember in that slide that I showed you of the influence of age on "lowness" of hemoglobin, that figure was 14 percent for those girls in their teens.

As we see young teenagers entering prenatal care at our university system, they enter with 22 percent of them having hemoglobins less than 10 grams, so that the data that we have gathered this summer, to me, now makes sense as to why we have been finding so much anemia in this particular group.

Senator YARBOROUGH. And you say that you were not surprised at what this survey showed, because of the high incidence of anemia in the pregnant young women that you had examined in the University of Texas Medical School?

Dr. McGANITY. Since 1964, we have been gathering data on this particular group.

Remember, I am an obstetrician and gynecologist, and this has been a particular interest of ours, and we have data on vitamin A, vitamin C, riboflavin, thiamin, niacin, and the whole gamut of things that we used during this survey.

Senator YARBOROUGH. I address this question to both of you, Dr. Schaefer and you, Dr. McGanity. You talked about this low percentage of the survey families participating in either the surplus food program or the food stamp program.

I ask you why.

Of course there is some reluctance of county governments.

You spoke, Dr. McGanity, of the families actually certified for these programs, and only 60 percent participating.

Why didn't the other 40 percent participate? Didn't they know about them, or what prevented the other 40 percent certified as eligible from participating?

Dr. McGANITY. Here again, there are a whole host of factors involved.

Migrant workers were out of home counties. This would contribute a portion.

Have you ever done any shopping for your family, sir, and done it once a month?

Senator YARBOROUGH. Not for an entire month at once.

Dr. McGANITY. Do you know how many baskets are required in order to shop once a month. Unfortunately in some of our counties, and this is true in other States, there is a food distribution once a month. Do you know how many pounds of flour or cornmeal or how many bags you need? You need a small truck in order to take these home. Then you have the problem of being able to store them in your home.

These questions that we asked in the social cultural part re refrigeration facilities and cooking facilities have a direct bearing on being able to use it. To my knowledge, at this particular time and date, there is not one of these packages that has a recipe on it to indicate how to use it.

If you remember, this morning Dr. Schaefer commented that in our population we needed Spanish in order to communicate with 40 percent of our sample.

Labeling is not done in Spanish. There is only one brand of tortilla mix that we were able to find that had a Spanish label, only one brand of salt that had a Spanish label.

At our stage of evolution in the education, growth, and development of our population in the State of Texas, there is still a need to be bilingual, particularly as you work in the lower portion of the State approaching the Rio Grande Valley.

Senator YARBOROUGH. And they do not have that bilingual aid to help them, people educated in the use of both languages, or to tell them of their method of procedure to acquire the foods?

Dr. McGANITY. In order to utilize the commodity program, the housekeeper who is going to cook the food—does not worry about the schoolchildren involved, because they are beautifully bilingual—but the housekeeper who has not had that education thinks in terms of recipes that are Spanish, and there needs to be some labeling, in my judgment, in Spanish, as we work in that particular area.

The same thing is true in terms of health and welfare work. You have to be able to communicate with people before you can get at their problems.

Senator YARBOROUGH. Dr. McGanity, you mentioned those surveys that you have made in Central America, and you have mentioned the relationship of your findings there in comparison with your findings in Texas.

Did I correctly understand you to say that the levels of anemia were just about comparable in Central America to those in your survey in Texas?

Dr. McGANITY. Using the "low" definition, I will read these across for all areas as an illustration. This will be table XV.

In Texas, it was 8 percent.

Now, our figure in Texas, on a national basis, is much better than the national data.

In Montana, the figure was 9 percent. These are the Montana Indians, rural Central America was from 2 to 5 percent "low" hemoglobin.

Senator YARBOROUGH. Was that Montana limited to the Indians of Montana?

Dr. MCGANITY. On the reservation.

Senator YARBOROUGH. And your survey in Texas was all levels of population?

Dr. MCGANITY. Lower socioeconomic areas.

It was all sections of the State, but it was limited to populations living in lower socioeconomic ED's.

Senator YARBOROUGH. Well, I don't quite understand this table where your income also goes up in the range of $180 a year to $42,000. Forty-two thousand dollars a year would not be in the lower economic levels.

Dr. MCGANITY. We went through this this morning with Dr. Schaefer. I will have a try at it to explain it to you.

When we drew the sample in February, I thought our sample was going to be restricted to less than $3,000 incomes. I didn't understand it completely at that time. However, the key to this is that it is the part of the census tract whose average income fell into the lowest 25 percent of the income range in our State.

Two hundred of the 254 counties in our State had a part of a census tract, or more, that would fit that criterion.

From that universe of 200 counties, 26 counties were selected by a table of random numbers.

Then proportionate, in each county, to the number of ED's that were at risk, a second random selection was done so that in two of the counties only one ED came out. In the more urban areas, as many as 11, as well as some sevens and nines were included. Each ED has about 300 household units in an urban area. After a random start, a cluster of 60 was identified somewhere in that ED. Then every third household in that ED was invited to participate. If you do not think that is a rigid sampling design to have to follow through, I can assure you it is.

On the basis of this, we had the city manager in one of the counties; a particular high earner lived in an ED in which the average income was less than $3,000, but he was the landed gentry of that particular ED, a cotton and sorghum producer, and this was his cash income for the previous year.

Senator YARBOROUGH. You say he was the city manager?

Dr. MCGANITY. No, he wasn't. In another community it was the city manager.

Senator YARBOROUGH. In one it was the cotton and sorghum producer?

Dr. MCGANITY. We have 15 percent of our population with incomes over $5,000, and 2 percent over $10,000, which will provide us the opportunity to examine to some extent the next income level up the scale.

It is an advantage that I did not anticipate when we began.

Senator YARBOROUGH. Thank you very much, Dr. McGanity.

I wish I had returned in time to welcome you here, but I am here now, and we are very proud of your work and study and effort to understand the scope and nature of malnutrition and hunger in our State.

I think the first step is to eliminate malnutrition and hunger. That is, of course, a problem that I think we can relieve, must relieve, before we can ever relieve poverty as such. We must get people to a level of health where they can take advantage of our educational systems and such other programs as we should develop to fit their needs.

While that won't eliminate poverty, it is a great step in eliminating diseases and other things that flow from malnutrition.

I hope that we can get the funds to make the comprehensive surveys that you say are needed in so many States.

I understood you to say that you needed this survey in practically every State to draw a national conclusion on this problem.

Dr. McGANITY. May I add one additional comment?

You remind me of something that has already developed within our own State. There are now four counties, outside of the sample, who have requested that this type of operation be done. They will be planned, we are looking into local and State funding to assist with other State problems.

Senator YARBOROUGH. I think that we are making progress in our State. Regrettably, lately it is very slow, but I think the survey you are making is helping to center the attention of the people on this problem.

Our committee learned in the survey of the migratory labor situation in Texas last year in hearings at Rio Grande City in Starr County and at Edinburg in Hidalgo County that there are some families where the total earnings per year for the entire family was under $300 per year, of all members combined.

Thank you very much. We may have other questions to submit to you in writing.

Thank you for coming here, and thank you for your study in depth of this problem.

(The prepared statement of Dr. McGanity together with supplementary documents follow:)

PRELIMINARY FINDINGS—THE NUTRITION SURVEY IN TEXAS—1968

In response to a request in January, 1968 from the Nutrition Program, National Center for Chronic Disease Control and the Regional Office of the Department of Health, Education and Welfare, the University of Texas Medical Branch, Galveston, and the Texas State Department of Health, Austin, agreed to undertake jointly a comprehensive survey of the nutritional health of a segment of our state's population. The first two of three phases have been completed during the periods 10 June–6 September; and 8–23 November. An 88 member team of clinicians, dentists, nutritionists, biochemists, biostatisticians and supporting skilled technicians was recruited and trained. Overall support of this project was provided through a contractual arrangements between U.S. Public Health Service and the University of Texas Medical Branch, Galveston; and the United States Army's Medical Research and Nutrition Laboratory, Denver. Additional support was received from the Texas State Department of Health; the Texas Education Agency; the University of Texas Medical Branch, Galveston; a host of Texas professional organizations and each and every community, independent school system, local health and welfare agencies and personnel.

During the period of the survey, field team activities included all sectors of the State of Texas from the Louisiana line on the east to El Paso in the west, from the lower Rio Grande Valley in the south to Wichita Falls in the north. Over 8,000 miles of team travel was driven in non-air conditioned vehicles during the height of the summer. The base of operations, including the biochemical laboratories and biostatistical unit was located in Galveston at the University of Texas Medical Branch.

More than 1,700 families have volunteered to enter at least the initial home interview aspect of our survey. Of these families ever 71% came to the examination centers for the remaining segments of the nutritional evaluation. In all, 4,497 adults and children were examined in 105 locations, 103 of these were in the preselected random sample. Two were special study locations in the Rio Grande Valley. All subjects in the 103 survey locations were drawn from the predetermined sixty household cluster in each of the enumeration districts. Special interest groups such as Headstart children, school children, persons in institutions, hospitals, clinics or the like were not participants in our survey. Data from families are the only basis of this report.

In late February or March, 1969, a smaller team will return to several locations to re-evaluate the same survey participants to ascertain possible seasonal alterations in the nutritional health of our participants.

While all of our field work is completed, the data punched and edited, and computer programs written and debugged only basic overall results are available as of mid January, 1969. Three computer facilities in Galveston, New Orleans and Washington working well over an eight hour day are processing our data. Each individual in the study has over 200 items of information. It will be several more months before we have all our analyses completed. The following findings are preliminary, based in large measure on hand and machine sorts rather than computer analysis. We can anticipate some minor changes in the data. For this reason all percent figures have been rounded and should be considered provisional although they are not wild guesses or mere impressions.

THE SAMPLE

Utilizing the national nutrition sample designed in February, 1968, a three step random process selected 103 enumeration districts (portions of census tracts) whose average income level in 1960 fell in the lower 25 percent of the economic scale. There were 200 of Texas' 254 counties that were in this universe. Twenty-six counties were picked which represented the urban, rural, regional and ethnic characteristics of our state.

Anderson	Guadalupe	Newton
Bexar	Hardin	Nueces
Cameron	Harris	San Patricio
Dallas	Haskell	Tarrant
Dimmit	Hidalgo	Travis
Duval	Jones	Uvalde
Ector	Lampasas	Washington
El Paso	Limestone	Wichita
Frio	McLennan	

It is important to understand that this sample was designed to provide data *for the whole state of Texas*—not for a given county or section. The numbers of E.D.'s/per county were proportionate to the population concentration in the economic range of the sample per county. Thus we had as few as one E.D. in two counties to as many as eleven at the other extreme.

Changes has occurred in the sample E.D.'s since 1960, one had disappeared entirely and 3 had been modified severely. In any given county the sample would not *a priori* give us the worst or best part of that county. However, the sample as a whole did give adequate representation of all the lower socio-economic levels in our state. For direct comparison purposes two special study groups of "the most vulnerable families" were added in November, and three more will be included in our spring '69 field operations.

The following table summarizes the number of participants and examinations in various areas of study conducted in the 103 survey enumeration districts. The numbers are rounded.

1. Households with home interview data	1,740
2. Individuals with home interview data	7,300
3. Households participating in examinations	1,250
4. Individuals participating in examinations	4,290
5. Persons examined:	
Anthropometric	4,150
Visual/auditory	3,520
Bone age	1,560
Biochemistry	3,850
Medical history and physical	4,120
Reproductive history (female)	1,420
Dental	3,360
Dietary:	
(a) Pattern	1,730
(b) Recall	1,700
Socioeconomic (family data)	1,110

In every county or location we did not have uniform success in either the home interview or examination phases of our study. We had to learn how to do such an operation. While the range of participation was from 30% to 100% success in both phases, in over 80% of the locations we had more than 4 out of 5 of the families in the home interview phase and over 3 out of 5 of the families at the examination phase.

The total family cash income by household size is tabulated below:

PERCENT/CASH INCOME/HOUSEHOLD SIZE

Number per household	Total	1	2	>2	Total
Number	995	169	199	627	995
Income per year	Percent distribution				
<$1,200	20	49	17	34	100
$1,200 to $2,999	40	16	25	59	100
$3,000 to $4,999	24	5	15	80	100
$5,000 to $9,999	14	4	14	82	100
>$10,000	2	0	33	67	100
All categories	100	17	20	63	100

NOTES

(1) Range: $180 to $42,000 per year. (2) 20 percent <$1,200 per year. (3) 60 percent <$3,000 per year. (4) <2 percent >$10,000 per year. (5) 59 to 80 percent of families with $1,200 to $4,999 income had 3 or more members.

Approximately 37% of the families were composed of 1 or 2 person households. These included a large concentration of older citizens. Among families on whom dietary data was obtained less than 10% of the total (one in six with cash incomes under $3000 per annum) were recipients of either the Food Commodity Distribution or Food Stamp Program. During the summer survey, school was out, as a consequence neither the school lunch or breakfast program was available to school age children except for 1 school district in San Diego, Texas.

Information with regard to participant employment giving rise to cash income is summarized below. Only minor variations were found in the reported pattern between last month and last year:

[In percent]

	Males	Females
Employed full time/full month or year	50	13
Employed part time/part month or year	13	14
Student	7	12
Primary homemaker	1	20
Retired	7	3
Ill or disabled	3	2
Not eligible (under age)	2	26
Work not available/other	7	3
Unknown	11	7

As we have experienced in every international survey of civilians our sample is deficient in young adolescents and males 20–40 years of age. Based on initial impressions we are satisfied that an adequate sample of pre-school, school, adolescent and elderly participants has been obtained. Three of five participants were female; one of four (over 1000) were pre-schoolers; one of six (over 700) were adolescents; one of eight (over 550) were elderly; however, only a small group of pregnant women (less than 70) were participants in the survey. (The University of Texas Medical Branch, Galveston has supplementary nutritional status information from over 1200 pregnant teenage women in the same lower socio-economic and ethnic population who were surveyed during the years 1964–68).

The ethnic distribution of the 103 E.D.'s and the participating survey families were as follows (by percent):

[In percent]

	E.D.'s	Families
Mexican Americans	45	50
Negro Americans	38	35
Non-Latin white Americans	15	14
Mixed or other	2	1

Spanish was the principal language in 37% of the E.D.'s and in 47% of the families visited by the home interviewers. English was the only language spoken in 54% of the E.D.'s and by 50% of the families. The remaining E.D.'s were mixed.

Basic analysis of the remaining segments of our data is only 80% complete. So it is important to regard these preliminary results as provisional. None of our medical history, blood pressure, auditory and visual and bone age information have been analyzed. Only dietary pattern and food purchase studies are available. While analysis by economic, and educational level, ethnic, location, age and sex characteristics are underway only a portion of the latter two dimensions are completed.

BODY MEASUREMENTS

Body heights and weights for children aged 0–6 years have been plotted by age and sex against an accepted American Standard (Iowa Growth Chart). These data reveal average heights and weights that follow the lower (16th percentile) curve. In both measurements our boys and girls had growth rates 6 to 9 months less than one would have expected. Later growth patterns in school age boys and girls show some improvement in both height and weight—more so in weight than height—so that our average measurements follow the 40th percentile growth line. Median skin fold thickness—an estimate of subcutaneous fat deposits—declined in the early school years and then progressively increased with age through adolescence to adulthood. Median skin fold thickness measurements are about 20% thinner than published American norms. The time of onset of menses is an important biological and physiologic marker. In our country menarche has been declining at the rate of 4 months per 10 years since the turn of the century. The average menarche for our young ladies was 12.6 years which is slightly older than current American norms. Collectively these findings suggest thinner and shorter children than expected from existing American norms for similar aged boys and girls.

Our adult height/weight measurements show a very different pattern. Over the age of twenty years there is an ever increasing incidence of obesity with age particularly in the female. Overall at least 2 of 5 of our women and 1 of 5 of our men were obese. At the other extreme 4% of adult women and 6% of adult men were underweight (less than 80% of standard weight for given age and sex). Subcutaneous fat thickness followed the same pattern of increase with age and at levels compatible with increasing obesity.

MEDICAL AND DENTAL

Physical examination for 49 signs of probable or possible nutritional significance were performed by 3 skilled and trained physicians. One infant with marasmus and one mentally retarded child with pre-kwashiorkor were seen. Neither was the result of only lack of calories and/or protein but rather primarily situational in origin. One participant had been an old chronic healed pellagrin

and less than a dozen children showed the end results of rickets. No cases of beriberi (thiamine deficiency), scurvy (Vitamin C deficiency), Xerophthalmia (Vitamin A deficiency) were found.

Among the participants a variety of *physical lesions* were found at a relatively low level of frequency. Those lesions of probable nutritional significance are listed below according to the nutrient possibly involved.

Protein/calorie: Abnormal hair—color/texture	2 percent of children.
Iron or B Vitamins: Filiform papillary atrophy, of tongue.	5 percent of total.
Vitamin A: Follicular hyperkeratosis of skin	2 percent of total.
Vitamin D: Enlarged wrists	2 percent of children.
Vitamin C: Diffuse swollen red gum, papillae of gums	3 percent of total.
Riboflavin:	
Angular lesions of lips	1 percent of total.
Glossitis of tongue	1 percent of total.
Iodine: Visible enlargement of thyroid gland	5 percent of total.

These findings suggest that a definite public health hazard is present with respect to goiter and iodine intake lack. The other clinical lesions are suggestive that dietary and biochemical data will yield less than acceptable food intake and body fluid levels of other nutrients in a significant portion of our survey population.

As a part of our pre-school aged (0–6 years) medical history immunization information was ascertained. From these data 53% had completed the DPT series; 57% had their polio protection; 44% had their smallpox inoculation and 39% had their measles injection.

Dental problems resulted in decayed, missing and filled teeth (DMF); evidence of disease of the supporting gums-peridontal disease index (PI) as well as trouble biting or chewing food. The overall condition of teeth and gums was very poor. However, the Texas data in some aspects were superior to those found in the National Health Examination Survey.

In Texas the average participant had an average of almost 10 decayed or missing teeth in the mouth of which one half were decayed at the time of examination. The average adult had only 1 filled tooth in their mouth compared to a National Adult Average of 6. The pattern of dental decay began in the 5–9 year group and reached adult levels after year 10. One in five of all persons in the Texas survey had a major dental plate—either full upper, lower or both. Over 90% of those examined had one or more carious teeth in need of filling or extraction. Very little difference was found between children and adults. In one in three persons the decay process had gone so far that at least one extraction was needed.

In 45% of the people their gums had evidence of peridontal disease—ranging from 10% in the 5–9 year olds, to 35% in the 10 to 16 year olds, to 50% or over in persons 17 years of age or older. Severely destructive peridontal disease with pocket formation was present in 1 of 5 of all subjects examined and also increased with age; 1% under 17 years; 10% in the 17–24 year olds; by age 35 years one-third or more persons had very severe peridontal disease.

Nearly 18% of all persons over 10 years of age had trouble with either biting or chewing. For 11% of these it involved only selected food items, for the remainder (7%) it might necessitate significant alteration of their food consumption. Municipal Texas water supplies an appreciable concentration of naturally occurring fluoride. In many communities the level is at or near protective levels and in a few regions, such as West Texas, the fluoride concentration in the local water supply far exceeds recommended levels and results in dental marking.

Over twenty individual nutrients have been measured in the blood and/or urine from over 3800 persons. At this time only 9 major ones have been partially analyzed. A total of 92 participants (2.4%) had significant amounts of glucose

found in their random urine sample. The vast majority of these persons were unaware—and not under treatment—that they might have diabetes mellitus. All of these were referred for further medical evaluation, diagnosis and therapy.

Utilizing biochemical standards developed in past years by the National Nutrition Program and published in the Manual for Nutrition Surveys, 1963, the biochemical values have been classified into categories of "deficient", "low", and "acceptable" for each nutrient. Our overall data, grouped without regard to age, sex or other physiologic characteristics are listed below in this classification by percent:

[In percent]

	Deficient	Low	Acceptable
Hemoglobin	3	8	92
Hematocrit	4	22	78
Plasma carotene	0	1	99
Plasma vitamin A	2	18	82
Serum vitamin C	4	12	88
Total serum protein	7	16	84
Serum Albumin	3	19	81
Urinary thiamine	1	9	91
Urinary riboflavin	6	19	81

Mean *hemoglobin* levels of both male and female subjects were in the "acceptable" range and increased with age during the first twelve years. With the onset of menses female means values plateaued while male levels continued to increase until the late teens. In both sexes there was a downward trend among subjects over 60 years of age. The percent with "deficient" and "low" values had three peaks; (1) in the early school aged boys and girls (6–9 years); (2) the highest percent in women 15–34 years of age; and (3) in our elder citizens of both sexes. "Low" levels of hemoglobin were present in declining prevalence order—Negro American to Mexican American to non-Latin white subjects.

A similar pattern was found for the ratio of red cells to plasma per unit of blood (*hematocrit*). The percent of "low" values was several fold greater than those for hemoglobin which can not be interpreted at this time.

Mean Plasma *Vitamin A* levels were in the "acceptable" range and increased with age. There was no significant difference between the mean values when examined for sex characteristics. The percent of "low" values declined with age from a high of 40% in the pre-schoolers to less than 5% after the age of twenty years; was higher in the Mexican American than the Negro or non-Latin white participant.

Mean Serum *Vitamin C* levels were in the "acceptable" range. The percent of "low" levels were greatest in non-Latin white subjects, next in the Negro and least in our Mexican American participants.

While the mean *total serum protein* and serum *albumin* levels fell in the "acceptable range, from 1 in 6 to 1 in 5 of the subjects had "low" values. From a nutritional biochemical viewpoint the serum albumin data are much more meaningful. We did not expect to find 3% of our subjects with values less than 2.8 gm per 100 ml. Up to twice as many "deficient" and "low" levels were found in the non-Latin white as compared to either the Mexican or Negro American participants.

Both urinary *thiamine* and *riboflavin* median values fell in the "acceptable" range. The percent of "low" thiamine values was twice as great in non-Latin white subjects as in either of the other groups. Likewise "low" riboflavin in non-Latin subjects revealed a similar pattern but at 1½ times the rate of the other groups.

Only our hematologic and Vitamin A data have age and sex characteristics. The other five basic variants have not been completed. It must be remembered that the data are based on only 80% of our participants.

Very limited dietary analyses have been completed. The pattern of frequency of food intake which our participants had been eating are summarized below by ethnic group and percent having less than 1 use/household/day:

PERCENT FOOD USE PER DAY PER HOUSEHOLD

	Mexican American			Negro American			Non-Latin white		
Use per day	Less than 1	1 to 15	Greater than 15	Less than than 1	1 to 15	Greater than 15	Less than than 1	1 to 15	Greater than 15
Legumes	41	21	38	89	10	1	87	10	3
Meats	59	26	15	55	19	26	53	28	19
Poultry	96	3	1	93	6	1	96	4	0
Eggs	15	75	10	32	64	4	28	66	6
Cereals	29	28	43	12	83	5	7	31	62
Tortillas	33	20	48	99	0	1	98	2	0
Vitamin A	80	18	2	79	19	2	72	25	3
Vitamin C	49	37	14	58	35	7	33	53	14
Milk	7	19	64	25	19	56	11	31	58
Pastries	75	21	4	88	11	1	60	35	5

These data cannot be used for dietary intake analyses; they do suggest that the intake of nutrient sources of at least Vitamin A, C, riboflavin, calcium and possibly iron and protein may be limited in a portion of our survey families.

Although the school lunch program was not available at the time of the summer survey activities, it was in full operation during the Valley operations in November. One in eight of all our adolescent young men and women did not participate in this program. Only a little more than one half had used their school lunch program the full 5 days per week.

Nine percent of our teenagers reported the ingestion of clay, starch, paper or other forms of pica. Both Mexican and Negro Americans reported its use.

Nutrients supplements (vitamins and/or minerals) were utilized by some of the 570 adolescent, 31 pregnant and 182 elderly individuals with dietary interview data. Eighteen percent, 42% and 38% respectively of these individuals were taking such supplements.

Among our elder citizens (over 60 years of age) three out of four reported they had made a change in what they ate or drank in the past 10 years. One out of five were on some type of special diet.

During the survey field operations in 26 counties the food stamp program was in effect in 3 counties and the Food Commodity Program in additional 19 counties. In July, Bexar, El Paso, and Tarrant counties were utilizing the Food Stamp Program—the first had just initiated their program. A total of over 6,500 families comprising 26,700 persons were eligible of whom a minimum of 3,650 households made one or more purchases during that month. During the month of July, 1968 on a state wide basis 190,000 persons were served items from the Food Commodity distribution program. In our 19 surveyed counties with such programs in operation, 86% of the 86,300 certified persons were served commodities in July, 1968. From our household dietary data less than 10% of survey participant families were recipients of either the Food Stamp or Food Commodity Programs.

To summarize the clinical, biochemical and dietary data we have available as of mid January, 1969 is very difficult because the incomplete analysis of many important factors. At this stage one can say we do have malnutrition in our random sample population of the lower socio-economic groups in Texas based on at least biochemical and clinical evidence. Our data *do not* indicate that any one ethnic segment of this sample is primarily affected. Each group may be more seriously involved in one nutrient while another group will be more so in another. It would be extremely dangerous to extrapolate these findings to other socio-economic segments of our state's population let alone to other states of the union. Not until many more state surveys have been completed will there be valid factual data to draw national conclusions, interpretations and recom-

mendations. In contrast, we in Texas now have the hard facts to commence to interpret and to develop recommendations for our people. With the aid of appropriate state and local governmental agencies, professional and educational groups, food production and industry representatives we plan to move forward to solve our nutritional health problems.

In closing I would like to return to the real story of the Texas Nutrition Survey—the participants, the team and the state and local support. Our appreciation can never be expressed adequately to the over 4500 individuals who volunteered to participate in all phases of the examination; the over 600 local governmental, health, school and welfare persons who assisted with the four parts of the field team activities, Dr. James E. Peavy, our Commissioner of Health and his staff; Dr. J. W. Edgar and his staff of the Texas Education Agency; and to the staff and consultants of the National Nutrition Program plus the Food and Drug Division. It was a remarkable survey team of 25 professionals and 63 allied health personnel of whom 51 were undergraduates or very recent graduates of Universities within our state. Five of six recent graduates of Universities within our state. Five of six team members were residents of our state, and one out of three was fully bilingual in Spanish. Included in our professionals were 6 physicians and 3 dentists. The survey is probably responsible for consolidating and/or altering a good number of our student team members career training plans. From our team, four persons have joined the New York State Survey, one the Kentucky Survey and two the forthcoming Michigan study. An additional 30 have applied to join future state surveys during the summer recess of 1969. Every one of the 88 team members functioned superbly. To single out only a few members will be unfair. However, without our codirector Dr. Fratis L. Duff of the Texas State Health Department; our deputy director Dr. Virginia Blocker; and our section chiefs Mr. Martin Towler, Mr. Edwin Bridgforth, Mr. Earl Schubert, Dr. Earl Dawson, Mr. Meredith Lewis, Miss Ann Fogelman, Miss Cleo Arnett, Miss Karin Werrbach, Dr. Jorge Cabrera, Dr. William Buckner, Mr. Malcolm Adams, Dr. Buford Nichols, Dr. Sidney Kaliski and Mr. Peter Moore the whole operation would not have been possible. It was a team effort!

ADDENDUM

SUMMARY—JANUARY 21, 1969

When a non-diseased population eats an adequate diet such as outlined in the Recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council one *would not expect* to identify clinical, biochemical or dietary manifestations of nutrient lack. Based on our preliminary examination of the data from the Nutrition Survey in Texas a significant amount of malnutrition has been found among participants residing in the 103 lower socioeconomic enumerations districts in Texas. Until our data processing and analysis have been completed one can not pinpoint the impact of age and sex; level of available cash income; educational background; ethnic characteristics or location. Suffice it to say that we have sufficient data to state that these nutritional health problems *are not restricted* to any one segment or region of our state.

The Nutrition Survey in Texas has completed its fact finding phase of operations based on a random sample of over 1700 families (7300 people) of whom over 70 percent were involved in both parts of our examination proceedings. There is in this sample an adequate representation of all the lower socioeconomic levels in our state. Having rigidly stayed within our sampling plan we will be able to use our data for statewide interpretation and recommendations.

While the vast majority of our subjects did not reveal evidence of malnutrition, a few participants were discovered with overt clinical manifestations of nutritional deficiency disease. A significant number of subjects had physical lesions (1 to 5 percent) and either "deficient" (1 to 7 percent) or "low" (8 to 22 percent) biochemical levels. These data are in the same order of magnitude as has been reported for the Montana Indians in 1961 and among rural communities in the six Central American countries in 1965 through 1967. Limited dietary data that are available at this time support the clinical and biochemical findings.

From 6 to 9 months of growth retardation in height and weight was found in our pre-school (0–5 years) aged children. During school years (6–18 years) these body measurements moved upward in weight and to a lesser extent in height—to move closely approximate accepted American norms. Beyond age twenty-five the other extreme begins to appear—namely an ever increasing prevalence of obesity particularly in the female.

In spite of some protection from naturally occurring fluoride in our water supply severe dental problems—both decay and peridontal disease were found. In one out of every fourteen over the age of 10 years this was advanced to the extent it could well interfere in their food intake.

Inasmuch as our data do not indicate that any one ethnic group of this sample was primarily affected. It would be extremely dangerous to extrapolate these findings to other socio-economic segments of our state's population let alone to other states of the union. Not until many more state surveys have been completed will there be valid factual data to draw national conclusions, interpretations and recommendations. In contrast we in Texas now have the hard facts to commence to interpret and to develop recommendations for our people. With the aid of appropriate state and local governmental agencies, professional and educational groups, food production and industry representatives we plan to move forward to solve our nutritional health problems.

COMPARATIVE "LOW" BIOCHEMISTRY/TOTAL POPULATION

[In percent]

	1968 (Texas)	1961 (Montana)	1965 (Guatamala)	1966 (Honduras)	1965 (Salvador)	1966 (Nicaragua)	1966 (Costa Rica)	1967 (Panama)
Hemoglobin	8	9	3	5	4	2	4	5
Plasma carotene	1	4						
Plasma vitamin A	18	62	11	22	23	8	17	6
Serum vitamin C	12	1	4	2	8	1	2	6
Total serum protein	16	2		10	4	3	8	7
Serum albumin	19	3						
Urinary thiamine	9	7	25	11	2	14	49	48
Urinary riboflavin	19	16	33	11	12	4	4	24

COMPARATIVE PERCENT CLINICAL LESIONS/TOTAL POPULATION

	Texas, 1968	Montana, 1961
Filliform papillary atrophy of tongue	5	9
Follicular hyperkeratosis of skin	2	4
Diffuse swollen red gum papillae of gums	3	6
Angular lesions of lips	1	2
Glossitis of tongue	1	[1] 1
Visible enlargement of thyroid gland	5	12

[1] Less than or equal to 1 percent.

TEXAS NUTRITION SURVEY—PROGRESS REPORT, OCTOBER 8, 1968

The progress of the Texas phase of the National Nutrition Survey was reviewed at a recent meeting of Dr. James E. Peavy, Commissioner of Health, Texas State Department of Health; Dr. William J. McGanity, Dr. Fratis L. Duff and other officials of the Texas State Department of Health and the United States Public Health Service Washington.

Of the 26 counties to be surveyed, 92 percent have been completed. Two counties in the Valley area will be surveyed in November after the return of migrant workers to their home base. The Texas Nutrition Survey, a joint operation of the University of Texas Medical Branch, Galveston and the Texas State Department of Health has examined over 3700 persons from over 1100 families selected by a three step random sample design in 95 enumeration districts (portion of a census tract) whose average income level in 1960 fell in the lower 25 percent of the economic scale. Employing 67 team members, a battery of objective tests and interviews to evaluate the social, cultural, economic, clinical, dietary and bio-

chemical factors involved in nutritional health assessment has been carried out in the following 24 counties:

Anderson	Guadalupe	Newton
Bexar	Hardin	Nueces
Dallas	Harris	San Patricio
Dimmit	Haskell	Tarrant
Duval	Jones	Travis
Ector	Lampasas	Uvalde
El Paso	Limestone	Washington
Frio	McLennan	Wichita

As of this time, basic identification, social, cultural and educational data have been collected from over 1600 households in home interviews. Of these families, almost 70 percent came to the examination centers for the remaining segments of the nutritional evaluation. These were carried out in Public School facilities provided by each school district with the assistance of Commissioner J. W. Edgar and his staff of the Texas Education Agency. Over 50 individual schools were utilized during the 3 months of field team activities completed during Phase I of the operations.

The nutrition survey in Texas was the first of 10 studies authorized as a part of a National Nutrition Survey under the overall responsibility of the Nutrition Program of the National Center for Chronic Disease Control. Louisiana, New York State and Kentucky are in training or in field operations at present. Texas was requested to initiate these surveys for several reasons. Skilled professional personnel with prior experience in Nutrition Survey design and techniques were available in our state. The population characteristics of Texas provide a cross section of cultural, ethnic, language, urban and rural aspects. From the Texas Nutrition Survey much has been learned and developed which will be incorporated into the planning and implementation of work in the other state nutrition surveys.

Only preliminary descriptive data from the Texas Study are available as yet. From Phase I data are available as follows:

Household Socioeconomic information	977 households.
Anthropometric measurements	3,661 persons.
Clinical nutrition examinations	3,676 persons.
Adult and pediatric medical histories	3,664 persons.
Visual and hearing tests	3,152 persons.
Dental examinations	3,011 persons.
Dietary:	
Frequency	1,530 persons.
Intake	1,503 persons.
Biochemical sample blood and urine	3,261 persons.
Bone age X-ray studies	1,171 persons.

Detailed compilation and analysis are under way. The random sample was designed to evaluate the nutritional status of households resident in lower economic enumeration districts in the State of Texas rather than for each individual county or city. In the *first 79 locations* over 2700 persons were studied of which 3 out of 5 were female. Of this overall total number, 18 percent were pre-schoolers; over 16 percent were adolescents; and over 12 percent were above 60 years of age. Of the survey participants, 56 percent had a combined family income of under $3,000 per annum; in an additional 24 percent the family income was between $3,000 and $5,000 annually. The vast majority (four out of five) of eligible adult male members of these families were gainfully employed both during the preceding month and past year.

Eighty-two persons (0.25 percent) had sugar found in their urine examination. The majority of these persons were not aware of the possibility of their having diabetes mellitus. In some areas clinical and biochemical evidence was found indicative of the need in the diet of additional intake of several essential nutrients; however, *no instances of acute hunger or starvation were found among subjects examined at the time of the survey during the summer of 1968.* Considerable variation was found in the overall nutritional biochemical assessment of 3300 subjects. Blood and/or urine values for each of the 26 nutrients that were measured revealed that from one to twenty percent of the subjects had values which fell below "acceptable" standards. The dietary information from house-

holds and individuals has been coded in preparation for computer processing and analysis. Preliminary tabulation of findings indicates a very large number of subjects with untreated dental and periodontal disease in need of urgent dental care.

Until all data—clinical, dietary and biochemical—have been examined for age, sex, location, ethnic and economic characteristics, any interpretation of the results or conclusions would be premature. When the nutrition survey is completed, and the almost 200 items of data are analyzed, health agencies, governmental bodies and professional groups within the State of Texas will have available valuable scientific data on the nutritional status of a significant sample of its population.

RELEASE BY TEXAS STATE DEPARTMENT OF HEALTH, OCTOBER 20, 1968

Nutritional deficiencies and dental and periodontal disease were uncovered among the more than 3,700 persons examined in the first part of the Texas phase of the National Nutrition Survey.

Dental and periodontal disease (ailments of the gum tissue) were found in 84 percent of those surveyed—about the national average—while some deficiency in nutrients was found in up to 20 percent.

A preliminary report of the Texas survey—which is 92 percent complete—was reviewed by Dr. James E. Peavy, commissioner of health of the Texas State Department of Health; Dr. William J. McGanity, University of Texas Medical Branch at Galveston; Dr. Arnold E. Schaefer, Nutrition Program, National Center for Chronic Disease Control; Dr. Boris Oscheroff of the United States Public Health Service; Dr. Fratis L. Duff and other officials of the Texas State Department of Health.

The Texas Nutrition Survey is a joint operation of the UT Medical Branch at Galveston and the State Health Department.

The more than 3,700 persons examined are from more than 1,100 families selected by random sampling in portions of 96 census enumeration districts whose average income level in 1960 fell in the lower 25 percent of the economic scale. The 67 team members used a battery of objective tests and interviews to evaluate the social, cultural, economic, clinical, dietary and biochemical factors involved in the nutritional health assessment. Surveys were carried out in the following counties: Anderson, Bexar, Dallas, Dimmit, Duval, Ector, El Paso, Frio, Guadalupe, Hardin, Harris, Haskell, Jones, Lampasas, Limestone, McLennan, Newton, Nueces, San Patricio, Tarrant, Travis, Uvalde, Washington and Wichita.

The present, basic identification, social, cultural and education data have been collected from more than 1,600 households in home interviews. Of these families, almost 70 percent came to examination centers for the remaining segments of the nutritional evaluation. Facilities in more than 50 public schools were used through assistance of Commissioner J. W. Edgar and the Texas Education Agency.

Texas was the first to initiate its portion of the survey. Only preliminary descriptive data is available. Detailed compilation and analysis are under way.

In the first 79 locations, more than 2,700 persons were studied, of which three out of five were female. Of this total, 18 percent were pre-schoolers; more than 16 percent were adolescents; and more than 12 percent were above 60 years of age.

Of the survey participants, 56 percent had a combined family income of under $3,000 per annum and another 24 percent had a family income of between $3,000 and $5,000 annually. The vast majority (four out of five) of eligible adult male members were gainfully employed both during the preceding month and past year.

Sugar was found in the urine examination of 82 persons (0.25 percent), the majority of whom were not aware of the possibility of their having diabetes.

In some areas clinical and biochemical evidence was found indicative of the need in the diet of additional intake of several essential nutrients; however, no instances of acute hunger or starvation were found among subjects examined at the time of the survey, said Dr. McGanity. Considerable variation was found in the overall nutritional biochemical assessment of 3,300 subjects. Blood and/or urine values for each of the 26 nutrients measured revealed that from one to twenty percent of the subjects had values which fell below "acceptable" standards for one or more nutrients. The dietary information from households and individuals has been coded in preparation for computer processing and analysis.

Preliminary tabulation of findings indicated a very large number of the subjects had untreated dental and periodontal disease in need of urgent care.

Until all clinical, dietary and biochemical data has been examined for age, sex, location, ethnic and economic characteristics, any interpretation of the results or conclusions would be premature, said Dr. McGanity. When the nutrition survey is completed and the almost 200 items are analyzed, health agencies, governmental bodies and professional groups within the state will have valuable scientific data available on the nutritional health status of a significant sample of its population, he said.

THE UNIVERSITY OF TEXAS MEDICAL BRANCH,
Galveston, Tex.

TEXAS NUTRITION SURVEY

QUESTIONS AND ANSWERS

During the past two weeks the Texas Nutrition Survey team has been working in the field in Nueces, Bexar, Uvalde, Frio and Dimmit Counties. Our original schedule has been modified only slightly, and we expect to complete all examinations except in Cameron and Hidalgo Counties by the end of the first week in September. Meanwhile, in contact with medical and nursing personnel in the various areas, with school superintendents and principals and with O.E.O. and other local and state agencies who are interested in our project, a number of questions have been asked which require additional clarification.

A. *How was the sample chosen?* In February, 1968, two months prior to the release of the "Hunger U.S.A." report, 26 counties in Texas were selected at random from 200 of the 254 counties. Within each county, in proportion to the number of census tracts with low-income sections, a second random selection was made of enumeration districts (so-called E.D.'s, that is, a portion of a census tract containing approximately 200 dwelling units at the time of the 1960 census). The number of E.D.'s range from a minimum of 1 to a maximum of 11 per county. A total of 103 E.D.'s have been allocated in the 26 counties.

B. *How are the families in each E.D. selected for participation in the Nutrition Survey?* Based on a random start a sector of each E.D. was selected as a unit containing 60 dwelling units. From this unit a total sample of 20 families was chosen to participate voluntarily. Residents in every third household are visited by our home interviewer who identifies members of the family and invites them to take part in the examinations. An appointment is made to suit the family's convenience.

C. *Are we interested in a particular age or sex group?* No, we wish to have *all members* of the family included for examination, from grandparents to the newest infant.

D. *How does the survey team operate?* We have 4 teams in the field:

(1) *The Mapping Team.*—To map the E.D. and to identify the specific cluster of 60 dwellings. This team has only 2 members, both males (Mr. Mario Dablo and Mr. Dennis Suirre). It operates almost 2 weeks in advance of the Field Examination team, and will be in your county.

(2) *Advance Team Co-ordinators.*—To co-ordinate and make arrangements for the home Interview and Field Examination, the team has Dr. and Mrs. Sidney Kaliski as members. They will contact the governmental, health, educational, and social agencies and organizations in your county. They are scheduled to start in your county.

(3) *The Home Interview Team.*—To visit the homes of the 20 families selected in each E.D. This team has 7 members, all males, with Mr. Martin Towler as Chief. Their duties are (a) to inform the family about the survey and to invite them to participate; (b) to obtain the names, ages and sex of each member, if the family agrees; and (c) to schedule a time for them to come to the examination center. The Home Interview Team operates 2 to 3 days in advance of the Field Examination Team, and will start work in your county.

(4) *Field Examination Teams.*—To carry out the procedures outlined in item F comprises two equal groups of 20 persons each. In most counties both teams will be operating in your county or community at the same time and very often in the same location. Each team has the capability to handle 20

families per working day. During phase I, Drs. Virginia Blocker, Harold Sanstead and William McGanity serve as Field Examination Team Directors. This team is scheduled to start work in your area.

E. *Where are the Field Examinations carried out?* Through the generous assistance of your state and local schools the survey team has been offered the facilities of schools adjacent to, or near, the selected E.D. areas. Cafeterias, gymnasiums or classrooms are employed for the various examinations.

F. *What is actually done during the examination?* The following studies are carried out on *each member* of the family group:

(1) Weight and height plus 10 other body size measurements.

(2) A screening test for hearing and visual acuity.

(3) A medical history oriented toward growth and development in children and chronic disease states in adults.

(4) A clinical examination for signs of nutritional deficiency which does not require complete undressing on the part of the patient.

(5) A dental evaluation of the teeth and gums from the standpoint of nutrition and overall assessment of dental condition.

(6) A half ounce sample of blood and 2 ounces of urine, on which 22 different measurements are made for a biochemical profile in relation to nutrition and apparent deficiencies.

(7) An x-ray of the right hand and wrist to evaloate bone growth and development.

(8) Dietary histories on individual members of families and/or family groups as a whole.

(9) A short socio-economic history to relate food habits to income.

G. *How long does the survey take?* About 90 minutes per family.

H. *Does it cost the family anything?* No.

I. *How do the families get to the examination center?* The team sends a driver to pick up the family and return them home after the survey.

J. *What are the hours of the field examinations?* From 2:30 to 9:00 p.m. Tuesday through Saturday. Except for the larger cities only 2 or 3 days are spent in each county.

K. *Who are the personnel?* Almost all team personnel are Texans. Each employee is either a college student or a graduate from a college and/or a professional school. These include physicians, dentists, nutritionists, dietitians and biochemists. All are permanent or temporary employees of the University of Texas Medical Branch in Galveston, which together with the State Health Department is in charge of the Texas Nutrition Survey. All team members carry identification cards with their photograph and their signature.

L. *How long will the survey last?* Phase I will be completed at the end of the first week in September. Phase II, which will include survey of migrant workers and of E.D.'s in Hidalgo and Cameron Counties will be conducted during the last week in October and the first week in November. (A specific schedule will come later).

M. *What is the plan for the entire country?* Texas and Louisiana are conducting the first two of twenty surveys planned in different parts of the United States. Funds are received jointly from state and federal sources.

N. *What is the purpose of the nutrition surveys?* The purpose of the nutrition surveys is to seek factual scientific information on the nutritional health of a segment of Texas. No data are available at present for our state or from any state in our country which will give an overall picture of our nutritional health based on a sound statistical approach. We have no bias as to which dietary food intake patterns are superior. We try to interest the family in the problem of general health in relation to nutrition: "Why does the food your family eats make them healthy—or unhealthy?" *This is not a hunger crusade.* We hope to identify whether or not malnutrition exists in our state; if so, where problems exist and to what extent. Malnutrition is objective; hunger, subjective.

O. *What about the results:* All data collected will be analyzed and interpreted in Texas. The preliminary and final reports will be forwarded to local and state agencies and professional organizations for their use in planning for their communities and activities. If any nutritional problems are found in an area, short- and long-term recommendations will be in order. Finally, if any immediate problems are noted in an individual patient (such as sugar or albumin in the urine),

referral will be made at the time of discovery to the patient's own physician or clinic and follow-up visits will be suggested from visiting nurses in the area.

P. *Do we need your help?* Yes, in many ways:

(1) Please inform *your staff personnel* of our work, our schedule as it affects your area and the purposes of the survey.

(2) Lend us your moral support and endorsement.

(3) Assist us in setting up examinaion facilities in schools. If you have not been contacted already, Mr. Earl Schubert will be in your area shortly to make these arrangements.

(4) Contact us in advance at the University of Texas Medical Branch if you have questions or advice or call us on the day of the survey in your area.

* * * * * * *

(5) Assist us in the work of the mappers. Although in large part our team is self-sufficient, our mappers need up-to-date maps which in small cities and towns are available only locally. We have census maps and maps from major oil companies but may need others for plotting the houses in each E.D. and for location of minor streets, etc.

(6) Welcome the Kaliski's, they will need a few minutes of your time to explain and answer your questions, to make final arrangements within the school to be used for examination, to identify, contact and orient individuals to assist our Home Interviewers. (See next item.)

(7) Help to provide us with local persons who can assist our *home interviewers.* Theirs is the toughest task of the survey. Doors are slammed in their faces; selected families are sometimes unwilling to answer their questions; sometimes they are mistaken for insurance salesmen. Even if they promise to come to the examination center at the appointed time, the family may lose confidence in the home interviewer and decide later not to come. To minimize problems and to attract, hopefully, at least 80% of the designated sample for meaningful results, we need persons in your communities to introduce our personnel to the families as they knock on the doors in each E.D. sample. Such persons need to have the following qualifications:

(*a*) They need to be known to families in the area

(*b*) They should be, preferably, female, mature individuals

(*c*) In areas with large Latin-American populations it would be helpful to have Spanish-speaking persons. Five of our seven home interviewers are bilingual, but occasionally Spanish may be needed in every home in a particular E.D.

(*d*) Home interviewer helpers should be available from 10:00–12:00 a.m. and from 4:00 to 7:00 p.m.

Q. *May visitors attend the survey?* We welcome visits from all interested persons. Please come between 2:30 and 9:00 p.m. on the designated days and inquire for the Team Director in charge. The examination team is self-sufficient, but we welcome comments and advice on problems in your community. From time to time we may ask for assistance with recruitment of individual families with whom prior appointments have been made.

In your county the following E.D.'s have been chosen by random selection:

Please feel free to pass along the information in this letter to your local communications media if you think that any more prior publicity would be helpful. Since we cannot use volunteers in our sample we have not made a great effort to advertise the survey except for general information purposes.

With kindest regards,

Sincerely yours,

WILLIAM J. MCGANITY, M.D.,
Project Coordinator.

The CHAIRMAN. Thank you very much, Dr. McGanity and Dr. Schaefer.

As I said earlier, this is going to be of tremendous help to the committee in the matters that we are pursuing.

The committee will adjourn until 10 o'clock tomorrow, when we will take testimony from Dr. Walter Unglaub and Dr. Patrick Morgan

of Tulane University, who are the directors of the nutrition survey in the State of Louisiana.

We will also hear from Mr. B. P. Taylor, the superintendent of schools at San Diego, Tex.

The committee will be adjourned until 10 o'clock tomorrow.

(Whereupon, at 3:45 p.m., the committee recessed, to reconvene at 10 a.m., Thursday, January 23, 1969.)

NUTRITION AND HUMAN NEEDS

THURSDAY, JANUARY 23, 1969

U.S. SENATE,
SELECT COMMITTEE ON NUTRITION AND HUMAN NEEDS,
Washington, D.C.

The committee met at 10 a.m., pursuant to recess, in room 1202, New Senate Office Building, Senator George McGovern (chairman of the committee) presiding.

Present: Senators McGovern, Ellender, Yarborough, Percy, Cook, and Dole.

Also present: William C. Smith, staff director and general counsel; Kenneth Schlossberg, professional staff member; Bertram G. Waters III, American Political Science Association fellow; and Clarence V. McKee, professional staff member for the minority.

The CHAIRMAN. The committee will come to order.

I have asked Senator Ellender to present the two lead-off witnesses today because they are distinguished doctors from his State.

Senator ELLENDER. Mr. Chairman, I am very glad to present Dr. Unglaub and Dr. Morgan. I graduated from Tulane in 1913 and tried to keep up with many of the professors, but all those who taught me are now dead. I go around the university quite often and am not able to meet all the professors, but I am very glad indeed this morning to present Dr. Unglaub and Dr. Morgan.

Dr. Unglaub is associate dean and professor of medicine, Division of Graduate Medicine at Tulane, Dr. Morgan is deputy director, National Nutrition Survey for Louisiana.

As I understand, there was money allocated by HEW in order to carry on this program in Louisiana in the same manner as in eight other States. Dr. Unglaub and Dr. Morgan, we are very glad to have you before us and you may proceed.

STATEMENT OF DR. WALTER G. UNGLAUB, PROFESSOR OF NUTRITION, TULANE UNIVERSITY, SCHOOL OF PUBLIC AND TROPICAL MEDICINE, ACCOMPANIED BY DR. PATRICK M. MORGAN, DEPUTY DIRECTOR, NATIONAL NUTRITION SURVEY FOR LOUISIANA; AND DR. ARNOLD E. SCHAEFER, CHIEF, NUTRITION PROGRAM, DIVISION OF CHRONIC DISEASE PROGRAMS, REGIONAL MEDICAL PROGRAMS SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. UNGLAUB. Perhaps before I go to my prepared statement, Senator, I should give some background to Dr. Morgan and myself. I hold an M.D. degree. I am a professor now, Senator—my title changed since you got that information—professor of nutrition now in the School of Public Health and Tropical Medicine.

I have worked in the field of human nutrition since 1951, and in my time I have participated in seven of Dr. Schaefer's nutrition surveys in developing countries, and directed four of them. I have worked actively in the evaluation of nutritional status of the State of Louisiana, particularly in the past 6 years.

Dr. Morgan holds the dual doctorate degrees of doctor of veterinary medicine and doctor of public health, he has in his time participated in nutrition surveys in Guatemala, El Salvador, and Costa Rica and, as Senator Ellender has mentioned, is serving as deputy director of the Louisiana segment of the National Nutrition Survey, which means essentially he is doing all the work.

To go to my prepared statement: The field work of the National Nutrition Survey in the State of Louisiana is now approximately 90 percent completed. At this time it is possible to present only a preliminary analysis of a portion of the data thus far gathered. However, the results of this preliminary analysis are considered to be sufficiently significant and worthy of concern to warrant their presentation to this committee at the present time.

I would mention that the data that Dr. Schaefer presented to you yesterday was composite data derived from Texas, Louisiana, Kentucky, and New York. The data I am to present this morning deals specifically with the State of Louisiana.

The information to be presented here this morning is derived from the study of a partial sample of the survey—we had the cut-off date on this some time back—representing a total of 2,774 individuals from 81 of 97 census enumeration districts in 16 of 19 parishes, or counties, of the State of Louisiana selected for study according to criteria described to you yesterday by Dr. Schaefer. Of this group, 50.3 percent were below the age of 16 years, 36.7 were from 16 to 59 years of age, and 12.9 percent were above the age of 60 years. Females made up 58.3 percent of the sample, while 41.7 were males. The majority of the sample was of the Negro race. In contradistinction to the findings in Texas, we have very few Spanish-American subjects in this survey so we do differ from Texas in our sample.

In addition to the studies of the basic sample population described to you by Dr. Schaefer, additional studies have been done in a group of 842 individuals, residents of the same sample enumeration districts but not included in the preselected random sample. Data from this group are to be analyzed separately from that derived from the definitive sample population and will be used for statistical control purposes.

Twenty-four hour dietary recall questionnaires have been completed for 863 individuals and 438 households in the definitive sample and for 210 individuals and 137 households of the "volunteer" sample, for a total of 1,073 individual and 575 household questionnaires. On table 1 [1] the actual status of it at the present time is considerably larger. As I said, we had to put an early cut-off on this date for purpose of analysis.

I burden you with these figures only because I would like to point out that the completion of each of these questionnaires, that is, solicitation of dietary information, requires a great deal of time by highly trained nutritionists, who are very few and far between.

[1] Table 1 can be found on p. 938.

Through January 9, 1969, blood samples obtained from 3,720 subjects of the study and urine samples from 2,471 of these for the routine biochemical studies described to you by Dr. Schaefer, and listed in his prepared statement yesterday.

In the Louisiana study, blood samples have also been collected for special studies of antibodies to various Salmonella species, identified with food intoxication and infection, and stool samples have been collected for studies of intestinal parasites. Special studies are also being done for identification of subjects with food and drug allergies.

As far as results, the dietary studies, analyses of data obtained from dietary intake studies is extremely complex and time-consuming, even with the use of advanced computer techniques. At this time the analysis of the dietary studies of the Louisiana survey have been limited to partial data derived from two of the major groups of the study population considered to be among the most susceptible to the effects of nutrient deprivation, namely, adolescent children and infants.

The results of this preliminary study are shown in table 2.[1] From these analyses, there appears to be reason for serious concern about the nutritional status of the adolescent group with respect to calories, iron and vitamin A in particular, although the level of intake of all the nutrients listed is cause for concern enough.

Senator ELLENDER. Mr. Chairman, off the record?

(Disscussion off the record.)

Dr. UNGLAUB. From the table I referred to, if we examine the level or adequacy, and by this I mean according to recommendations of the Food and Nutrition Board of the National Academy of Sciences, National Research Council, we find that almost 30 percent of our sample got less than 50 percent of an adequate amount of calories. Almost 17 percent of the sample received less than 50 percent of the recommended level of protein. Of particular concern, 33 percent of this group of adolescents received less than 50 percent of the recommended allowance for iron.

Now, I would remark here that, with respect to calories and iron, the recommendations of the Food and Nutrition Board do not allow us much of a safety factor, if any. In fact, there is none for calories and little, if any, for iron. So these are particularly significant.

With respect to the recommedations for certain other nutrients such as vitamin C, there is a safety factor allowed, so perhaps this is not as serious as it may appear in some instances.

Almost 40 percent of our samples were getting less than 50 percent of an adequate amount of vitamin A, 32 percent again receiving less than 50 percent of an adequate amount of vitamin C. There are significant numbers below 50 percent of the recommendation.

For thiamine and riboflavin to the B-complex vitamins, 16.3 percent in one hand about 9 percent with respect to the other, so as you can see across the board for the nutrients listed there are an alarming number who are not receiving an adequate intake.

Senator ELLENDER. Are you able to tell us why that is?

[1] Table 2 can be found on p. 939.

Dr. UNGLAUB. Not at the present time, Senator. I think we have to speculate. Part of it I am sure is economic, but I think probably most of it is ignorance and habit.

Senator ELLENDER. That is what I wish you would give us a little thought on. Personally, I do feel that a good deal of it is due to a lack of knowledge on the part of the fathers and mothers and probably older people, and I am sure that some of it is due to inability to provide funds in order to purchase the necessary food.

Dr. UNGLAUB. Right. I wholeheartedly agree with you. I think that ignorance and lack of knowledge is a major factor here, and I think this underlines what Dr. Schaefer has mentioned and I believe former Secretary Cohen, the need for expanded educational programs at all levels, and by this I mean not only in the medical profession, in the public health profession down through the schoolteachers to the parents.

Senator ELLENDER. Would you say that it is as important to provide knowledge as it is to provide funds?

Dr. UNGLAUB. Absolutely. Very definitely.

Senator COOK. Mr. Chairman.

The CHAIRMAN. Senator Cook.

Senator COOK. Doctor, I think what the Senator is getting at is, are the commodities made available through the various programs of our Federal Government supplying the basic needs of the recipients in terms of vitamins, calories, et cetera?

For instance, you say that a great many of the cases that you analyzed were short of vitamin A, and the books tell us that one glass of tomato juice will provide a child with the needed vitamin A in the course of a day's time.

I think we want to find out whether the food supplied by government programs is so balanced that the recipients will not suffer from malnutrition. And if the food supplied is not providing a balanced diet then we want to know why. Also, we need to know just how much of this failure to eat properly is due to ignorance.

Dr. UNGLAUB. Precisely correct. I agree.

The CHAIRMAN. Doctor, is it fair to say that the medical profession itself has not concerned itself sufficiently with nutritional problems and nutritional education?

Dr. UNGLAUB. I would say this is correct, yes; at least up until recent times. There is increasing concern among the medical profession in our undergraduate teaching and our graduate teaching and in the public health profession. We have always, I think for a long time, regarded nutrition as public health problems for somebody else and I think we are only now finally coming to realize that we do have a public health problem in terms of nutrition in this country.

The CHAIRMAN. Is there any organized effort on the part of medical societies or medical associations either on a national level or through the State and local societies to try to generate a more effective nutritional education program?

Dr. UNGLAUB. Yes, sir; there is. The Council on Food and Nutrition of the American Medical Association is quite active in this area. They have undertaken surveys to determine how much nutrition education is actually getting into the professional curriculum. In fact, I received a letter from Dr. Philip White, who is Secretary of the Council on

Food and Nutrition, just the day before yesterday requesting that I participate in one of their programs during the coming fall in which they send nutritionists around to various undergraduate schools to orient the undergraduate students and attempt, well, literally to recruit them into the area of nutrition studies, and I have agreed to do this along with a number of other people throughout the country. This is a pretty extensive program of the Council on Food and Nutrition.

Senator ELLENDER. Doctor, are you familiar with the many health centers we have throughout Louisiana?

Dr. UNGLAUB. Yes, sir.

Senator ELLENDER. Is any work of that character carried on by these centers?

Dr. UNGLAUB. Our State health department, the nutrition section of the State health department, is a very active section. Miss Rose Ann Langham, the chief of the nutrition section, who is the coordinator for the State department of health in the Louisiana survey, is quite an active person. She enjoys very good relationships with the State department of education and they do carry on educational programs in the health centers.

Senator ELLENDER. At this time would you be able to state any differences you found? You have 15 parishes here in Louisiana. You have Orleans, you have Evangeline, Acadia, Caddo. Do you find any difference in the examinations you have made of children or of the adults that come from one parish as compared to another?

Dr. UNGLAUB. With respect to this study, Senator, we have not broken the data down that far. However, based on 6 years of experience doing nutritional studies of school age children around the State—we have worked in 12 parishes in that State many of which were included in the survey—yes, we have found differences.

Senator ELLENDER. You found differences.

Dr. UNGLAUB. Yes, sir. Our dietary patterns vary quite a bit. I think five distinctive dietary patterns have been described in the past.

As you are well aware, in southwest Louisiana we have a rice area wheras farther up it is beans and rice, and beyond that we get into the yam country around Opelousas. There are variations.

Senator ELLENDER. When I was a boy we got white beans and rice every day. I am wondering if you would be able to give any specific examples to show the difference, let's say, in certain parishes compared to others, and if you could advance a reason for that difference.

Dr. UNGLAUB. Well, I can give one or two examples based on these early studies. For example, in St. Charles Parish in the school children we studied there we found a high prevalence of these children with very low plasma vitamin C levels. This is a little discouraging because this is a truck farming area and you would think that foods would be rich in vitamin C. And in fact, foods rich in vitamin C are available and yet they do not eat them.

Another example is we find a high prevalence of anemias across the lake from New Orleans in Tangipahoa Parish. Here, I think, it is partly a combination of poor intake of iron and, on the other hand, this is an area that is known to have a high prevalence of intestinal parasites, so these are some of the factors that can enter into the variations.

Senator ELLENDER. Thank you. I think we have a fairly good school lunch program in Louisiana.

Dr. UNGLAUB. We do.

Senator ELLENDER. As a matter of fact, I was in the legislature in Louisiana when we started all this, and then we carried it on on a national basis.

Do you find any improvement in the diets of the schoolchildren in various parishes where they have a very active school lunch program in contrast to one in which they don't have?

Dr. UNGLAUB. We have studied the school lunch program at some length in Louisiana in conjunction with our earlier school surveys and, as you state, we do have an excellent school lunch program which compares very favorably with any in the country.

In fact, I believe there is an article in the most recent issue of the American Dietetic Association which compares the various school lunches, and ours compares quite well with others. We are very proud of it. Participation in it is varied. In some areas there may be 25 percent of the children participating and in other areas as much as 85 or 90 percent. Where they do participate and actually buy the school lunch the amount of it they consume is variable. This varies with the individual child. I think it is helpful. I don't think there is any question about this. We estimate that the school lunches provide about one-third of the daily needs for these children in a well-balanced manner, and usually with an attractive menu.

Senator ELLENDER. How does that affect the intake of the minimum amount of vitamins that should be taken by a child?

Dr. UNGLAUB. In some instances I think the participation in the school lunch really provides the only real good square meal that some of these children get. Children are notorious, of course, for passing up breakfast, and then if they go to a candy machine and Coca-Cola machine for lunch and they go home and the family usually doesn't have a large hot meal in the evening, they don't get too much.

Senator ELLENDER. My reason for asking the question, of course, is really to prove your point that in a balanced diet all of these proteins, calcium, iron, vitamin A, and so forth, would be well furnished. I understand that in these programs an effort is made to provide these vitamins.

Dr. UNGLAUB. Correct.

Senator ELLENDER. Have you been able to find cases where there has been a sufficient amount of vitamins under the supervision by the managers of the school lunch program in contrast to what they get at home?

Dr. UNGLAUB. Of course the school lunch program is very carefully planned to be a balanced diet which is what we would ultimately hope to be able to get across to the mother to do at home but, as I say, this at the most might only represent a third of the recommended level of intake, so they have to get the rest of it somewhere else.

I think if we get back to this table I referred to, we have some tables here regarding the dietary intake of infants from zero to 3 years of age.

Senator ELLENDER. Number what?

Dr. UNGLAUB. That is table 2 at the bottom. But even here in the infants less than 3 years of age we find as much as 62 percent of the sample receiving inadequate amounts of iron. We have almost 40 percent with inadequate intakes of vitamin C and I might add, as you will see shortly, that our biochemical data in general confirm these dietary findings.

Senator ELLENDER. Would you say that a good deal of this is due, and I would like you to repeat it if you will, to the lack of knowledge on the part of the mother and father?

Dr. UNGLAUB. I would say this very definitely. I think perhaps if we can strengthen our nutrition education program in our well-baby clinics—most of these women do attend, as you know, throughout the charity hospital system, either the well-baby clinics at the State hospitals or in the State health department centers, and we do make an effort to incorporate nutrition education here but again we suffer from a shortage of personnel for this purpose.

I was talking to Dr. Hedmeg just yesterday and he informed me that at the present time he has eight vacancies in the State health department alone for nutritionists which he cannot fill because of lack of trained personnel.

Now this figure actually is considerably larger than that because some of these health units are independent of the State health department and the New Orleans City Health Department is independent of the State health department. The New Orleans City Health Department has actually one nutritionist on its entire staff.

Senator ELLENDER. You mean for the whole city?

Dr. UNGLAUB. For the whole city; yes, sir. They are not available. This is the difficulty.

Senator ELLENDER. Again off the record.

(Discussion off the record.)

The CHAIRMAN. Senator Cook has a question.

Senator COOK. Doctor, to pursue Senator Ellender's remarks, don't we again have to relate the food supply that goes into the school lunch programs to the food supplies that are made available to the poverty families to see whether we are providing the same kind of balanced diet through commodity distribution as we are in the school lunch program.

Dr. UNGLAUB. Well, of course, Senator, this is the entire purpose of this national survey, is to get the basic information that we may accomplish that. Up until this time we have not had this type of information.

Senator COOK. Let me ask you this, then, Doctor: You are familiar with some food distribution programs because you have studied the school luncheon programs. You made a survey in Louisiana of schoolchildren in relation to this. In that matter of whether we are efficient or whether we are inefficient in our food distribution programs, is it that these foodstuffs are being made available and there is an ignorance on the part of the families as to what they should consume for balanced diets, or are the programs short in supplying foods which contain iron, calories, protein, vitamin A, vitamin C, and the other nutrient requirements?

Dr. UNGLAUB. I think probably both factors apply. I think again on the basis of the data that we are collecting I would hope that we would be able to undertake a more detailed evaluation of some of these food distribution programs based on some factual knowledge. Up until this time we have only been able to say, "Well, this is what we think you should be getting but we don't know what you are actually getting."

Senator COOK. Although it is a combination of both, you do indicate strongly that the school lunch program is a much more sophisticated program in its daily food requirements than the food distribution programs.

Dr. UNGLAUB. Yes, sir; and we do have one difficulty with the school lunch program in Louisiana at the present time which I hope will be corrected on the basis of these studies, and that is that in the kindergarten grades we do not have a school lunch program and these are the children that really need it.

A little further along I will refer to this again in regard to some special studies we have been carrying out in this respect.

Now, with respect to the clinical studies, I might add that besides simple examination for clinical evidence of nutritional deficiencies we get a very good overall health evaluation of all subjects in this sample and we have picked up other disease conditions, sometimes correctable conditions.

When this happens the action is promptly taken and either the person's physician is notified or the appropriate health officer is notified and action is recommended. We have had very good cooperation from the Charity Hospital of Louisiana of New Orleans, Dr. Burch. If we find a condition that really needs emergency care he is willing to accept our referrals to anywhere in the State without regard to criteria of eligibility.

For example, I believe there was one child with an unset fractured arm which he had had for several days. It hadn't been recognized. Another had an umbilical hernia. This child of course was referred and was accepted. We have in Louisiana a system of charity hospital care which is unlike that in any other State that I know of, and we do have good facilities for hospitalization of patients in this category.

Senator ELLENDER. All of these facilities you mentioned—I think there are nine or 10 of them—all operated by the State.

Dr. UNGLAUB. They are all operated by the State; yes, sir. The two in New Orleans and Shreveport have autonomous boards. The rest are under the State department of hospitals.

The CHAIRMAN. Dr. Unglaub, with reference to the nutritional deficiencies that you find, to what extent are they caused by lack of health care, lack of adequate sanitation in the homes, and other matters related to health?

I realize that is a broad question but I am trying to get some idea of the significance of lack of health care.

Dr. UNGLAUB. I am afraid I can't answer that question, Senator. I simply do not know. As I say, we will have this data available and it will be analyzed with respect to nutritional status, but this is a matter for some time in the future. We have tried up to this point to get out what we feel is the critical data referring to nutritional

status. These other factors such as economics, education, and general health status will be analyzed and this will be reported.

There is a great deal of interest on the part of the medical profession there in the State in getting feedback of these studies so they will know more about what the prevalent medical problems are in their particular area of the State.

The CHAIRMAN. You are not prepared at this point to draw conclusions about the basic factors though that are behind the nutritional deficiencies other than to say a lack of education is certainly a major—did I understand you to say that it is the major factor?

Dr. UNGLAUB. I would say it is a major factor. As I say, we have not done income breakdowns on these studies for Louisiana as yet, and even if we do, if we find, as was found in Texas, a certain predominance in families with incomes of less than $3,000, I still don't know that that would necessarily make it more of a major factor than others.

The CHAIRMAN. If there are large numbers of people in the sampling group that have incomes, let us say, of $2,000 a year of less, would you expect to find a strong correlation there between income and nutritional deficiency?

Dr. UNGLAUB. I don't think I can predict the answer to that question, Senator.

The CHAIRMAN. You have no dependable evidence yet?

Dr. UNGLAUB. Not yet.

Senator ELLENDER. Well, Doctor, do you think that the surveys that are being made in the 10 States will give you a clue?

Dr. UNGLAUB. Yes, sir.

Senator ELLENDER. I wonder if you will also get clues as to States, let's say, like Louisiana, where you say you have good school lunch programs as compared to a State where they don't participate in the school lunch program.

Do you think you will be able to get evidence to show the difference in areas where meals are prepared under the direction of a dietician and where they are not?

Dr. UNGLAUB. I think we will, yes.

Senator ELLENDER. I hope you do because that in my estimation will go far toward assisting Congress in providing better food, methods of distribution, and better school programs because I think that is where we ought to have it. That is where the education comes in, at the school level.

Dr. UNGLAUB. I can say this much Senator: We have been involved in some studies of evaluation of nutritional status of children, in Operation Head Start. We have over 500 of these children under study in the City of New Orleans at the present time. We have also studied similar children at the same ages, four and a half to five and a half years old, in the southern portion of Mississippi.

Now, the program in Mississippi differs from that in New Orleans in that it is a full school day program and these children are served a hot school lunch as part of the Headstart program. In many instances they are given breakfast when they come in. Our clinical evaluation of these children shows that their nutritional status is significantly better than that of the children in New Orleans.

Now, there are other factors that may be involved here besides the school lunch program. For one thing, there is a larger proportion of white subjects in that group. Another thing, it is more of a rural or semi-urban sample, whereas the New Orleans sample is strictly an urban slum, so these are other factors that may be operational but there is a difference there.

Now, the major finding of our clinical examinations as far as nutrition is concerned has been the finding, as shown in the last four figures attached here, of evidence of growth failure in both boys and girls and chiefly below the age of five years. In figure 1 [1] it can be seen that the mean height for age in this group is significantly below, one standard deviation below, the mean of our reference standards, and approximately the same thing can be said for the girls, not quite as marked, but nonetheless within the lower range.

In the children from six on up to 16, it is interesting that they stay pretty much right around the mean, and there is somewhat less variability in this age group. I think we can say that there is evidence of growth retardation of the younger children and I rather imagine, although we have not examined, this will be borne out by our extra studies which Dr. Schaefer referred to yesterday.

Now, we have seen during the course of this survey only two cases of what could be called starvation, or marasmus, and these were found in a pair of premature infant twins who had been under medical care from the time of the delivery and who were being seen, and with a diagnosis of intestinal disorder, so this would be a secondary form of starvation.

Senator ELLENDER. That wasn't due to lack of food, was it?

Dr. UNGLAUB. No; it was probably due to inability to absorb what food was given.

Senator ELLENDER. And you say you found only two cases?

Dr. UNGLAUB. Only two; yes, sir.

Senator ELLENDER. Out of how many samples?

Dr. UNGLAUB. Oh, I would say we have about 3,400, more than that; between 3,000 and 4,000.

Senator ELLENDER. And that is in the 15 parishes that you have been sampling?

Dr. UNGLAUB. Yes, sir. Actually, we have now 17 parishes.

Senator ELLENDER. Seventeen.

Dr. UNGLAUB. Yes, sir. This was written at the time it was 16. Now the real cause, as I say, of concern here is this evidence of retardation in physical growth. We do not know if there is any retardation of mental development in this specific group. However, in our Operation Headstart studies we are doing evaluations of mental performance and physical performance along with the department of psychology in our college of arts and sciences. No overt evidence of nutritional deficiency diseases of any sort was encountered. The prevalence of enlarged thyroid glands does not indicate any overall problem of endemic goiter, although some of our earlier studies of schoolchildren have indicated some localized areas in which this may be a minor problem.

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[1] Charts may be found on pp. 940–943.

The prevalence of goiter, I think, in our population so far is approximately 4 percent, which is not really a cause of immediate concern.

Senator ELLENDER. Would that be normal?

Dr. UNGLAUB. Yes, sir; I would say so, especially with a large group of children such as this. This is a fairly common finding in the adolescent.

Senator ELLENDER. Have you sufficiently studied the findings in Texas where they say there is an unusual amount of goiter?

Dr. UNGLAUB. As I recall, Texas had what—about 5 percent? We have some areas that we can identify, pockets where there is more than this prevalence. We have also done iodine studies in these areas.

Senator ELLENDER. Would you be able to account for that difference?

Dr. UNGLAUB. Well, I think probably it is a matter of iodine content in the local water and soil. It used to be fairly common, particularly up and down the river, years ago, and it was reported by the State health department back in the early 1920's in which it was felt that I think they had something like 12 or 14 percent goiter at that time, and in their interpretation of this they attributed this to the fact that they drank cistern water collected off the roof, so this would be practically distilled water with no iodine whatsoever. Once we can identify if there truly are iodine deficient areas this is an area where we can promote the use of iodine rich salt and I think for practical purposes eliminate it.

In closing my discussion of the clinical findings of this survey I would like to state that as a clinician I feel very strongly on the basis of my years of clinical experience, and in fact I actually know, that the physical manifestations of nutritional deficiency disease appear only in the general population with significant prevalence when such deficiency disease is extremely serious and widespread.

The manifestations of "hidden hunger," as Dr. Schaefer has put it, are less obvious than changes in body structure. Irritability, apathy, loss of physical and mental efficiency are difficult things to evaluate, but they are the earliest manifestations of "hidden hunger." In my personal experience with Dr. Grace Goldsmith in her human experimentation which contributed so much to our knowledge of human requirements for the vitamin niacin, I early learned to recognize the premonitory behavioral signs of impending deficiency disease clinically recognizable. Behavior disorders will always show up before a recognizable disease on a physical basis can be demonstrated.

Senator PERCY. Mr. Chairman.

The CHAIRMAN. Senator Percy.

Senator PERCY. Doctor, we were discussing yesterday the relationship between malnutrition and undernourishment, and workers' productivity. In your survey, how prevalent were cases involving the hidden symptoms: apathy, lack of attention to work, inability to perform effectively and efficiently due to malnutrition, present to the extent that they became almost a permanent health condition of the persons affected?

Further, to what extent would an investment in food supplements for this group enable the individuals involved to function more effectively, thereby increasing our general economic productivity?

Dr. UNGLAUB. I can't answer that question, Senator, on the basis of any sure knowledge. As I point out later on, we do have extensive evidence of biochemical inadequacy. I can't say that simply because we have 20 percent of people getting too little thiamine that 5 percent would be impaired physically. These are studies that need to be done and need to be done under controlled conditions, and so far we do not have that information available.

As I mentioned just a minute ago, we are hoping to get significant information from these studies in the Operation Head Start group in which, as I pointed out, our psychology department is studying behavior patterns, studying learning efficiencies, and studying physical performance indices, and we hope that we will have some beginning information derived from these studies.

In the National Nutrition Survey it is an impossibility to evaluate these things accurately in the general population.

Senator PERCY. Had any previous nutritional studies been made in Louisiana prior to the National Nutrition Survey so that we get any feeling as to whether the condition in Louisiana is getting worse or is getting better?

Dr. UNGLAUB. Well, I can say yes, we have done this. I think as I mentioned this before you came in, for the past 6 years we have been studying nutritional status in school age children throughout the State, children from 10 to 16, 17 years and these findings of the National Survey I don't think differ significantly from what we have found in those children during that period.

Senator PERCY. Well then, is your feeling regarding children that their nutritional status neither is improving nor worsening?

Dr. UNGLAUB. I can't say that because we simply don't have data far enough advanced to draw such a conclusion.

Now, the biochemical studies, again, Senator, these are presented in the tables 3 and 4. In table 3 we find that out of a total number of 1643 blood samples which we had collected for analysis up to the present point there were approximately 24 percent having hemoglobin levels less than acceptable. In other words, there is here a definite problem of anemia most likely, but not necessarily entirely, due to iron deficiency as has been indicated by the dietary studies.

With respect to vitamin A, there is also a problem here. There is overall about 8 percent of this group of samples that would be considered unacceptable with respect to vitamin A levels.

I believe this figure is a little bit lower than what was found in Texas but it is still enough to be alarming. We feel that when this type of evidence is present in more than 5 percent of the population that we have a problem.

Now, with respect to vitamin C, ascorbic acid, again an alarming amount of unacceptable serum levels, almost 21 percent being at unacceptable levels. In the following table, table 4,[1] are some of the data derived from our operation Headstart studies. This was not intrinsically a part of the National Nutrition Survey but it is a corollary study. It has been done with the same techniques and it is pertinent. We find, for example, 33, almost 35 percent of the children in this study with low, unacceptable levels of vitamin A in their serum as contrasted to only about a little over 1 percent of their mothers.

[1] Table 4 can be found on p. 944.

With respect to vitamin C, the situation is reserved. About 18 percent of the children have unacceptable levels of vitamin C in their blood but almost 33 percent of mothers.

Now, how much this may be attributable to getting orange juice in the Headstart snack program which they do have, they get milk, orange juice, and cookies in the midmorning, how much this may be attributable to that I can not say.

Again, if we look at the hemoglobin levels using two different criteria, one that of the Children's Bureau which is what our Headstart study is based on, we find over 11 percent of the children develop clinical anemia. This is hemoglobin levels of less than 10 grams percent which any clinician will accept as anemia worthy of treatment. Seven percent of the mothers fall in that category. If we adopt the criteria that are being used for the National Nutrition Survey, which is approximately 1 gram percent higher, we find 41 percent of the children classified as anemic and 19 percent of their mothers. We have a real problem here and, as I will point out shortly, we are attempting to do something about this.

Serum albumin levels in Louisiana, at least in the data so far examined, are somewhat better than reported in Texas. About 12 percent of our subjects had unacceptable levels of serum albumin, which is an index of adequacy of protein nutrition.

Other biochemical studies, as Dr. Schaefer outlined, either have not been completed or the analysis of the results has not been completed at this date.

We do not have a detailed analysis of our dental studies. I think it can be safely said even by an M.D.-type clinician that the dental status of this population is deplorable. I have seen some of the most horrible teeth and this of course came as no shock to us. We observed this again and again in our school studies previously. There is no statewide program of preventive dentistry in Louisiana. I think the results of our study will underline the need for such a program for the future. We have had children at the age of 12 with complete upper and lower plates and some of the mouths you wouldn't believe if you saw them.

In conclusion, I would like to comment, as I have already earlier, that the findings to date in the National Nutrition Survey in Louisiana agree surprisingly well with our previous findings in a study of over 3,000 schoolage children throughout the State. This study, which was sponsored by the National Institute of Arthritis and Metabolic Diseases of the National Institutes of Health, also indicates serious nutritional problems with respect to calories, vitamins A and C, and anemia. The children involved in this study were from low and lower middle income groups and probably of somewhat better socioeconomic status than those selected for the National Nutrition Survey. But in our school survey we did not get such detailed data as we are currently getting in our National Nutrition Survey. The other study which I have referred to is supplementary to this National Nutrition Survey and this is the study in Operation Headstart.

We became interested in this because we were aware of the problem of anemia. We surveyed a group of some 500 children at the beginning of Operation Headstart last June and found a very high percentage

of these children to be anemic. We then grouped these children into anemic and nonanemic groups and divided these groups again.

We are now supplementing one group by daily feeding of one serving of a special Kellogg fortified cereal which contains 10 milligrams of iron per day. Half of the study group, half of the anemic and half of the control group are receiving this supplement, which is provided by the Kellogg Co. for us. The other half are not. We will reevaluate our data, complete nutritional reevaluation after they have been fed the supplement for a 6-month period. The reason this particular supplement was selected is because it was cheap, is readily available on the open market, and it is acceptable to the children. They like it. They will consume it, and for educational purposes, if we can demonstrate the beneficial effect of this type of supplementation after 6 months of administration, we then have the basis for an education program to approach the problem of anemia in these small children.

I think that is the limit of my formal statement, Senator.

(Dr. Unglaub's prepared statement follows:)

PREPARED STATEMENT BY WALTER G. UNGLAUB, PROFESSOR OF NUTRITION TULANE UNIVERSITY

The field work of the National Nutrition Survey in the State of Louisiana is now approximately 90% completed. At this time it is possible to present only a preliminary analysis of a portion of the data thus far gathered. However, the results of this preliminary analysis are considered to be sufficiently significant and worthy of concern to warrant their presentation to this Committee at the present time.

The information to be presented here this morning is derived from the study of a partial sample of the survey, representing a total of 2774 individuals from 81 of 97 Census Enumeration Districts in 16 of 19 perishes of the State of Louisiana selected for study according to criteria described to you yesterday by Dr. Schaefer. Of this group, 50.3% were below the age of 16 years, 36.7% were from 16 to 59 years of age, and 12.9% were above the age of 60 years. Females made up 58.3% of the sample, while 41.7% were males. The majority of the sample was of the Negro race. Very few Spanish-Americans are included.

In addition to the studies of the basic sample population described to you by Dr. Schaefer, additional studies have been done in a group of 842 individuals, residents of the same sample Enumeration Districts but not included in the preselected random sample. Data from this group are to be analyzed separately from that derived from the definitive sample population and used for statistical control purposes.

Twenty-four hour dietary recall questionnaires have been completed for 863 individuals and 438 households in the definitive sample and for 210 individuals and 137 households of the "volunteer" sample, for a total of 1073 individual and 575 household questionnaires. (Table 1). I burden you with these figures only because I would like to point out that the completion of each of these questionnaires requires the effort of a highly-trained nutritionist for a period of approximately one hour.

Through January 9, 1969 blood samples have been obtained from 3720 subjects of the study and urine samples from 2471 of these for the routine biochemical studies described to you by Dr. Schaefer. In the Louisiana study, blood samples have also been collected for special studies of antibodies to various *Salmonella* species, identified with food intoxication and infection, and stool samples have been collected for studies of intestinal parasites. Special studies are also being done for identification of subjects with food and drug allergies.

Results: Dietary studies

Analysis of data obtained from dietary intake studies is extremely complex and time-consuming, even with the use of advanced computer techniques. At this time the analysis of the dietary studies of the Louisiana survey have been limited to partial data derived from two of the major groups of the study population considered to be among the most susceptible to the effects of nutrient deprivation,

namely adolescent children and infants. The results of this preliminary study are shown in Table 2. From their analysis, there appears to be reason for serious concern about the nutritional status of the adolescent group with respect to calories, iron and vitamin A in particular, although the level of intake of all the nutrients listed is cause for concern enough.

Special attention should be paid to the deficiencies in intake of calories and iron, as the levels of intake for these recommended by the Committee on Dietary Allowances of the Food and Nutrition Board of the National Academy of Sciences—National Research Council do not allow any "margin of safety" as do their recommendations for intake levels of other nutrients such as Vitamin C.

With respect to the infant group included in Table 2, there is again special concern for the levels of intake of Calories and iron in particular, although in general this group would appear to be relatively better nourished than their older brothers and sisters. Confirmatory evidence to support this concern about the nutrient intake of infants and pre-school children will be presented shortly.

Clinical studies

With the exception of anthropometric studies, clinical evaluation of nutritional status of subjects in this survey has been largely negative. This is not surprising, and Dr. Schaefer has referred to this fact when he mentioned "hidden hunger" in his testimony. Only two instances of what could be called "starvation" have been encountered until the present time. These two cases involve a pair of infant twins, prematurely born and under medical supervision from birth. The present medical evaluation of the cause of their severe undernutrition is that they suffer from an intestinal malabsorption syndrome, perhaps genetically determined.

The real cause for concern arising from the clinical evaluation of nutritional status in the evidence shown in Figures 1–4, in which it can be seen that infants and young children up to the age of 4 or 5 years are suffering from growth retardation, as reflected by height-for-age values. This is a situation entirely analogous to that seen in developing countries throughout the world, perhaps less marked, but nonetheless present. Dr. Shaefer has referred to this in his testimony earlier. It is a real cause of concern to both of us.

With respect to other clinical findings there is little to say. No overt evidence of nutritional deficiency disease of any sort was encountered. The prevalence of enlarged thyroid glands does not indicate any overall problem of endemic goiter, although some of our earlier studies in school children have indicated some localized areas in which this may be a minor problem.

In closing my discussion of the clinical findings of this survey I would like to state that as a clinician, I feel very strongly on the basis of my years of clinical experience, that I feel, and actually know, that the physical manifestations of nutritional deficiency disease appear only in the general population with significant prevalence when such deficiency disease is extremely serious and widespread. The manifestations of "hidden hunger", as Dr. Schaefer has put it, are less obvious than changes in body structure. Irritability, apathy, loss of physical and mental efficiency are difficult things to evaluate, but they are the earliest manifestations of "hidden hunger". In my personal experience with Dr. Grace Goldsmith in her human experimentation which contributed so much to our knowledge of human requirements for the vitamin niacin, I early learned to recognize the premonitory behavioral signs of impending deficiency disease clinically recognizable.

Biochemical studies

Partial results of biochemical studies are presented in Table 3. Significant numbers of results of urinary excretion studies presentation here are not yet available for the Louisiana segment of the survey.

As can be seen from the Table, there exists in this study group a serious problem of anemia, as manifested by unacceptable hemoglobin levels in 23.5% of the subjects studied thus far. Only a very small portion of this can be attributed to genetically determined abnormalities of hemoglobin synthesis. It remains to be determined from analysis for other nutrients now being carried out what proportion of this incidence of anemia is due to iron-deficiency and what portion to deficiency of folic acid or other nutrients.

Serum vitamin A studies reveal that 8.2% of the total sample studied thus far had serum concentrations of this vitamin below acceptable levels. Examination of the distribution of low serum vitamin A levels reveals that the major concentration of this problem is among infants and children, with as high as 37% of some age groups affected. It is generally conceded that in studies of this type, an overall prevalence of this finding in excess of 5% is cause for concern.

Serum vitamin C levels also give cause for concern in that 20.8% of the sample were found to have serum concentrations below the acceptable level. The greatest prevalence of unacceptable levels in this instance is among children less than six years of age and among adults.

Serum albumin concentrations, an index of adequacy of protein nutrition, were below acceptable levels in 12.3% of subjects examined to date.

Other biochemical studies, as outlined by Dr. Schaefer are in the process of completion at the moment and insufficient data are available at the moment to permit comment.

Dental studies

Data derived from our dental studies has not yet been adequately analyzed to permit detailed presentation here at this time. It can be stated, however, that the dental health of the vast majority of the persons studied is deplorable and bears witness to inadequate dental hygiene and dental care.

Remarks

In conclusion, I would like to comment that the findings to date in the National Nutrition Survey in Louisiana agree surprisingly well with our previous findings in a study of over 3,000 school-age children throughout the State. This study, which was sponsored by the National Institute of Arthritis and Metabolic Diseases of the National Institutes of Health, also indicates serious nutritional problems with respect to Calories, vitamins A and C, and anemia. The children involved in this study were from low and lower-middle income groups and probably of somewhat better socioeconomic status than those selected for the National Nutrition Survey.

A second study of nutritional status in Louisiana to which I would like to refer is currently under way and is supplementary to the National Nutrition Survey. This is a study of children, aged 4½ to 5½ years enrolled in Operation Head Start. This study is supported by a contract from the Office of Economic Opportunity and employs precisely the same study techniques as does the National Nutrition Survey, with the addition of special mental and physical performance studies being carried out by the Department of Psychology of our College of Arts and Sciences. Children enrolled in Operation Head Start and their mothers have been subjected to the same examination procedures used in the National Nutrition Survey. Following the initial studies, the children have been divided into anemic and control groups. Half of each group is being given a daily snack supplement of a fortified cereal, commercially available and provided us by the W. K. Kellogg Company. The other half of each group is given only milk and cookies normally provided in the Head Start program. After six months of supplementation, all groups will be completely reexamined to determine the effectiveness of this supplement in improving their nutritional status. Results of the initial biochemical studies are shown in Table 4, and are more alarming then those of the state-wide Survey.

TABLE 1.—DIETARY HISTORIES, NATIONAL NUTRITION SURVEY, LOUISIANA

Parish	Infants, 0 to 36 months	Adolescent	Aged	Pregnant or lactating	Household	Total
Evangeline	12	25	7	3	29	64
Tangipahoa	11	16	14	1	21	73
Acadia	11	21	19	0	55	106
Caddo	12	48	36	2	43	146
Bossier	3	13	5	0	8	21
Red River	20	34	25	3	40	129
East Baton Rouge	9	57	11	0	23	102
Ouachita	16	21	13	2	22	70
Jefferson	8	6	3	1	9	27
St. Bernard	8	19	5	1	11	44
St. Landry	23	45	10	2	22	102
Vermillion	2	5	4	0	12	23
St. Mary	12	21	2	1	10	46
Calcasieu	16	18	5	0	18	57
Orleans	53	73	48	2	115	291
Total	216	422	207	18	438	1,301
Volunteers	47	126	33	4	137	347
Grand total	263	548	240	22	575	1,648

TABLE 2.—ADOLESCENTS (MALES 12 TO 16 YRS., FEMALES 10 TO 16 YRS.)

[Percentage of subjects failing to reach various levels of dietary adequacy preliminary sample]

Level of adequacy	Calories (N=225)	Protein (N=217)	Calcium (N=227)	Iron (N=225)	Vitamin A (N=225)	Vitamin C (N=224)	Thiamine (N=225)	Riboflavin (N=225)
Less than 50 percent	29.7	16.6	25.0	32.8	39.6	32.2	16.3	8.9
50 to 74 percent	27.9	12.9	8.7	27.9	17.8	11.1	22.7	7.3
75 to 100 percent	19.5	12.0	14.1	15.1	11.1	10.3	14.6	12.0
Over 100 percent	23.1	64.0	52.0	24.0	32.3	46.5	46.5	72.5
Infants (0 to 36 mos.) N=96								
Less than 50 percent	14.6	5.4	13.5	62.0	19.9	39.6	12.5	3.1
50 to 74 percent	10.2	5.4	9.3	19.0	11.5	17.8	4.2	2.1
75 to 100 percent	19.0	3.1	6.4	7.5	14.6	9.3	8.4	4.2
Over 100 percent	56.3	86.1	70.8	11.5	54.0	33.2	74.9	90.6

TABLE 3

Hemoglobin—Concentrations of 10.9 gm. percent or less

Sex	Total number	Number unacceptable	Percent unacceptable
Male	694	152	21.7
Female	949	238	25.1
Both	1,643	390	23.5
Serum vitamin A—Concentrations of 20μg. percent or less			
Male	694	63	9.1
Female	949	69	7.2
Both	1,643	132	8.2
Serum vitamin C—Concentrations of 20μg. percent or less			
Males	694	163	23.5
Females	949	182	19.2
Both	1,643	345	20.8
Serum albumin—Concentrations of 3.51 gm. percent or less			
Both	571	70	12.3

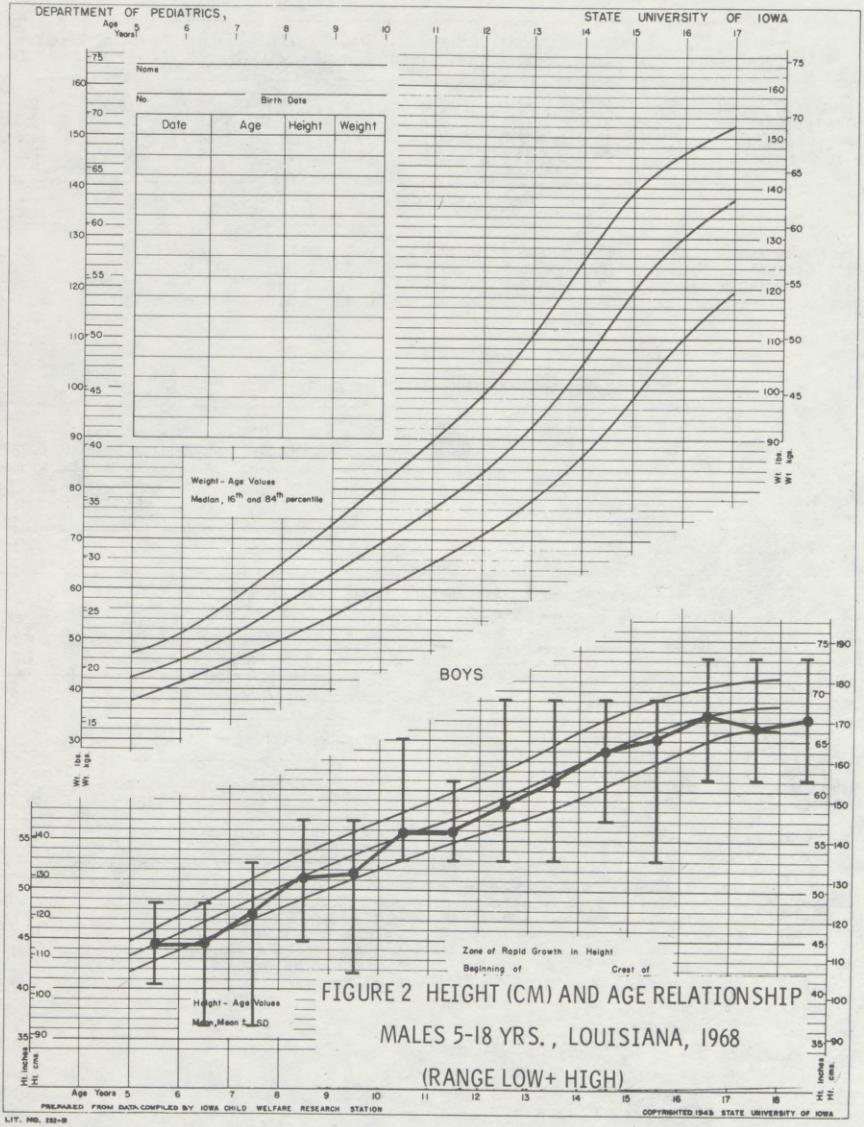

FIGURE 2 HEIGHT (CM) AND AGE RELATIONSHIP

MALES 5-18 YRS., LOUISIANA, 1968

(RANGE LOW+ HIGH)

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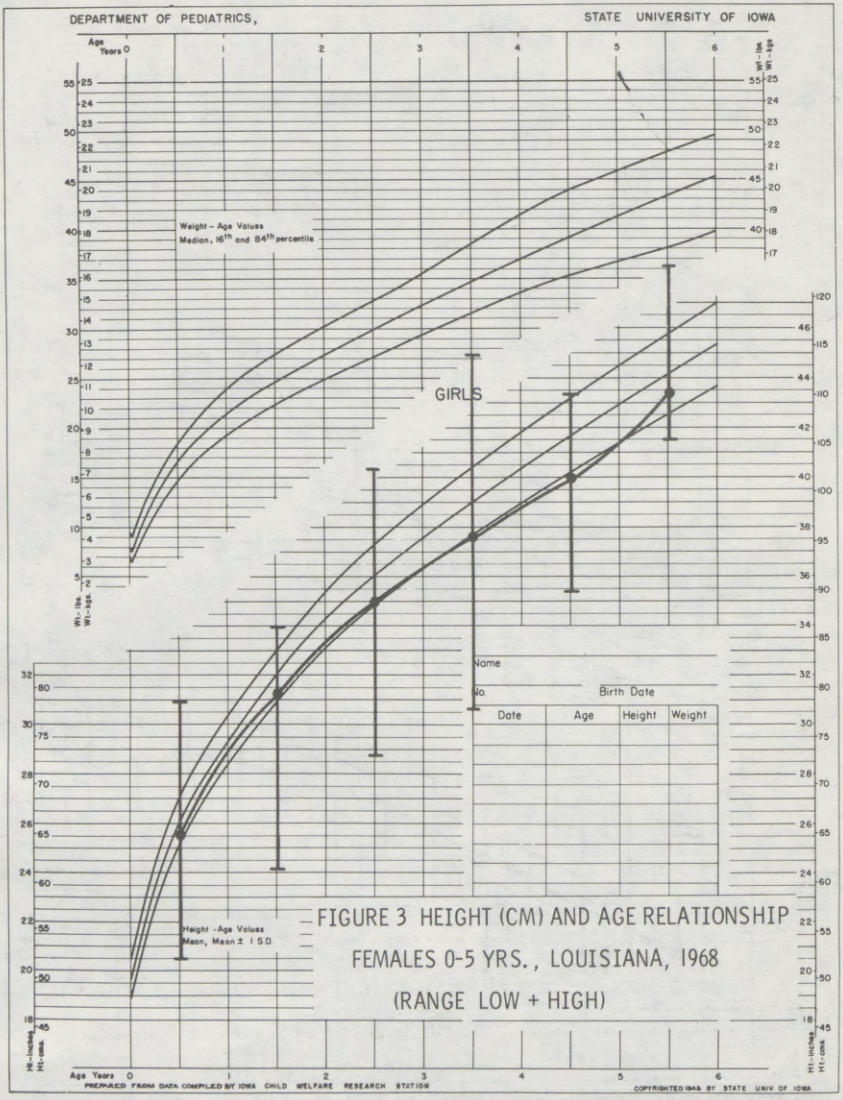

FIGURE 3 HEIGHT (CM) AND AGE RELATIONSHIP
FEMALES 0-5 YRS., LOUISIANA, 1968
(RANGE LOW + HIGH)

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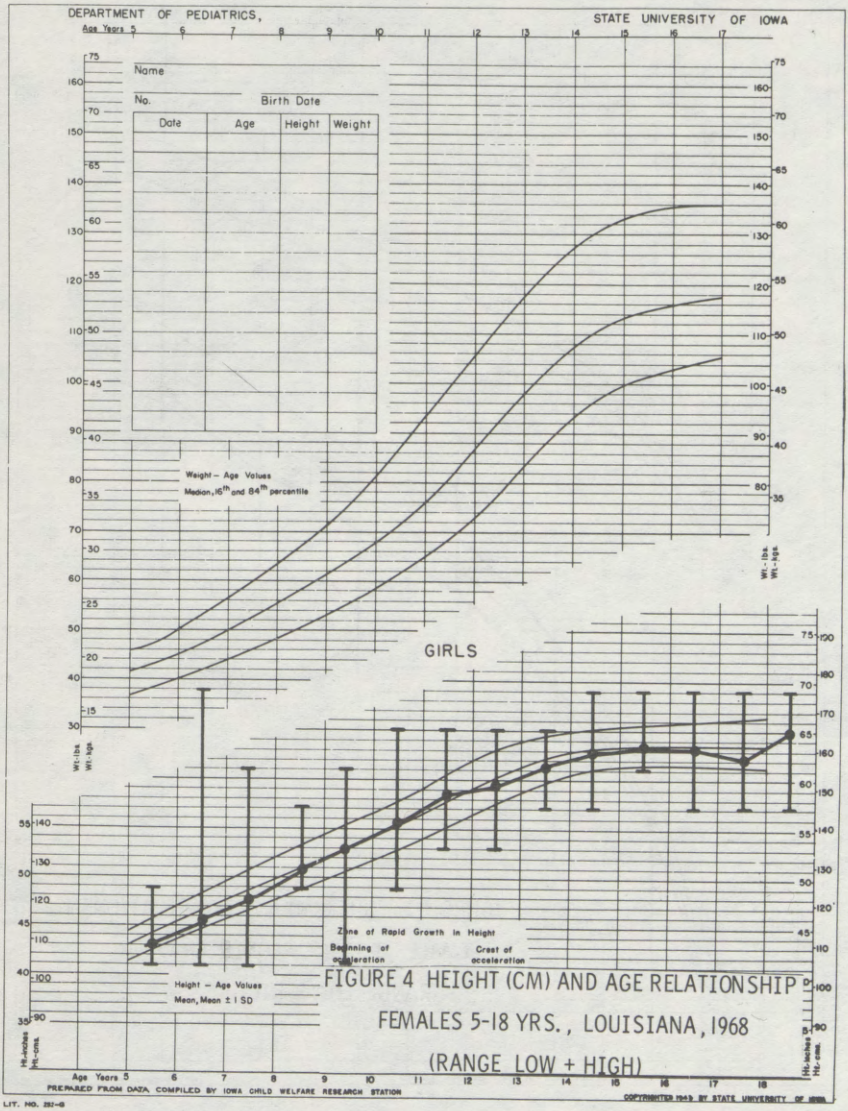

FIGURE 4 HEIGHT (CM) AND AGE RELATIONSHIP

FEMALES 5-18 YRS., LOUISIANA, 1968

(RANGE LOW + HIGH)

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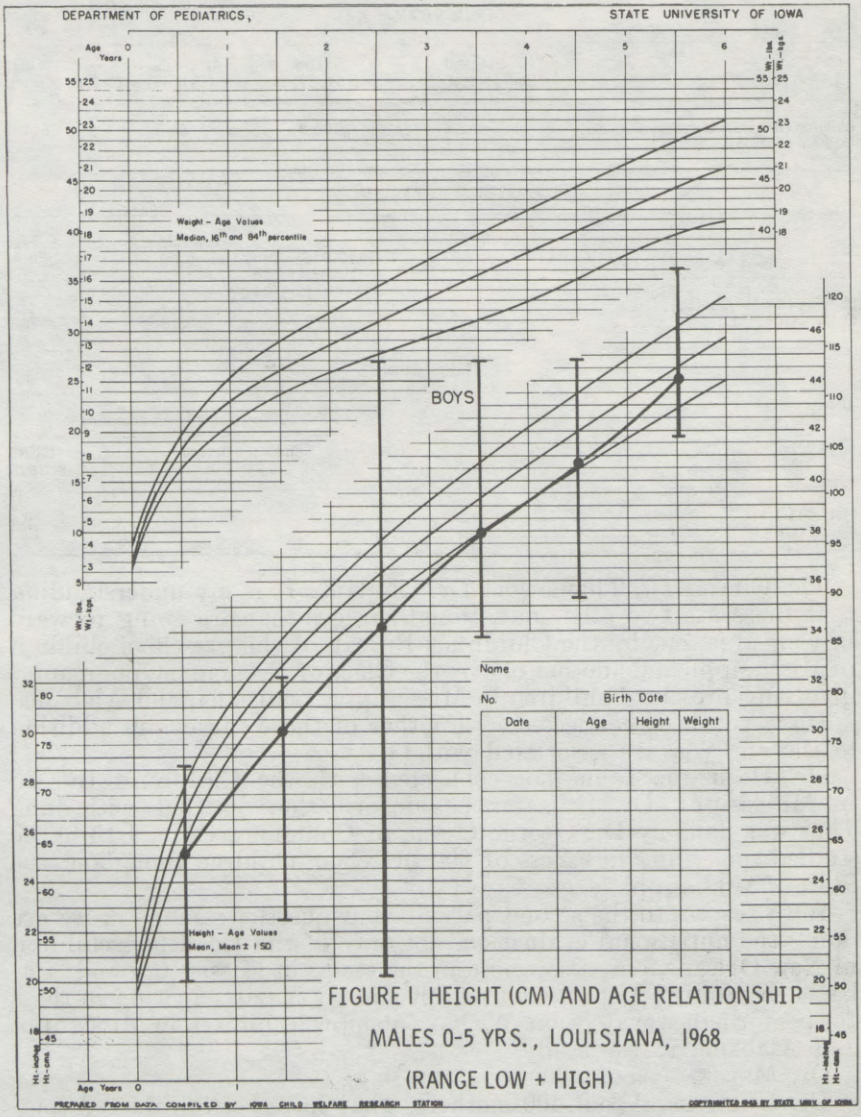

FIGURE I HEIGHT (CM) AND AGE RELATIONSHIP

MALES 0-5 YRS., LOUISIANA, 1968

(RANGE LOW + HIGH)

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TABLE 4.—OPERATION HEADSTART, NEW ORLEANS, 1969

[Percent prevalence of findings]

SERUM VITAMIN A

	Deficient (<10μg percent)	Low (10 to 19)	Acceptable (20 to 49)	High (>50μg percent)
Children (N=453)	2.6	32.8	64.0	0.4
Mothers (N=359)	0.1	11.2	63.5	35.3

SERUM VITAMIN C

	Deficient (<0.10 mg. percent)	Low (0.10–0.19)	Acceptable (0.20–0.39)	High (≤0.40
Children (N=468)	1.9	16.2	37.3	44.4
Mothers (N=378)	6.6	26.9	38.3	28.0

HEMOGLOBIN

	Unacceptable levels according to—	
	Childrens Bureau (<10 gm. percent)	ICNND (<10.9 gm. percent)
Children (N=499)	11.2	40.8
Mothers (N=380)	7.2	19.1

The CHAIRMAN. Thank you, Dr. Unglaub. It is my understanding that there are two other nutritional surveys that are going forward in your area, one by the Children's Bureau of the preschool children in Mississippi, and another one by the Office of Economic Opportunity involving preschool children in Mississippi, Louisiana, and Alabama.

Have you been connected with either of those surveys in addition to the one you are associated with?

Dr. UNGLAUB. I am not connected with the Children's Bureau in Mississippi. Dr. Schaefer has information on that with him. That was done by Dr. George Owen, of Columbus, Ohio. I think he studied something in excess of 600 preschool children thoughout the State of Mississippi.

With respect to the second part of your question: Yes, sir; we are doing the nutritional evaluation, not only of the Headstart children in New Orleans, but, also, those in the study in Mississippi and Alabama. Again our Department of Psychology is participating in these for performance evaluation. We have about 600 children in Mississippi and Alabama in the study.

Dr. MORGAN. About 700.

Dr. UNGLAUB. About 400 mothers. They have been evaluated completely, using the same criteria and procedures as that used in the National Nutrition Survey.

The CHAIRMAN. Are there any noticeable results in these other surveys that are unique in comparison with the National Survey that you are doing in Louisiana? Do the results differ?

Dr. UNGLAUB. No, sir; I would say the types of problems that are involved are the same. There may be slight differences in degree.

As I mentioned to Senator Ellender, in this south Mississippi area where the children are getting a school lunch, the findings are not

as bad as they are in our New Orleans group of Headstart kids, but they are still bad enough to cause concern. I have not seen the final data from the Alabama study as yet. As you pointed out, this is sponsored by the Office of Economic Opportunity and it is being done under separate contract with them.

The CHAIRMAN. What are the general differences, if any, between the results that were found in Louisiana as over against Texas?

Dr. UNGLAUB. I think there are differences only in degree. I think the same problems exist in both places. As I say, our data hasn't been as completely analyzed as we would like as yet as in Texas, as Dr. Schaefer has pointed out in his composite data, that this is a major problem. There are major problems with respect to calories, vitamin A, vitamin C, and perhaps proteins.

As I said, as I recall the figures from Texas, their findings relative to inadequate protein are somewhat more marked. How much, this is a reflection of the nature of their sample, the inclusion of a large number of itinerant workers, Spanish-Americans, we can't say at this moment.

The CHAIRMAN. Doctor, did the actual fieldwork fall under the direction of Dr. Morgan? Was he in charge of your field operations?

Dr. UNGLAUB. Yes, sir; he has been in the field the entire time.

The CHAIRMAN. I would like to ask a couple of questions of you, Dr. Morgan, before I yield to other members of the committee.

First of all, what problem, if any, have you found in getting the cooperation of families across the State with the survey effort?

Dr. MORGAN. Senator, this has been our major problem. We feel that we have a field team competent to do virtually anything in the realm of field studies in nutrition. However, when we hold a clinic and we invite certain families to come in, selected ones randomly, believe me they don't flock to the door. It takes a concerted effort not only by our people, but by the local health authorities, by Welfare, by any agency that we can find that has any contacts with these people individually. We have used the clergy. We have used the principals of schools in those districts that were involved, any means at all that we can get the people to actually come into the clinics.

I point this out because this will be the problem of other States yet to come. I would like to use this opportunity to make an appeal to the news media. Although, in general, we have had excellent cooperation with the news media, misuse of a word or a phrase can absolutely kill you in any given area.

The people in Louisiana, even though they may be poor, even though they may be undernourished, frankly, they simply resent being tagged poverty families, starving families, et cetera. On some occasions our people have encountered overt hostility when they would ask these people to come in because the previous day an item had appeared that says "Poverty families," and so on, and so forth, "to be studied." People are people. You find the same thing in Texas, Michigan, and Kentucky, wherever you go. Even though they do fit these categories they resent these tags, so I would appeal to the press and to the news media to use discretion in their choice of words. These are emotional words. I realize they catch people's attention. They are dramatic. But this has been one thing that has hurt us.

I would say at this point that occasionally it appears that we have taken sort of a left-handed swipe at the medical and the dental societies. A part of my job has been to act as the liaison man between our studies and the medical and dental societies. I am generalizing, of course, but initially there is some feeling of suspicion, "Just what are you people doing here, anyway?" But once you go and talk with them, explain what your program is about, explain what you are going to do, that you are not involved in treatment and interference with private practice, then we get exceptional cooperation.

As a matter of fact, in four different parishes the medical and dental auxiliaries have come to the clinic and volunteered to serve as clerks to help us so that we don't have to use professional people who are right now low in numbers, so we are most gratified.

This, I would say, is our major problem in getting people to cooperate.

The CHAIRMAN. In that connection, Doctor, recognizing that people are reluctant to talk about malnutrition, poverty, or whatever their problem might be, are you reasonably sure you get a representative sample in a survey of this kind? Or are you more likely to get the more aggressive, perhaps even better educated, more articulate families involved in the survey?

Dr. MORGAN. To give you a direct answer, yes, I do think we are getting a representative sample. The ones that we have the most difficulty with are at the top and the bottom of the socioeconomic scale. The man or the woman who lives in a $3 a week hovel who may move three times in the course of a month is not likely to be responsive. They are likely to be hostile. The person who occasionally you find living in a district who is well to do doesn't want to be associated with something that they think is beneath them, so these two groups are the ones that we have the most difficulty with.

I will say, however, that due to the efforts primarily of the local people to get them in, many times the people really don't have any firm idea as to why they are there but they love and they respect the public health nurse who has been in their district for years and years, and Miss Margie asks them to participate in the clinic and that's all that they need, so, yes, I think we are getting a representative sample.

Dr. UNGLAUB. May I add something to Dr. Morgan's comment, Senator.

The CHAIRMAN. Certainly.

Dr. UNGLAUB. We are getting information on the families that do not respond and we can characterize the families even though they did not come in for examination. Many of these people will admit you for initial interview and we can obtain family characteristics, housing characteristics, and things of this sort at the time of the initial interview.

If then they do not appear for examination we can go to these records and characterize a sample that was missed so we will be able to recognize any bias that might come into a sample through this mechanism.

The CHAIRMAN. What percentage of the families you have surveyed, Doctor, are Negro?

Dr. UNGLAUB. I can't give you that figure right off the top of my head, Senator. Would you make a guess?

Dr. MORGAN. I would say approximately 60 to 65 percent.

The CHAIRMAN. Of those in the survey?

Dr. MORGAN. Yes, sir.

The CHAIRMAN. One more question: In your travels around Louisiana, Dr. Morgan, what have you found with respect to people's attitudes toward the existing food programs; that is, primarily the food stamp and commodity food programs?

Dr. MORGAN. This could best be answered by the ladies who do the nutritional interviews, the dietary recalls. However, I have listened in on a number of these. We do get some feedback. Now, one question that always comes up is, Does this study mean we are going to get more food?

We can't say yes. We can't say no. We tell them that we feel that this study will air the problems that they have and will certainly be one mechanism for setting legislative action in place, but we can't guarantee them anything. I think, in general, most of the people are rather confused, honestly, about the food distribution program, at least the few with whom I have talked.

One thing that concerns many of them with the food stamp program is that they have a great deal of difficulty raising the initial 25, 35, 40, or what-have-you, dollars that it takes to buy the stamps. At the very, very bottom of our social scale where we would like to help these people they are having an extremely difficult time coming up with that small amount of cash to purchase the stamps, so these are the two things that have just been empirical observations.

I couldn't give you a set pattern but this has been my feeling.

The CHAIRMAN. You say two things, the general confusion and lack of knowledge about the operation of these programs; second, the lack of money even to meet the minimal standards.

Dr. MORGAN. That is correct.

The CHAIRMAN. Thank you very much.

Senator Ellender?

Dr. UNGLAUB. Senator, may I insert another item I think will be of interest to you. This was a news release that was prepared for the Louisiana State Health Department. It quotes Dr. Andrew Hedmeg, State health officer and president of the State board of health. He made this statement:

> The Louisiana State Health Department will as a result of this study make a thorough analysis of the statistical data available to the official reporting system for the past several years in the area of nutritional deficiencies insofar as both disease and death are concerned. We will also give serious consideration to recommending to the State Board of Health that in the future all disease conditions be reported as being due to nutritional problems be investigated in the same manner as communicable and other reportable diseases.

And Dr. Hedmeg has in fact made this recommendation to the State board of health. To my knowledge this is the first time that this has been done.

The CHAIRMAN. Thank you, Doctor.

Senator ELLENDER. Dr. Morgan, in your discussion about the food stamp program, I presume that the recipients of the stamps; that is, let's say families where the income is very, very low, put up $2 or $3 and get $48 worth of stamps. It is really left to the department to make the decision.

Another requirement, as I understand, is that they should spend at least as much for food as they have in the past, and use the extra buying power to supplement their diet.

Has that been explained to them?

Dr. MORGAN. I don't know, Senator. I really don't.

Senator ELLENDER. Now, you commented, both of you, on the medical facilities we have in Louisiana. Would you be able to say what happens when you find individuals who need immediate medical attention?

Dr. MORGAN. Yes, sir. Dr. Unglaub has mentioned this before, but in essence the first thing that we do is ask these people if they have a private physician or a private dentist. If they say yes, then our physician or our dentist writes a referral on the spot saying, "We have found such and such, and suggest that you take a look at this." Ask them to take that to their private physician and have them evaluate the patient.

Last week we found an elderly lady with skin carcinoma. She was completely unaware of it. It was something that itched and annoyed her but she did not realize the danger involved. We told her what it was, wrote a referral to her physician. We emphasized that she must do something about this right away.

On the other hand, if the people say that they simply don't have a private physician, cannot afford one, then there are a number of mechanisms that we can follow. One, as Dr. Unglaub mentioned, is referral to charity hospital system in Louisiana. If the people by some technicality are not eligible for admission, the charity hospital system has agreed to accept these people for that particular problem and they will correct it.

On the other hand, at the local level there are many means that we from New Orleans are unaware of. We refer these people to the local health officer, to the local health nurse. In many communities there are physicians or dentists who donate their time gratis to help people who are unable to pay for private care themselves.

The local nurses, the health officers, know who these people are. They direct them to, in some areas, civic clubs, Kiwanis, Civitans, what-have-you, will take a project to take care of dental care for indigent people, to take care of glasses for children with poor eyesight, this sort of thing.

The local people know who these people are and we refer them back through them. We have alluded to the fact that in addition to the basic nutrition survey, due to the interest of other individuals and at no cost to the study we are also doing parasitological examinations, stool examinations for the presence of salmonella and allergy studies in these people. If we find something, for example, that needs immediate care, and one thing I can think of right off the bat is Entamoeba histolytica, if not checked it can be fatal. When we get one of these reports we don't bother writing the report to the people, we pick up the telephone and call the local health officer and say, "Look, such-and-such a family, Suzy, Jim, the father, are infected with this parasite and will you contact them and see that something is done about this right away."

If it is a chronic sort of condition, it doesn't require immediate attention but something should be done soon, then as soon as possible

we send a written report back to the local health officer and they handle it at that level.

We feel this is the only judicious way to do it. This way we maintain good relationships with the local people and they, of course, know more about their situation than we do. So, yes, Senator; something is done to follow up in these cases.

Senator ELLENDER. Doctor, what has been, generally speaking, the attitude of the doctors and the societies of medicine and dentistry concerning this survey?

Dr. MORGAN. Initially, it is one of acute curiosity, shall we say. Once we meet with them and explain the situation to them, what we are doing, that we are not trying to prove or disprove anything, we are simply trying to find the facts, that we are not going to interfere with their method of operation, then they have been most cooperative, but this contact must be made.

Senator ELLENDER. Has that suspicion been eliminated?

Dr. MORGAN. Yes, sir.

Senator ELLENDER. Thank you.

Dr. MORGAN. You are welcome.

The CHAIRMAN. Senator Percy.

Senator PERCY. Doctor, in your testimony you stated that the findings to date in the national nutrition survey agree with the previous study of 3,000 schoolchildren. How long ago was this previous study made?

Dr. UNGLAUB. It was initiated about 6 years ago and has continued up through last year.

Senator PERCY. Will you describe what was done within the State to correct the conditions of malnutrition you uncovered?

Dr. UNGLAUB. Again, this is where the State health department has collaborated with us, I think, in an outstanding manner in these studies as well as in the national survey, and through their regional nutritionist and through the system, so to speak, the department of education, through the schools largely. If there were any, as Doctor Morgan has described, real honest health problems, these have been taken care of by the mechanism he described.

As far as nutritional problems, they have been visited by the area or regional nutritionist, who goes out and talks to the mother. If it is the problem of obesity, for example, and we do find quite a bit, they are given prescribed diets.

If it is a question of deficiency, the mother is taught what foods to offer, how to prepare them, and so on.

Senator PERCY. Was a program initiated on an individual basis, for those who participated in the survey, those specific cases that needed treatment; or was some sort of universal program initiated, based on the survey findings that apply to all residents of the State?

Dr. UNGLAUB. This would depend, of course, on the circumstances. In some cases it was on an individual basis. In others where we could identify an area problem, and I referred to this vitamin C level in St. Charles Parish, then it was approached on an area basis.

Senator PERCY. Does the fact that your survey revealed current conditions of malnutrition to be similar to those revealed by the study conducted 6 years ago, imply that there has been no significant or demonstrable improvement in the situation during the interim period?

Dr. UNGLAUB. Well, of course the previous survey was on a rather limited scale. It was spread out over a considerable period of time and, quite frankly, when this survey started there was doggone little interest in it, to be quite truthful. There have been other surveys in other States. I know of surveys, for example, in the State of New York by Doctor Brin in a similar group. There have been surveys in Vermont and there have been studies in Nebraska and in the State of Iowa. There have been studies in Chicago; Chicago studies for Headstart, OEO studies, if I recall correctly.

Senator PERCY. Does the present report indicate that the nutritional level in Louisiana is cause for concern?

Dr. UNGLAUB. Yes, sir.

Senator PERCY. Can you tell us what response you expect from the State and various parishes in the State to nutrition conditions as revealed by your survey? Have the findings been evident to local persons long enough so that you have had some sort of reaction from them as to what should and must be done?

Dr. UNGLAUB. Yes, sir; I think this is the case. As I pointed out, we have an excellent nutrition section in our city health department. They are quite active. The people in the individual parishes, as Dr. Morgan has mentioned, after they once find out what is going on, they have been extremely interested. I just recently had a letter from the president of the Calcasieu Parish Medical Society expressing their interest in not only the nutritional results of the survey but the general health results, and we have assured him that as soon as we have sufficiently complete data for his area it will be provided to his society and he implies, although he doesn't say so in so many words, that they would like to use this information to develop action programs of their own. And, as Dr. Morgan has said, some of the civic organizations, whether it be Total Community Action or whether it be the Rotary Club, or some other organization, are taking an interest in this and I think we will be able to propose, based on these findings, action programs for the future.

I think we will get the acceptance of these.

Senator PERCY. Because you have been in the forefront of the survey in Louisiana and inasmuch as we have other States and communities yet to go, can you give us suggestions based on your own experience, regarding this reluctance of people to participate? How did you go about encouraging a wider spread participation? Did you encourage participation by hiring trained local personnel in whom the people had confidence? Are there any suggestions that you can make which might accelerate the process in other areas?

Dr. UNGLAUB. In every area we have made every effort to get the participation of the local people who are recognized by the study group as being on their side, you might say, in making our initial contact and in keeping up their interest and soliciting their visits to the clinics for examination.

The success of this, of course, has varied. In some areas, for example, the public health nurse may not be too enthusiastic and, if she is not, we are going to have additional problems. We have civic leaders. We utilize all the methods we can of radio, television, and newspapers to solicit these people's support and cooperation.

We have prepared a number of video tape releases which we send around to television transmitters around the State. They have been most cooperative.

Any of the civic organizations that we have approached have been most cooperative. They come in and baby sit. They help record data. I think we have had a very fine example of outstanding cooperation. For the future I don't know whether we will be able to initiate action programs unless we have additional assistance for this purpose.

As I mentioned, our State health department has a limited budget. They are interested, as reflected by Dr. Hedmeg's statement. They are anxious to expand their program wherever this expansion is needed but they are going to have to have, I think, financial assistance as well as assistance in recruiting the necessary personnel. We are probably going to have to go back to scratch and start an intensified program of training of nutritionists, of all types and levels, nutrition educators, dieticians, and what-have-you, and I think support for training programs of this sort is urgently needed. We do plan to begin a graduate training program in nutrition in the school of public health and tropical medicine the first of July. This has been approved by the National Institutes of Health and funded. It has been funded at a relatively low level. We will only have stipend assistance for tuition for students which is just a drop in the bucket. We are at the present reactivating a program for the training of dieticians or public health nutritionists or a combination of recognized dietetic internship and a master of public health degree which was proposed some 3 years ago, was approved by the Office of Health Manpower, but was not funded. We are reactivating that program and we hope that it will be approved and adequately funded. We have the capability of doing this.

I think we have an outstanding capability in other schools around the country, not too many of them. I think we have the potentiality of making a significant contribution in terms of adequately trained manpower if we get the support for our training programs.

Senator PERCY. Doctor, based on your experiences, what can you tell us regarding the degree to which undernourished individuals in Louisiana are aware of and do partake of medicaid and medicare benefits? Further, can you advise us as to the approximate number of doctors and hospitals that participate in these health service programs?

Dr. UNGLAUB. The vast majority of the hospitals in Louisiana, with some few exceptions, are participating in the medicare program and the physicians, too, reluctantly at first, but now it has been accepted. People in Louisiana who you might call medically indigent, that group, as the term is so commonly used, is quite aware of what is available, and I think this of course might be expected from the fact that we have had such an expansive welfare program and this program of State charity hospital care for all indigents in the State.

As I mentioned, this is a unique situation in the United States as far as the State of Louisiana is concerned. So I think they are aware of this. There is constant publicity about it. I think they are getting more aware of some of the programs, for example, on the food stamp program in New Orleans, newspapers at the moment are full of information about the food stamp program because it is only now being

initiated on February 4 and they are undertaking a massive popular educational program to show these people what will be available to them and how to apply for it and qualify for the food stamp program.

Senator PERCY. Could you tell us approximately how many public health officers in Louisiana are doctors? If you do not have those figures with you, could you obtain them so that they may be placed in the record?

Dr. UNGLAUB. I could get the figures for you very readily. I would be glad to send them to you.

To my knowledge, I would say the vast majority of them are M.D.'s. We have very few who are not physicians.

(The information received for the record will be found in the appendix.)

Senator PERCY. Did they participate in your survey?

Dr. UNGLAUB. Oh, yes.

Senator PERCY. And what reaction did you have from public health officers to the results of the survey?

Dr. UNGLAUB. They are quite enthusiastic about it. I think they are surprised at some of the results that they were unaware of before. They really didn't recognize or realize that there was this type of problem. They have so many other demands on their time and they are usually spread so thin that nutrition, I guess, is one of the things that up until this time has taken a lower priority. It has always been assumed that it can't happen here, this is an affluent country, and so on and so forth.

Senator PERCY. Doctor, it is becoming increasingly clear, I think, to us all that a large part of the malnutrition problem is just plain ignorance.

Dr. UNGLAUB. Yes, sir.

Senator PERCY. It appears there is widespread ignorance of nutritional requirements for all ages of people. Can you give us any suggestions as to the best way you think proper information can be brought to lower income people as to how they can best utilize the available resources to provide proper nutrition to all members of the family?

Dr. UNGLAUB. Well, I think this is going to take an intensive program of nutrition education and I think we are going to have to depend upon this as a nucleus of this program on our collaborators in the State health department along with our own personnel in the school of public health and tropical medicine.

As I say, we will have to make intensive effort at all levels and I think the critical level of course is the mother, but even the schoolteachers, and our State department of education has done an excellent job in preparing educational material for primary and secondary schoolteachers.

Much of the material they prepared has been based on results of our earlier studies that you have asked about. I think our State department of education has given us outstanding collaboration and I am sure they will for future programs.

Senator PERCY. Mr. Chairman, thank you very much.

I would just like to comment on the understandable reluctance of some people to participate in these surveys. Their reluctance is motivated to a great degree, I think, by personal pride. Even a country doesn't want to be called an underdeveloped country, it prefers the

term developing country. Accordingly, I believe that we should approach test areas and test subjects on the positive basis that the survey to be conducted is designed to help improve the quality and quantity of both personal and community health practices. In this connection, I consider the institution of effective remedial action based on survey findings to be the most effective means of insuring active participation in future surveys. Unfortunately too many times studies are made, hearings are held, the volumes are bound together, and no action is taken on the various recommendations. I am very pleased that the members of this committee were selected from action committees. I think you can assure the people participating that we intend to do something about these studies and that the excellent cooperation we have had has enriched our body of knowledge on this very important subject.

Dr. MORGAN. May I refer to a question that Senator Percy asked a few minutes ago, as to what is being done to prepare or to assist the States that have yet to encounter this?

I would say that Dr. Schaefer has used us to the fullest, since Texas and Louisiana were the first two States to get going.

Since this type of study, this scope of study, had never been done in the United States before, we have had to feel our way along. We made mistakes, but we try not to make the same ones twice.

Dr. Schaefer has made the point to send people from the other States to visit with us, pick up our experience, so they will not make the same mistakes.

The health officer's main comment initially was one precisely that you just said. "We are surveyed, we are surveyed, we are surveyed, and we never get the results, and nothing is ever done about it. Is this going to be another one of those?"

My answer was that I can assure you you will get the information back as soon as it is humanly possible to do so without error. We are doing this, and also that we will do our best to see that something comes from it.

The other thing that we are doing to try to further future cooperation in any type of programs or projects that we might have in this area, every family that is interviewed is sent a personal letter from our office. It is not a mimeographed sheet. It is a personal letter. It is personally signed.

If they did participate, we thank them for their participation in the study, tell them that if anything out of normal ranges are found, they will be notified through their local health officer.

To those who do not show up, we write a letter saying, "We are very sorry that you found it impossible to participate in the study. Hopefully, we will be back in your area again someday, and if we can be of service to you, we will do so," so there is followup in there.

The CHAIRMAN. Dr. Schaefer, with regard to the questions that Senator Percy asked about the health centers in Louisiana, I think it would be helpful if you could get for our record, not today, but whenever the information is available, a report on the number of health centers of that kind in each of the States, and the qualifications as to whether the directors of those centers are qualified doctors or not, the most complete evaluation you can give us of the existence of health centers in the various States, and also any information you

have as to what those health centers are doing with reference to nutrition education.

Could that be secured for the committee?

Dr. SCHAEFER. Yes, sir, we certainly could do this in the 10 States we are working in.

The CHAIRMAN. I think this would be helpful.

(The information received for the record will be found in the appendix.)

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Dr. Unglaub and Dr. Morgan, did I correctly understand you to say that there was no substantial difference in the percentage of anemia which was found in Louisiana from the percentage of anemia in Texas, as reported by Dr. Schaefer and Dr. McGanity yesterday?

Dr. UNGLAUB. I don't have the figures for Texas as such available to me at the moment. What I have is Dr. Schaefer's conglomerate.

Senator YARBOROUGH. I thought you didn't think there was much difference.

Have you had an opportunity to compare the findings in Texas and your preliminary findings in Louisiana?

Perhaps Dr. Schaefer could comment.

Dr. SCHAEFER. Basically, we would quickly eyeball the data.

There are two differences. The anemia problem is more severe in Louisiana.

The incidence in Texas was 8 percent. Walter, your figure was approximately 24 percent.

Based on our risk unacceptable level, I think one of the major differences was in Louisiana having less of a vitamin A problem, ranging from 8 percent, and I have the overall figure of 13 percent. As I recall Texas' figure, it was 17 or 18 percent, so that we have a percentage difference, and there are different kinds of problems, but when we look at some further basic grounds, Louisiana had less overall percentage of vitamin A problem.

However, in the preschool child, we remember Texas had approximately one-third of the children having a low vitamin A. So does Louisiana. Your figures are 33 percent.

So in general terms, they are similar, except one has to remember there are these differences specifically on anemia, which we think possibly are significant, and I quote that significance of having an overall incidence in Texas of 8 versus 24 in Louisiana.

The CHAIRMAN. That is for the entire population?

Dr. SCHAEFER. The entire population, right, and this is really the sort of thing that I guess we would expect, that there are going to be differences.

Some of this has to do with soil, you know, the iron, perhaps in water, just like some of the iodine problems.

Dr. Unglaub's overall figure on goiter wasn't as high as Texas. However, you do have pockets, Walter.

Dr. UNGLAUB. Yes, we have. It varies, 12, 14 percent.

Senator YARBOROUGH. That depends in part on the mineral content of the water that they drink?

Dr. UNGLAUB. That could have an influence.

Senator YARBOROUGH. Of course, Doctor, there are different dietary patterns, and I think Dr. Unglaub described your characteristics of the population sample in which there were virtually no, or very few, Spanish-speaking Mexican-Americans, whereas in Texas we have many.

Dr. UNGLAUB. Our only Spanish-speaking Americans are Puerto Ricans and Cubans, or in one area in the State there is an indigenous Spanish-speaking population, Delacroix Islanders who have been there for generations.

Senator YARBOROUGH. Where is that population?

Dr. UNGLAUB. It is not too far from New Orleans.

Senator YARBOROUGH. Spanish?

Dr. UNGLAUB. Spanish speaking, yes, sir; for generations.

Senator YARBOROUGH. Did you say most of the Spanish speaking were either Puerto Ricans or Cubans in Louisiana?

Dr. UNGLAUB. Yes.

Senator YARBOROUGH. Not Mexican-Americans?

Dr. UNGLAUB. We have quite a few Central Americans in New Orleans, as well. We do not have a large Mexican population, and of course, as you are aware, the dietary pattern of Mexicans in Texas is considerably different than it is for either the white Caucasian or the Negro, so Texas does have a unique dietary pattern in that respect, just as we have unique dietary patterns in various parts of the State of Louisiana.

Someone from north Louisiana is not eating the same meal pattern as someone from down around Lake Charles, for instance.

Senator YARBOROUGH. Thank you very much.

The CHAIRMAN. Senator Cook.

Senator COOK. Thank you, Mr. Chairman.

Dr. Unglaub, Dr. Morgan, and Dr. Schaefer, on table 2 you show the deficiencies in calories, proteins, calcium, iron, vitamin A, and vitamin C.

You don't really have to turn to it, but all three of you could very easily prescribe proper foods and food supplements to see to it that these situations were corrected.

Now, what I want to know, and to be specific within your knowledge, are these things being provided by our commodity distribution program?

And I ask you, Dr. Schaefer, or Dr. Unglaub, specifically, does the food distribution program currently provide a proper nutritional balance?

Dr. UNGLAUB. I believe Dr. Schaefer has some figures on the contribution per capita of those participating in the commodity distribution program.

Dr. SCHAEFER. Actually, as I mentioned yesterday, we have not actually analyzed all the data, but I could give you these impressions from looking at the data that we have accumulated:

That the commodity distribution program again is restricted to very few commodities, not the 22 that are available. We have not found a family that was receiving anywhere near the 22. It is more likely to be eight to 10 to 12 of those items.

If one takes those 12 items and calculates out the nutritional contribution, you certainly do not come up with an adequate diet, if they were consuming only this.

The point I made yesterday is that the average dollar value, cents value, per person per day for the food commodity distribution program is up to about 17 cents a day.

I am talking about Louisiana.

Senator Cook. In essence, what you are really saying then, is——

Dr. Schaefer. It is not responsive to these needs. If it had been, we would not really expect to find this level or this magnitude of problem.

I think this is a fair statement.

Senator Cook. All right, then, knowing the deficiencies that exist as a result of your study, with all the education in the world, with all of the advanced programs of knowledge to mothers that you could conceivably give to them, you cannot correct these unless the program itself is corrected to give the necessary items to make up for these deficiencies.

Is that correct?

Dr. Schaefer. Yes, sir. I would agree; yes.

Senator Cook. All right. Thank you, sir.

Dr. Unglaub, I had just another question, here.

I have been wondering, pondering your statement here about ignorance being a major part of the problem. Isn't it a fact that it is almost impossible to separate ignorance of nutrition from the economic level of these people?

By that I mean is there any ground for believing that the rich or the middle class have a better understanding of nutritional needs than the poor?

Dr. Unglaub. There is no ground for that at all, Senator. I agree the poor are almost certain to be ignorant of nutrition, but this ignorance extends up into the high socioeconomic groups.

The Chairman. So if you have better nutritional standards among middle class or upper middle class families, it is not so much that they are wiser about what they eat, but because they can afford to buy fresh vegetables and fruit and other commodities that they need?

Dr. Unglaub. The fact that they can afford to buy them does not seem to have that much influence. They don't know, for example, what they should be buying, even in the upper socioeconomic groups.

There is a tendency, of course, the more affluent they are, that they use more of the convenience foods, the more expensive types of food, TV dinners and things of this sort, which in themselves nutritionally are pretty good.

On the other hand, even amongst my friends and my colleagues, they have a difficult time in getting their children set in the proper food habits, and they really don't make too much of an effort.

As long as they are growing and they are gaining weight, that is all they are concerned about.

The CHAIRMAN. But you will find all of these nutritional problems more acute and more prevalent among low-income families, will you not, Doctor?

Dr. UNGLAUB. I am certain that will be the case. We don't have that data analyzed, as I pointed out, but I would say that is a safe assumption.

The CHAIRMAN. So we are really talking about a double problem, here, are we not?

Dr. UNGLAUB. We are.

The CHAIRMAN. The lack of education and knowledge about what constitutes a good diet, and secondly, the inability to purchase an adequate diet.

Dr. UNGLAUB. We are, indeed.

Senator ELLENDER. Have you found any families in which the children had all of the vitamins that you are speaking of here? You have given us an average, and I am just wondering if you have found any family in Louisiana or in Texas wherein the children or the parents receive the proper amount of vitamins, whatever defect you find in the others?

Dr. UNGLAUB. I am sure there are. As you see the figures in the table, there is a certain percentage of families that are receiving a hundred percent or more of the recommended allowances, so it is bound to be the case.

Senator ELLENDER. Well, now, have you followed through in this family to determine why it is that they are getting the proper amount?

Dr. UNGLAUB. We have not as yet, but I think we should.

Senator ELLENDER. Yes. I think that is essential.

Dr. UNGLAUB. I think this is essential.

Senator ELLENDER. That may improve it.

Dr. UNGLAUB. Find out what they are doing right, so we can teach other people how to do it.

Senator ELLENDER. I would like to offer here as an example my 13 grandchildren, because they get all the bananas and all of the oranges that they need. It is there, and I am not joking about it.

I would just like to get some concrete examples as to whether or not the families are getting the proper amount, and why they are.

Dr. UNGLAUB. It takes a major effort, Senator, to get the children to eat as they should eat, and I speak from my own personal experience, and this is a frustration. Of course, I should not say it, but at times my son's diet appalls me, and the boy needs constant supervision and encouragement to keep him on a reasonable dietary track.

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Doctors, you have all certainly had some experience along this line. You know we have fad foods in this country. For a while, if you ate yogurt every day, you lived to be a hundred years of age.

A vast number of people buy different fad foods, and there are many different food fads.

Are these food fads, as a percentage of participation in them, following the higher or the middle income brackets, or people in the low-income brackets?

Have you ever made an in-depth survey or a casual survey of who follow the food fads?

Dr. UNGLAUB. We have not made any in-depth studies of this, but I would guess that probably the participation in such fad diets is greater in the higher income bracket.

Senator YARBOROUGH. And the many who follow those food fads also suffer deficiencies in vitamins?

Dr. UNGLAUB. If they follow long enough, they are bound to. They can't miss.

Senator YARBOROUGH. Those are all the questions I have.

The CHAIRMAN. Thank you very much, Doctor, and Dr. Morgan.

This testimony has been very helpful to the committee.

Dr. UNGLAUB. Senator, Dr. Morgan and I would like to express our appreciation to you and the committee for the interest you have shown, and the time you have given us to present our side of the story.

The CHAIRMAN. Thank you very much.

Dr. UNGLAUB. Thank you.

The CHAIRMAN. The final witness this morning is Mr. B. P. Taylor, the superintendent of schools of San Diego, Tex., and we would like to hear from Mr. Taylor at this time.

Mr. Taylor, you may proceed in any way you wish.

STATEMENT OF B. P. TAYLOR, SUPERINTENDENT OF SCHOOLS, SAN DIEGO, TEX.; ACCOMPANIED BY DR. ARNOLD E. SCHAEFER, CHIEF, NUTRITION PROGRAM, DIVISION OF CHRONIC DISEASE PROGRAMS, REGIONAL MEDICAL PROGRAMS SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. TAYLOR. All right, Senator.

As you know, I have a written statement here. I would just like for that to be made a part of the record.

The CHAIRMAN. All right. The entire statement will be made a part of the record.

(Mr. Taylor's prepared statement follows:)

PREPARED STATEMENT OF B. P. TAYLOR, SAN DIEGO INDEPENDENT SCHOOL DISTRICT
MEDICAL AND NUTRITIONAL PROGRAMS

LOCATION

San Diego, a city in Duval County, Texas, is located 80 miles from Laredo, Texas, and fifty miles from Corpus Christi, Texas. It is the county seat and has a population of approximately 4,795 inhabitants, of whom ninety-nine percent are Mexican Americans and descendants of pioneer families. About 60% of all families represented in the San Diego Independent School District have an income of less than $3,000.00 per year and the average family size is 5.

BUILDINGS AND GROUNDS

The San Diego Independent School District covers an area of 440 square miles. The campus covers 49 acres of land.

The physical plant of the San Diego Public Schools consists of more than twenty-five buildings all of which are air-conditioned.

Recreational facilities include a football stadium and athletic field, gymnasiums for the junior high and senior high schools, one gymnasium for the

primary and elementary schools, two playgrounds with facilities for children's outings, a swimming pool, and a Little League park. The playgrounds and gymnasiums are opened all year round and supervised daily by professional personnel.

THE LIBRARY

The San Diego Independent School District has a library which contains about 7,000 volumes and is kept opened all year round and supervised by a qualified librarian.

The library is open to the public on a twelve-month basis, including Sundays. A recreational reading program for children is sponsored during the summer. Two color television sets and a listing center afford other forms of study and recreation.

STAFF

Three principals, forty-four teachers, and eleven aides, compose the staff of grades one to eight. The teachers and the aides supervise the children at breakfast and lunch at the cafeteria besides their regular teaching duties.

Other personnel responsible for duties connected with grades one to eight are the elementary school counselor, the school nurse, the librarian, book custodian, visiting teacher, child accountant, administrative assistant, and the secretaries to the principals.

ENROLLMENT AND ATTENDANCE

Attendance and enrollment is very good. The following table gives attendance information:

ATTENDANCE

Year	Enrollment	ADA [1]	Percent of attendance	Scholastic census [1]
1964–65	1,520	1,385.548	95.72	1,631
1965–66	1,551	1,479.142	95.35	1,603
1966–67	1,551	1,499.438	95.41	1,648
1967–68	1,584	1,537.144	94.98	1,665

[1] The kindergarten is not included in the ADA or in the scholastic census report above.

KINDERGARTEN

Year	Enrollment	ADA	Percent of attendance
1966–67	121	92.983	87.43
1967–68	131	103.254	85.40

HEALTH SERVICES

The school started its complete lunch and breakfast program during the 1966–67 school year. The two programs are financed partly with Title I funds—forty percent to be exact.

The programs have been very successful due not only to the response of parents, but to the cooperation of the members of the staff in the departments involved. In fact this study reveals that many of the late entries enroll and stay in this system because of these programs.

Ninety percent of 363 families who qualify for these programs are also in some of the state, county and federal welfare programs; others fall under the category of low-income families. No family who has asked for participation and qualifies in these programs, has been denied aid. This year 771 children are enrolled in these programs from the first to eighth grades. Every child that qualifies is included in the breakfast and lunch programs.

The table below shows participation in the programs. Absenteeism in most cases was due to inclement weather or flu epidemics.

GRADES 1–8

Year	Number enrolled	Average participation	Percentage
1966–67	799	[1] 583	73
1967–68	724	[1] 615	85
1968–69	771	[2] 714	93

[1] As of month of March 1967, 1968.
[2] As of month of October 1968.

Besides the breakfast and lunch programs, the school, with Title I funds, provides other services that will benefit the well-being of its low-income population. The following report from the nurse's office reveals some of these aids:

Vision:	
Students examined and fitted with glasses	123
Number examined by eye specialist	8
Ear examination:	
Receiving hearing aids	12
Ear operations	2
Shoe correction: Number receiving shoe correction	35
Tonsillectomy: Operations performed	7
Circumcision: Operations	3
Medical examinations: Complete examinations given	([1])
Medical cases (in general):	
Kindergarten to 3d grade	25
Elementary, 4th-6th grades	20
Junior high, 7th-8th grades	13
High school	7
Tine tests:	
Tine tests and Mantoux administered	583
Students X-rayed for positive tine	24
Dental cases:	
Examinations	([2])
Dental care, fillings and extractions	822
Expenditures for examinations and dental care	$12,032

[1] All entries.
[2] All.

(Most of these students were also provided with medicines and others received penicillin shots)

Injections—The school nurse administers the following injections: Diptheria, pertussin, tetanus (DPT), smallpox, tetanus toxoid, measles vaccine, tine tests, oral polio vaccine.

These injections are administered prior to enrollment in school. The DPT injections are given in a series of three, one month apart, followed by a booster a year later. Polio Trivalent—two are given eight weeks apart.

Smallpox—before enrollment or as soon as possible after entrance.

Measles vaccines were administered to all students attending school during the summer months.

The attitude of parents toward medication has changed considerably since these programs went into effect. Through home visitations by the counselors and school nurse, the parents have been taught to be concerned about the health of their children and themselves.

We think our program has shown, beyond a shadow of doubt, that a school that furnishes these benefits certainly keeps the drop-out problem at a very minimum and average daily attendance rises and that we have healthier children attending school. This whole program is based on the philosophy that only a healthy child can be taught. In order for children to learn at their maximum rate, they cannot be hungry or under nourished.

Mr. TAYLOR. To proceed with the story that we found in a nutritional survey, back in 1959, in the school district in San Diego, after I became superintendent, we had some real problems, problems of nutrition, problems of health, problems of attendance, problems of dropouts, and major basic problems of the school district.

Well, our staffs got together and found out what could be done, and what we thought should be done in regard to these problems, and ultimately the problem that consistently came up was food and health, followthrough surveys on food and health, following this up.

Well, we started with feeding them lunch, all the students, school children from first grade through 12, of which we had a large number participating.

At the same time we did that, a few years later, we started with the breakfast program with the Department of Agriculture, and with the same number participating.

We started a preschool program prior to the Headstart, whereby we had the 5-year-old children up there for some 13 months, from June to a year from the following August, prior to the first grade.

We found some phenomenal things over the past 3 years. We found that just with these programs, atendance climbed by some 15 to 20 percent. We found that the dropout record was real low, that our ADA would be from 95 to 98 percent consistently through the year.

Well, we followed up on these programs to a point then along came title I, this made it possible for us to afford a number of things, and with our own local effort we followed up on a program. We gave the children eyeglasses that needed them, hearing aids that needed them, corrective shoes.

We tried our best to carry this into the homes of the children. Our elementary counselors, our nurses, go to the home, and did when it started, and explain what we are doing with the children.

They take pride in what we are trying to do. The parents are in full agreement with the strides that we have made with their children.

We at the same time noticed that perhaps the deficiency in nutrition was not just that of the children eating the wrong food, but it might be that of some of the parents preparing the food the wrong way.

We had some programs whereby we brought the parents into the home economic departments and into our schools, and taught them how our nutrition people and diet people thought that the food should be prepared to be more advantageous to them and the children.

The CHAIRMAN. Mr. Taylor, may I stop you there for just a moment and ask you if you could tell us a little about the composition of your student body, the number of students, the economic level, and/or ethnic background of these youngsters?

Mr. TAYLOR. Yes, sir. We have about 1,600 students, of which 99 percent are Mexican-American descent. The income of our families in our school district according to the 1960 census is that some 50 percent of them are under the $3,000 bracket. It might be a little higher now.

The CHAIRMAN. They are essentially low income?

Mr. TAYLOR. Yes, sir, they are essentially low-income families.

Senator YARBOROUGH. I would like to ask a question here, Mr. Chairman.

Superintendent Taylor, give us the location of San Diego, Tex.

Mr. TAYLOR. Geographic location? It is in Duval County, Tex., some 55 miles from Corpus Christi, and some 55 miles from Laredo. It is right between the two.

Senator YARBOROUGH. It is brush country?

Mr. TAYLOR. Brush country, yes.

Senator YARBOROUGH. Range country?

Mr. TAYLOR. Range country.

Senator YARBOROUGH. What is the elevation above sea level?

Mr. TAYLOR. I would not know exactly, Senator.

Senator YARBOROUGH. Not over 150 feet?

Mr. TAYLOR. No, sir.

Senator YARBOROUGH. What is the rainfall per year?

Mr. TAYLOR. Oh, 20 inches.

Senator YARBOROUGH. So it is low rainfall, and a brush ranching country. It does not have the natural resources, without development of them, to give people very high income, does it?

Mr. TAYLOR. No. That is correct.

Senator YARBOROUGH. Unless you develop manufacturing or something else?

Mr. TAYLOR. Right.

Senator YARBOROUGH. And what is the population of San Diego?

Mr. TAYLOR. Oh, about 4,700.

Senator YARBOROUGH. And how far are you from Alice, the city of Alice?

Mr. TAYLOR. Ten miles.

Senator YARBOROUGH. How big is the city of Alice?

Mr. TAYLOR. Oh, I would say 20,000 people.

Senator YARBOROUGH. The county seat of the adjoining county?

Mr. TAYLOR. Yes.

Senator YARBOROUGH. I hope, Mr. Chairman, this background will be helpful.

Knowing that 99 percent of the population are of Mexican extraction, are these recent migrants after the Mexican Revolution of 1910, or were these old, original inhabitants?

Mr. TAYLOR. They were the old original inhabitants.

Senator YARBOROUGH. These were there before the great influx of Mexican-Americans during the Mexican Revolution from 1910 to 1921?

Mr. TAYLOR. That is correct.

Senator YARBOROUGH. This country had been settled before the Anglo-Americans came to Texas in 1821?

Mr. TAYLOR. That is correct.

Senator ELLENDER. Does this survey cover the whole of Duval County?

Mr. TAYLOR. No, I am speaking for San Diego School District per se.

Senator ELLENDER. Just the city?

Mr. TAYLOR. Well, not just the city; some 400 square miles, and it even involves part of Jim Wells County, the San Diego School District does.

Senator YARBOROUGH. Do you reach over into Jim Wells County?

Mr. TAYLOR. Yes, toward Alice.

Senator YARBOROUGH. So you are a pretty successful administrator being able to bite off Jim Wells County?

Mr. TAYLOR. It was there when I got there, and I just try to keep it, Senator.

Senator YARBOROUGH. Go ahead.

Pardon me, Mr. Chairman.

Mr. TAYLOR. And basically we adopted a philosophy in the school district from the point of origination of these programs that we felt that no child could be educated if he were hungry, if he felt bad, if on occasions he got sick more frequently than other children.

So we accepted the responsibility of this being part of our job, getting these children ready to be taxed to the maximum, and the teachers in the school district and the people within the school district adopted this theory.

The school board, of course, went along with it 100 percent, and to do this you have to have some dedicated people. You have to have people that recognize the problem and want to cure the problem.

They are not just teachers. They are people that participate in a school program, regardless of what the program develops into, in regard to size and time and hours. We are one of the few school districts in the State, I think, that particularly has no teaching problem. We find teachers readily.

Our teachers understand the problems. We let the nurses meet with them, and the elementary school counselors meet with our teachers, and explain the problems that we are trying to work with throughout the year.

It has been a successful program from the standpoint of attendance, from the standpoint of children feeling better, from the standpoint of grades.

We know that children that we have started with the in-school program and fed breakfast and lunch, along with our extensive recreation program in the summertime, make better grades than the students prior to this did.

The CHAIRMAN. Do you feed them in the summertime, also?

Mr. TAYLOR. Yes, sir; we feed them in the summertime. A lot of this is local effort. A lot of it is title I money.

The CHAIRMAN. But they come to the school?

Mr. TAYLOR. Yes. sir.

I don't know if we have oversold it or not, but it is a community. We keep all our gyms open the year around, our library open the year around. We have playgrounds for elementary school children. We have a swimming pool.

These are all watched over by professional people, teachers.

If I may say so, teachers do this work around the clock, and during the year.

Senator ELLENDER. During the course of your presentation, would you tell us how all of this is financed?

Mr. TAYLOR. Well, it is financed through the title I program.

Senator ELLENDER. Through what?

Mr. TAYLOR. Title I, Elementary and Secondary Act.

When that act was enacted, as you know, it was explained to us through our agency, and I am sure they are correct, that they wanted to give the schools what they had not had before in the order of first things first, and we knew beyond a shadow of a doubt that food and health was the first thing, as far as our children were concerned.

The CHAIRMAN. Mr. Taylor, you started this program, though, long before the Elementary and Secondary Education Act. As I understand it, it began in 1959.

Mr. TAYLOR. Yes, sir.

The CHAIRMAN. What were the conditions that led you and your school board and the community to reach a judgment 10 years ago that you wanted to make sure that every student in that school had an adequate diet and adequate health?

Mr. TAYLOR. Well, we have visiting teachers to go out to the community and check on absentees, check with the local doctors. We kept charts on the number of children. We knew the teacher connection with most families in town. We knew the children that came from the low-income brackets. We knew the ones that were more frequently sick than others. We knew the ones that were frequently sick and not taken to a doctor because of close relationships between the school district and the people.

We never hesitated in going into the house, the teachers or the counselors or the nurses, to check on these things.

Inevitably, the teachers, and with the nurse, and with the counselors, all agreed these children were not getting an adequate diet.

They were not taken to the doctor when they should be. I don't think it was a matter of parents not having loving concern. I think it was a matter of economics on the one hand, and on the other hand it was a matter of education of the parents as to when they should be concerned about these problems.

The CHAIRMAN. Superintendent Taylor, do you provide a school lunch to all of the 1,600 students in your jurisdiction?

Mr. TAYLOR. Well, we provide school lunch to all of the youngsters that need it, from the kindergarten all the way through the eighth grade.

Of course, then, as you know, we are prime sponsor for the NYC program in that area. We have some work-study jobs through our area vocational school, and all these youngsters eat at the cafeteria, and they are able to buy their lunch at the cafeteria, because of the money that they make through these programs.

The CHAIRMAN. What percentage of the students are fed without cost to them?

Mr. TAYLOR. Well, in the first eight grades, you have some 771 children enrolled, and I would say about 90 percent of all the children in the lower grades.

The CHAIRMAN. They are fed without any cost?

Mr. TAYLOR. Without any cost at all; yes, sir. Of course, a breakfast and lunch. We insist that the children participate in both breakfast and lunch, and they are glad to do so.

This breakfast program, when it came in at a later date, was a problem, because they had not been used to eating breakfast, but now it is as important, if not more important, than the lunch meal. They seem to consume their food better.

This meal has got great participation in it. Of all the children that are eligible, some 95 percent attend regularly the dinner and breakfast.

Senator YARBOROUGH. May I ask a question?

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Superintendent Taylor, how many Anglo children do you have in your school district?

Mr. TAYLOR. Four, and they are mine.

Senator YARBOROUGH. All four Anglos are your children, in the entire system of what you have totally enrolled?

Mr. TAYLOR. I don't have four now. I had a girl graduate 3 years ago.

Senator YARBOROUGH. Three, with 1,584 enrolled?

Mr. TAYLOR. I will have four pretty soon.

Senator YARBOROUGH. I presume your children are bilingual?

Mr. TAYLOR. Yes, sir; much more than I.

The CHAIRMAN. I am curious, Superintendent Taylor. Is the assumption in feeding all of these youngsters, without cost to the student, based on your feeling that most of the families in that community just are not capable of paying?

Mr. TAYLOR. That is it.

The CHAIRMAN. Suppose you were an administrator in a community where there were sharp differences in economic levels, and some of the families could afford to pay, but the majority could not, what would you do in terms of protecting the students, not just in terms of their diets, but also some recognition of the feelings against them?

Mr. TAYLOR. We do it that way right now. No one knows in our school district who pays for their lunch and who does not, except the confidential list that we have in my office by name.

The CHAIRMAN. That is confidential information?

Mr. TAYLOR. Yes. No one knows. Not even the classroom teacher that is teaching the students knows who is free and who is not free. All she gets is the number of people that go to the cafeteria day by day.

The CHAIRMAN. You mentioned a rather dramatic result which you detected in terms of the grades and academic performance and general effectiveness of the students. Can you talk a little bit more about that?

Mr. TAYLOR. Well, we find that with this program that of course the children attend more regularly. Our ADA is constantly above 95 percent. The average student in school attends over 95 percent, and this is documented through the agency.

That is how we get our teachers, through our foundation program, on our average daily attendance, which you are familiar with.

Senator YARBOROUGH. What you are talking about is that the ADA is your foundationfor the State?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. You have very little tax value in that district?

Mr. TAYLOR. Yes, sir; we have very little. We have some $20 million.

Senator YARBOROUGH. Very small business district in San Diego for a city of that size?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. People go over to Alice?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. So your tax base is very low?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. The State has a supplementary program to make up for the districts with a low tax base?

Mr. TAYLOR. Yes.

Senator YARBOROUGH. That is where you speak of your basic money?

Mr. TAYLOR. That is correct.

We found in the grade system that these students, after receiving meals and health services—and I am sure the health services were as important in many instances as the food—such as glasses, hearing aids, constantly come to school and consequently make better grades.

Another problem that we were faced with was when I first got there, we had a bunch of retainers in the first grade.

I know one of the problems was the language barrier, along with inability to consume the information, but I do know that the retainer number has lowered in the last 5 years tremendously.

I would have to say that in all due respect to the personnel, some of the teachers want this program to work so hard, and are so interested in it, they may take a little more pains with these children than prior to this program, than they did back there when we did not have the program, and they know that they have everything to work with now, as far as the child is concerned.

We give them all their inoculation shots from top to bottom, and we start in our preschool program.

We found some other things. We found that we have less discipline problems now than we had before. I believe that this is probably on the education of the parent, believing in what we are trying to do for the child, along with the child wanting to attend school and wanting to correct the things that are wrong healthwise.

The CHAIRMAN. What about after graduation, Mr. Taylor? Have you also noticed better performance standards on the part of your graduates?

Mr. TAYLOR. Yes, we have.

The CHAIRMAN. Than you had previously gotten?

Mr. TAYLOR. We have not only noticed a little better performance standard: we have noticed that a bigger percentage strive to attend college and want to attend. We find that they go to jobs and stick with them.

The CHAIRMAN. Has your experience with these food and health programs spread to other schools in the area? Have they come to observe your operations and try to apply this elsewhere in the State or in your region?

Mr. TAYLOR. Well, we have had a lot come to observe. I cannot answer the question as to what they have done about the problem.

We have gone, too, and we have had a number of phone calls and school boards have come to observe what we are doing. As to what they are doing to solve the problem, I just don't know. I just don't know to what extent they have carried it.

The CHAIRMAN. Do you think that the Federal part of the school lunch and other programs that relate to the nutrition of youngsters are generally satisfactory?

In other words, if you had the kind of local followthrough that you suggested that you have in San Diego, would the existing food programs that the Federal Government provides on the school level be adequate?

Mr. TAYLOR. Yes, I think on the school level they are adequate. I think that the most important phase of our problem, or at least our solution to the problem, I think, is that so many schools might not be using enough of their elementary and secondary money in this field.

We use some 40 percent of our total allotment in health and nutrition, which is quite a lot of money in the program. It has grown to the standpoint it has been such an important part of our curriculum that it has just absorbed the money.

The CHAIRMAN. What part of the budget comes to you through the school lunch allocations from the Federal Government?

Mr. TAYLOR. From the Federal Government? Well, to the school I would say probably 25 to 30 percent of the total operation.

The CHAIRMAN. Is funded by Federal money?

Mr. TAYLOR. Yes, sir; not counting the elementary and secondary.

The CHAIRMAN. I understand. And of that elementary and secondary education money you put about 40 percent into food and health programs?

Mr. TAYLOR. Yes, sir.

The CHAIRMAN. I am interested in your efforts to deal with the families. I don't quite understand what you do in terms of involving the parents in this program.

Did I understand you to say you go into the homes?

Mr. TAYLOR. Yes, sir; we go into the home. We sit down with the parents, and we explain this program to them, and we never put it on the scale or even say that, "We are here because you are a needy family."

Our school is accepted in the community, and the parents accept what we talk to them about as the truth.

We talk to them about the vitamin deficiency of the child and the attendance of their child, and, "We think that these meals, even though you are preparing them here at home, and they are offered to the child here at home," and in many cases this may or may not be the truth, "We think that their being at school at 7 o'clock in the morning to eat breakfast and then eating lunch at noon will solve a big problem and help the student's performance so far as the school is concerned," and we found no difficulty at all.

Perhaps it is because most of the people that go in the homes are acquainted and make themselves acquainted with the families and, of course, then, when the nutritional survey came in this, of course people were real receptive from the standpoint that they thought, and still do, that someone else has expressed a concern with this problem.

The CHAIRMAN. Was your school district involved in the nutrition survey that Dr. Schaefer and his group studied?

Mr. TAYLOR. Yes, sir; it sure was.

Senator ELLENDER. What did they find? Do you know?

Mr. TAYLOR. Well, I don't know.

Senator ELLENDER. It might be interesting to take your case itself, just to see if there are any deficiencies in calories or iron, and what have you.

Mr. TAYLOR. That information will be compiled and sent out at a later date, I understand, but from the information that I can get, it was extremely good.

The CHAIRMAN. Dr. Schaefer, would you want to comment on this when you come back for a moment? I think it would be interesting to get your observation on that.

Dr. SCHAEFER. Senator, we had an opportunity to look at the data, and this was one outstanding example in a number of aspects.

These were the best teeth we have seen in any place that we have surveyed to date, least number of decayed, unfilled teeth. The blood biochemistries are completely different than what I presented for the overall picture of the national nutrition survey.

I don't remember the exact figures, but we were particularly interested to look at the data on hemoglobin, and this is down in the level of 3 to 4 percent, instead of our normal level of 15 percent, with very few other blood biochemicals being in the unacceptable level, and this is what really brought our attention to going back and finding out just what Superintendent Taylor had accomplished.

So I think this does indicate that if one can get to the families and initiate aggressive programs that involve local participation, as he I think modestly indicated, there are effective ways and means of doing it.

The CHAIRMAN. You are talking about nutritional results for the whole community, not just the children?

Dr. SCHAEFER. No; basically we looked at just the children, and our information is not out on the parents and the other divisional, but this we certainly will zero in on.

The CHAIRMAN. Is there any evidence, though, that the nutritional education these youngsters are receiving in school, plus the experience of an adequate diet, carries over into the home so that the families become more concerned about nutritional matters?

Dr. SCHAEFER. This is one of the things we hope we will be able to also get out of the questions that we are asking of the mother, as to her purchasing, her food patterns, has she changed these recently, and in our questionnaire we should be able to look at this to see whether there has been any shift, in other words, whether she is answering more of the questions stating that she is feeding more milk or more vegetables, or the past year she is now introducing citrus fruits, and things like this.

This should come out of our data. We have not analyzed this yet, but we certainly will be looking with real concern to that area that is in there.

The CHAIRMAN. Would you comment on that, Mr. Taylor?

Mr. TAYLOR. Well, the participation in the program, as I understand it, was tremendous.

I think the fact of selling the people on participating in this program was no problem at all, in our community. We sent the same teachers and the same counselors and the same nurses, everybody working with the program, to get participation.

The CHAIRMAN. I was not thinking so much about the nutritional survey, but is there any evidence that what seems to be an excellent school lunch program, school breakfast program, carries over into the home, so that the mothers and fathers become more concerned about nutritional standards, and in fact know more about what constitutes an adequate diet?

Mr. TAYLOR. Well, we think so. We are getting more mothers up at the school asking the opinions of our home economic teachers in regard to how to prepare the commodity food that they receive, the best way for them, and that their children consume.

As to what is the reaction on the bodies of the food makeup in nutritional values within the adults, I would not know, but I certainly know that any time that we put on a participation program with the parents to come to the school and learn how to prepare these things, they do, and they are glad to come, and will work hard in following our instructions as to preparing them.

Senator YARBOROUGH. Mr. Chairman, may I ask a question?

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Superintendent Taylor, in your experience in Texas, have you found family ties are closer and tighter and you have a closer family among the Latinos than among the Anglos?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. I have been astonished at the ease with which you say you have been able to get the people to get into this, because the Latino, in his personal habits, is very conservative about change, is he not?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. And you have broken down their cultural patterns that existed right in that geographical area for 200 years by these small children leaving the family?

Mr. TAYLOR. Yes, sir.

Senator YARBOROUGH. I think we have one of the most tremendous successes that I have heard of anywhere in the whole southern part of the United States, along the Mexican border from Brownsville, Tex., to San Diego, Calif.

That is the poverty area of the United States, where the income is lower than any other part.

Mr. TAYLOR. I appreciate those remarks, Senator. I don't think that it is anything that we particularly did, outside of just applying the services that were available through the programs to the children, and seeing to it that they benefited out of them the most they could.

Senator YARBOROUGH. I am not going to ask you to comment on another school. As a superintendent, you probably would not want to, but last year we had our migratory labor hearings in Rio Grande City, Starr County, on the Rio Grande, which is how far, less than 100 miles, or about 75 miles?

Mr. TAYLOR. Yes, sir, about 100; between 75 and 100, yes, sir.

Senator YARBOROUGH. There the superintendent told of a turnover of about a third of his staff every year, and the country was so impoverished the teacher would teach a year and leave with despair.

As I understand you, your teachers stay. They work in the homes, and they work after hours, and they work long weeks to help put this program over.

Mr. TAYLOR. Yes, sir, our turnover in our school district teacherwise is less than 2 percent, if that high.

Senator YARBOROUGH. I commend you on the high morale of the teaching staff that you have built.

Mr. TAYLOR. I think they are taking pride, and in my opinion it would be well to say that our teachers are paid the minimum foundation salary.

Senator YARBOROUGH. In other words, you don't have any high pay. You don't have an oil field in there that lets you have a tax base to pay higher salaries.

Mr. TAYLOR. No, sir.

Senator YARBOROUGH. The salaries are very uneven as to school districts in Texas, are they not?

Mr. TAYLOR. That is correct.

Senator YARBOROUGH. If a school district has on oil field in it, it pays salaries far beyond the salaries the teachers get in other districts, don't they?

Mr. TAYLOR. That is correct. We have not used any of the Federal programs to raise anybody's salary prior to the program.

Senator YARBOROUGH. You have done all this with the very minimum of money in this school district, one of the school districts that is right on the bedrock with minimal money, have you not?

Mr. TAYLOR. Yes, sir. We think we have.

Senator YARBOROUGH. I think that shows what can be done by the dedication of people when they are doing a job, when you have done this with the meager resources at your command.

I happen to know a little about the country.

Mr. TAYLOR. I might make one comment on the dental. I mentioned that most of the teeth have been filled, or would have been filled, or are being filled.

By this time next year, we should not have a cavity among the first eight grades in school.

We are completely following up on these programs, and I think probably that is the key to it.

It is the followup, and once you define the problem, if you have the money, it is no big chore to solve it.

Senator ELLENDER. Mr. Chairman.

Dr. Schaefer, I wonder if we could have your findings in this school district set aside and just give us the same information as to the school that you gave for the average in Texas.

Dr. SCHAEFER. Yes, sir; we will be pleased to do that, sir.

It will be restricted to get that portion identified and pulled out.

Senator ELLENDER. If that can be done in line with the full cooperation of the people, this may be our trouble in many places.

(The information requested will be found on p. 751.)

Senator YARBOROUGH. Mr. Chairman, I would like to file Superintendent Taylor's statement to be printed in the record. He tells about all of the facts on inoculations, all the students fitted with glasses, hearing aids, the hair examination, shoe correction, all the things they are doing, and I think this is very valuable.

The CHAIRMAN. Yes, sir. We will see that this entire statement is made a part of the record.

Of course, the same thing will be done with Dr. Unglaub's prepared statement.

Let me ask, Mr. Taylor, if you have any close knowledge of the operation of the food stamp and commodity programs in your area.

I realize that is not directly under your jurisdiction as superintendent of schools, but are you generally familiar with the operation of those family feeding programs?

Mr. TAYLOR. I am familiar with it from the standpoint that we know how many of our families of scholastic population receive commodity. I don't think we are in the stamp program in that county.

The CHAIRMAN. What is your judgment about the quality of that program?

Mr. TAYLOR. Oh, I think it is an outstanding program, if you could add nutritional education along with the program, and I think the food, from what I have seen, is very good food.

I see nothing wrong with the food. I am not an M.D. from the standpoint that I can evaluate it——

The CHAIRMAN. I understand that.

Mr. TAYLOR. From the nutrition standpoint, but I do think that in many cases, in most cases, that it is adequate in our county.

I think that the only thing we need is nutritional education to teach these folks how to use this food and use it more advantageously, for their families and themselves.

The CHAIRMAN. Is the food package sufficiently varied so that it seems to offer an adequate diet?

Mr. TAYLOR. Well, I would think so. From what I have seen, it does.

I know the food that we receive for the school cafeteria is sufficiently packaged.

The CHAIRMAN. I wonder if either you or Dr. Schaefer might know what commodities are distributed there.

Dr. SCHAEFER. I don't know, offhand, Senator, but we can certainly get this.

(The information requested will be found in the Appendix.)

Mr. TAYLOR. I know meal, and I think canned roast beef and gravy. I think some canned chicken, peanut butter. I know these things have been distributed.

Senator ELLENDER. There are quite a few different varieties, as I understand it, of food.

Dr. SCHAEFER. We did give you this list, sir.

Senator YARBOROUGH. Just one more question.

Superintendent Taylor, how does a school superintendent go about convincing the school board and all the town regency that they ought to accept responsibility for feeding all these schoolchildren?

Mr. TAYLOR. I dont think that the superintendent can do it, Senator. I think that the superintendent must convince his staff, the teachers.

The school board, of course, in my instance, are men that believe in this. They think that this is an obligation, that when people are hungry, and the school district can do something about it for children to benefit, this should be done.

Senator YARBOROUGH. Do you think the main problem is his own staff and all the people who work with him?

Mr. TAYLOR. Exactly. If you can educate these people from the standpoint of getting them to honestly convince themselves, and you helping them be convinced that their job is not just the job of teaching the children that can be taught, but a job of getting all the children

to where they can be taught in regard to problems, working with their problems, and selling them on dedication, they will sell the community.

When they see teachers coming to work at 7 in the morning and leaving at 5 or 6 in the afternoon, when they see the cafeteria open before daylight and close after dark, when they see bus routes start at 5 and get back home at 8, and we pick up first graders before daylight and let them off after dark, knowing well and good that they are in good hands at the school district, they will be watched out after, not only foodwide, but healthwise, and we will do our best to educate them.

This is no problem. This sells itself.

Like everybody, you have to have a certain amount of dedication.

Senator YARBOROUGH. This goes beyond the conventional pattern of what teachers have done for generations, does it not?

Mr. TAYLOR. Yes, sir. This is not what teachers have done for generations, or want to do during this generation, by and large, and I don't mean in any way to cast reflections upon the teaching profession as a whole but I do know that I am blessed, and our community is blessed, with some dedicated people, and some not just merely teachers.

For instance, we have 40 percent of our faculty master degree people.

Senator YARBOROUGH. I believe you even turn out a good football team down there.

Mr. TAYLOR. Well, we finally won the district this year, and I in some way had tried to tie that in with the program, but I don't know whether we did or not.

Senator ELLENDER. Is there any child delinquency in your district?

Mr. TAYLOR. Yes, sir; we have some child delinquents.

Senator ELLENDER. How do you go about it?

Mr. TAYLOR. We try to accept the responsibility for those children, on top of everything else.

We meet with the people that are in charge of child delinquency, and we meet with the grand juries. We meet with these problems.

Our high school principal works with them, and talks with these children, and tells these children when we accept them back in school what we expect of them.

We have a very small percentage of this. But just because a boy or a girl gets in trouble, we don't wipe him off the map. We don't say that is an undesirable that we don't want in our school, or we feel like we failed, that this is part of our responsibility, too.

We are not going to give up on them, and consequently we keep a tremendous amount, percentagewise, in school.

As the chart will verify, we have less than 100 scholastics that are school-age children that are not enrolled in school.

Now, this is considering the kids that are sent away to school, kids that are transfererd to other schools, so I would guess that we probably have less than 50 kids that should be in school that are not in school, and we have a percentage of those taking our GED course at night, whereby they can get a high school diploma by going through adult education.

So we try to touch them all, and we try to be fair with them. We are firm. We look for what we think in many cases is correct for the student to do, and they do in many cases voluntarily.

We don't have bad kids at all, and this in some ways, and in many areas, goes back to the program. If they are really, genuinely sold that you are trying to help them, and that that school is there for them, and their participation, and their families are sold on this philosophy, you don't have much trouble with schools today.

I don't think there are any unreasonable cases coming up in a school district of our size. I don't find it.

Senator YARBOROUGH. Those are all the questions I have, Mr. Chairman.

The CHAIRMAN. Thank you very much, Mr. Taylor.

I personally think you have described an almost unique situation here this morning. I know every member of the committee is impressed by what you have been able to accomplish in your schools, and it may very well be that the committee should take a further look at what you have accomplished.

And I would hope, Dr. Schaefer, that you will give us all the help you can in isolating the factors there that produced what seems to be a remarkably successful operation, because this could very well give us some clues as to the type of direction we ought to be moving in in other parts of the country.

Mr. TAYLOR. Just for the record, Senator, I want it understood that it is not me. It is the people of that community. They are genuinely interested in this program, and teachers.

Senator YARBOROUGH. Mr. Chairman.

The CHAIRMAN. Yes, Senator Yarborough.

Senator YARBOROUGH. You know, I think it is not only unique, but almost an ideal situation, kind of a dream, the way the relationship of teachers ought to be with the children and the community in an educational system.

The CHAIRMAN. Thank you very much, Mr. Taylor.

The committee will be adjourned until 10 o'clock Monday.

Mr. TAYLOR. Thank you.

(Whereupon, at 12:25 p.m., the committee recessed, to reconvene at 10 a.m., Monday, January 27, 1969.)

NUTRITION AND HUMAN NEEDS

MONDAY, JANUARY 27, 1969

U.S. SENATE,
SELECT COMMITTEE ON NUTRITION
AND HUMAN NEEDS,
Washington, D.C.

The committee met at 10:30 a.m., pursuant to recess, in room 1202, New Senate Office Building, Senator Ralph W. Yarborough, presiding.

Present: Senators Ellender, Yarborough, Percy, Cook, and Dole.

Also present: William C. Smith, staff director and general counsel; Kenneth Schlossberg, professional staff member; Bertram G. Waters III, American Political Science Association fellow; and Clarence V. McKee, professional staff member for the minority.

Senator YARBOROUGH. The Select Committee on Nutrition and Human Needs will come to order.

Hearings will be resumed. The first witness today is Dr. William J. Darby. Is Dr. Darby here?

Dr. Darby, would you come around, please? Dr. Darby is professor of nutrition and director of the division of nutrition at Vanderbilt University School of Medicine, Nashville, Tenn.

Dr. Darby, do you have any staff accompanying you which you desire to bring to the table with you?

STATEMENT OF DR. WILLIAM J. DARBY, PROFESSOR OF NUTRITION, AND DIRECTOR, DIVISION OF NUTRITION, VANDERBILT UNIVERSITY SCHOOL OF MEDICINE

Dr. DARBY. No, sir.

Senator YARBOROUGH. You proceed in your own way, Dr. Darby.

Dr. DARBY. Thank you, Senator Yarborough.

Mr. Chairman and members of the committee, I am grateful for this opportunity of meeting with you and discussing with you some of the problems of nutrition and related human needs.

My professional interest has been focused on research and education in the field of nutrition since my first scientific publication in 1933 and my experience embraces the spectrum of nutritional biochemistry, clinical nutrition, nutrition surveys, and governmental planning of nutrition programs.

This latter has in large measure resulted from direct participation in the nutrition work sponsored by the former Interdepartmental Committee on Nutrition for National Defense and included serving as director of surveys in six developing countries.

Additionally, I have repeatedly served in an advisory capacity and as a consultant for the World Health Organization and other United Nations agencies with responsibility for nutrition planning.

Senator YARBOROUGH. Dr. Darby, I notice that you started publishing scientifically in this field in 1933. I do not see a statement attached with your publications. I know that modesty has prevented you filing that with your statement, but if you have a list of publications, I would like to have it in the record.

Dr. DARBY. I shall be glad to provide that. I don't have a complete list here, but I will provide a list.

Senator YARBOROUGH. And it will be placed in the record here for the benefit of the people who will be studying this record when it is printed.

Dr. DARBY. Fine. I will be glad to do this.

(The information referred to follows:)

CURRICULUM VITAE

Name: William J. Darby.
Home Address: Route 2, Box 165, Thompson Station, Tennessee 37179.
Place of Birth: Galloway, Arkansas.
Date of Birth: November 6, 1913.
Telephone:
Office: AC 615, 254–5411, ext. 6619.
Home: AC [redacted].
Educational Background:
1937: M.D., University of Arkansas.
1941: M.S. (Biological Chemistry), University of Michigan.
1942: Ph. D. (Biological Chemistry), University of Michigan.
Professional Experience:
1965– : Professor of Medicine in Nutrition, Vanderbilt University School of Medicine.
1964– : Professor of Nutrition, Vanderbilt University School of Medicine.
1949– : Chairman, Department of Biochemistry, and Director, Division of Nutrition, Vanderbilt University School of Medicine.
1948– : Professor of Biochemistry and Director, Division of Nutrition, Vanderbilt University School of Medicine.
1946–48: Associate Professor of Biochemistry, Vanderbilt University School of Medicine.
1944–46: Assistant Professor of Biochemistry, Assistant Professor of Medicine, Vanderbilt University School of Medicine.
1943–44: Director of Medical Nutrition, North Carolina State Board of Health, Assigned to Duke University School of Medicine.
1943–44: Instructor in Preventive Medicine, Duke University. Assistant Research Professor in Nutrition, University of North Carolina, School of Public Health.
1942–43: Special Fellow in Nutrition of the International Health Division of the Rockefeller Foundation, Department of Medicine, Vanderbilt University School of Medicine.
1941–42: National Research Council Fellow in the Medical Sciences, Department of Biochemistry, College of Physicians and Surgeons, Columbia University.
1940–41: Horace H. Rackman Fellow and Graduate Student, Department of Biological Chemistry, University of Michigan.
1940– : (Summer) Assistant in Biological Chemistry, University of Michigan.
1939–40: University-Sigma Xi Fellow and Graduate Student, Department of Biological Chemistry, University of Michigan.
1937–39: Instructor in Physiological Chemistry, University of Arkansas School of Medicine.
1935–37: Part-time Instructor in Physiological Chemistry, University of Arkansas School of Medicine.
1930–35: Assistant in Physiological Chemistry, University of Arkansas School of Medicine.

Current Advisory Posts:

1968– : Advisory Committee on Nutrition, Agency for International Development.

1967– : Scientific Advisory Committee, The Nutrition Foundation.

1967– : National Consultant to the Surgeon General, U.S. Air Force.

1966– : Member, Technical Advisory Committee, Institute of Nutrition Sciences, Columbia University.

1965– : Member, Governor's Pesticide Council, State of Tennessee.

1965– : Member, Council on Foods and Nutrition, American Medical Association (Chairman, 1967–).

1964– : Advisory Board, Corn Products Company.

1962– : Public Trustee, Food and Drug Law Institute.

1962– : Scientific Advisory Committee, United Health Foundations (Chairman, 1965–).

1962– : Member, Panel on Nutrition, Space Science Board, National Academy of Sciences-National Research Council.

1961– : Board of Basic Science Examiners, State of Tennessee (President, 1962–).

1959– : Advisory Committee on Nutrition to the Office of the Surgeon General, U.S. Army (Chairman).

1950– : Committee on Food Protection (Chairman, 1954–). National Academy of Sciences-National Research Council.

1949– : Food and Nutrition Board, National Academy of Sciences-National Research Council (Steering Committee, 1955– ; Vice Chairman, 1968–).

Former Advisory Posts:

1963–68: Member, Visiting Committee, Department of Nutrition and Food Science, Massachusetts Institute of Technology.

1964–67: Member, U.S. Department of Agriculture Advisory Committee on Agricultural Sciences.

1966: Secretary of Agriculture Freeman's Mission to Vietnam.

1955–66: Committee of Consultants. Interdepartmental Committee on Nutrition for National Defense (subsequently Development and Office of International Research) and Director of ICNND surveys in Philippines (1957), Ethiopia (1959), Ecuador (1960), Lebanon (1962), Jordan (1963), Nigeria (1966).

1964: WHO Expert Committee on Nutrition in Pregnancy and Lactation (Chairman).

1963: Food Science Mission to Europe (Chairman), U.S. Department of Agriculture.

1962–65: Advisory Committee on Personnel for Research, American Cancer Society.

1961–62: Second Citizens Committee on the Food and Drug Administration.

1961–65: Committee on International Centers for Medical Research and Training, NIH.

1960–62: WHO/FAO/UNICEF Protein Advisory Group.

1956–60: WHO Protein Advisory Group (Chairman).

1960–61: Ad hoc Advisory Group on International Health—Research and Training Programs, NIH.

1959–61: Nutrition Study Section, USPHS, NIH (Chairman).

1959–60: Advisory Committee on Metabolism to the Office of the Surgeon General, U.S. Army (Chairman).

1958–65: Scientific Advisory Committee, The Nutrition Foundation, Inc.

1957–59: Board of Scientific Counselors, National Institute of Arthritis and Metabolic Diseases, NIH.

1956–60: Committee on Nutrition Research, Division of Indian Health, USPHS.

1956–59: General Medicine Study Section, USPHS, NIH (Chairman).

1956–59: Selection Committee for Senior Research Fellowships, NIH.

1956: First Joint FAO/WHO Expert Committee on Food Additives (Chairman).

1954, 57, 61, 66: FAO/WHO Expert Committee on Nutrition (Chairman, 1957).

1953–63: Scientific Advisory Board, Samuel Roberts Noble Foundation (Chairman, 1955, 1958, 1961).

1952–53: Member-at-large, Gordon Research Conference Advisory Board.
1950–64: Technical Advisory Committee, Institute of Nutrition for Central America and Panama.
1950: World Health Organization Expert Panel on Nutrition: WHO Consultant on Nutrition in Yugoslavia, Austria, Egypt, Southern Rhodesia, Basutoland, Guatemala, and other Central American countries and Panama.
1950–64: Scientific Advisory Board, National Vitamin Foundation.
1950–53: Panel on Nutrition, Committee on Growth (Chairman, 1951–53).
1950–53: Consultant on Nutrition, U.S. Public Health Service.
1949–54: Committee on Chemicals Introduced in Foods, Food and Nutrition Section, American Public Health Association.
1948–62: Council on Foods and Nutrition, American Medical Association (Chairman, 1960–62).
1948–53: Study Section on Biochemistry and Nutrition (1948–51), NIH.
1948–53: Chairman, Metabolism and Nutrition Study Section (1951–53), NIH.
1948–52: Advisory Committee of the Children's Bureau, FSA.
1944–58: Consultant on Nutrition, Division of Health and Safety, Tennessee Valley Authority.

Publication Appointments:
1966– : Corresponding Editor, Journal of Nutrition and Dietetics, India.
1965– : Advisory Board, Nutrition Today.
1963–67: Honorary Advisory Board, Food and Cosmetics Toxicology, London.
1959– : Chairman, Publication Management Committee, American Institute of Nutrition.
1950–54: Editorial Board, Journal of Clinical Investigation.
1949–52: Editorial Board, Journal of Nutrition.
1944–50: Associate Editor, Nutrition Reviews.

Scientific Societies:
American Institute of Nutrition (Vice President, 1957; President, 1958; Chairman, Publication Management Committee, 1961–).
American Society of Biological Chemists (Member, Committee on Clinical Chemistry, 1956–60).
The Nutrition Society (British).
American Chemical Society (Division of Biological Chemistry).
American Association for the Advancement of Science (Fellow).
Association of American Physicians.
American Medical Association (Chairman, Council on Foods and Nutrition, 1960–62; 1967–).
American Public Health Association, Fellow (Member, Governing Council, 1957).
American Society for Clinical Investigation (Member of Council, 1953–55).
Official U.S. Delegate, 7th International Congress of Nutrition, Hamburg, Germany, 1966.
Society for Experimental Biology and Medicine.
Southern Society for Clinical Research (Vice-President, 1948).
American Federation for Clinical Research.

Awards, Lectureships, and Honorary Societies:
Visiting Professor for the Centennial Year, University of California, Davis, Sept.–Dec. 1967.
Honorary Doctor of Science Degree, University of Michigan, 1963.
Joseph F. Goldberger Award in Clinical Nutrition, American Medical Association, 1964.
Star of Jordan, Hashemite Kingdom of Jordan, 1963.
Osborne-Mendel Award, American Institute of Nutrition, 1962.
Order of Rodolfo Robles, Guatemala, September, 1959.
Distinguished Alumnus Citation, University of Arkansas, 1957.
Outstanding Alumnus Award, Little Rock Junior College, 1951.
Mead Johnson B-Complex Award, American Institute of Nutrition, 1947.
Lydia J. Roberts Memorial Lecturer, University of Puerto Rico, 1966.
Phi Beta Kappa Visting Scholar, 1966–67.
Margaret L. King Lectureship, Henry Ford Hospital, 1965.
Kempner Lecturer, University of Texas Medical Branch, Galveston, 1961.
Herbert Swift Carter Memorial Lecturer, Columbia University, College of Physicians and Surgeons, 1955.

Charles Franklin Craig Lecturer, American Society of Tropical Medicine, 1950.

Sigma Xi (Michigan).

Phi Lambda Upsilon (Michigan).

Alpha Omega Alpha (Vanderbilt Faculty).

Honorary Member: Austrian Public Health Association, 1951; National Medical Society of Panama, 1951; El Colegio de Guatemala, 1950; Serbian Academy of Science, 1959; Philippine Dietetic Association, 1957.

PUBLICATIONS—WILLIAM J. DARBY

J. P. Carter, L. E. Grivetti, J. T. Davis, S. Nasiff, A. Mansour, W. A. Mousa, Alaa-El-Din Atta, V. N. Patwardhan, M. Abdel, I. A. Abdou, and W. J. Darby. The Effect of Zinc, Iron and Placebo Supplements on the Growth and Sexual Development of Adolescent Egyptian Village Boys. Am. J. Clin. Nutrition, January, 1969.

W. J. Darby. Tocopherol-Responsive Anemias in Man. Vitamins and Hormones, *26*, 685–699 (1968).

M. P. Macapinlac, W. N. Pearson, G. H. Barney, and W. J. Darby. Protein and Nucleic Acid Metabolism in the Testes of Zinc-Deficient Rats. J. Nutrition, *95*, 569–577 (1968).

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W. J. Darby. Prevention of Nutritional Anemias. Proc. 6th International Symposium on Nutritional Anemias. Tylosand, Sweden, August, 1967. Symposia Swedish Nutrition Foundation, *VI*, 167–173 (1968).

M. P. Macapinlac, G. H. Barney, W. N. Pearson, and W. J. Darby. Production of Zinc Deficiency in the Squirrel Monkey (*Saimiri sciureus*). J. Nutrition, *93*, 499–510 (1967).

G. H. Barney, M. P. Macapinlac, W. N. Pearson, and W. J. Darby. Parakeratosis of the Tongue—a Unique Histopathologic Lesion in the Zinc-Deficient Squirrel Monkey. J. Nutrition, *93*, 511 (1967).

A. Hassan and W. J. Darby. Professor William Hawkins Wilson, A Biography. J. Nutrition, *92*, No. 1, 1–9 (1967).

H. H. Sandstead, A. S. Prasad, A. R. Schulert, Z. Farid, A. Miale, Jr., S. Bassilly, and W. J. Darby. Human Zinc Deficiency, the Endocrine Manifestations and Response to Treatment. Am. J. Clin. Nutrition, *20*, No. 5, 422–442 (1967).

W. J. Darby. Advances in Nutrition in the Middle East. 5th Middle Eastern Mediterranean Pediatric Congress. Jordan Med. J., *2*, No. 1, 8–24 (1966).

W. J. Darby. Nutrition Research for the Future. VIIth International Congress of Nutrition, Hamburg, August, 1966. Am. J. Clin. Nutrition, *19*, 440 (1966).

F. R. Blood, W. J. Darby, G. A. Elliott, and M. S. Wright. Feeding of Irradiated Beef to Rats. Toxicol. & Appl. Pharmacol., *8*, 235 (1966).

F. R. Blood, W. J. Darby, M. S. Wright, and G. A. Elliott. Feeding of Irradiated Peaches and Whole and Peeled Oranges to Monkeys. Toxicol. & Appl. Pharmacol., *8*, 247 (1966).

F. R. Blood, M. S. Wright, W. J. Darby, and G. A. Elliott. Feeding of Irradiated Chicken, Beef, and Pineapple Jam to Dogs. Toxicol. & Appl. Pharmacol., *8*, 241 (1966).

W. J. Darby. Nutrition Problems and the World's Food Supply. Minnesota Winter Seminars on World Agriculture, 1966. International Agriculture Series No. 2, Institute of Agriculture, University of Minnesota, 21 pages.

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H. H. Sandstead, A. S. Prasad, Z. Farid, A. Schulert, A. Miale, Jr., S. Bassilly, and W. J. Darby. Endocrine Manifestations of Human Zinc Deficiency. *Zinc Metabolism*, A. S. Prasad, Editor, Chapter 16, pp. 304–320, 1966. C. C. Thomas & Co.

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H. H. Sandstead, A. S. Shukry, A. S. Prasad, M. K. Gabr, A. El Hifney, N. Mokhtar, and W. J. Darby Kwashiorkor in Egypt. I. Clinical and Biochemical Studies with Special Reference to Plasma Zinc and Serum Lactic Dehydrogenase. Am. J. Clin. Nutrition, *17*, 15–26 (1965).

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J. S. Dinning, A. S. Majaj, S. A. Azzam, W. J. Darby, C. H. Shunk, and K. Folkers. Response of Macrocytic Anemia in Children to the Coenzyme Q_4-Chromanol. Am. J. Clin. Nutrition, *13*, 169 (1963).

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A. S. Majai, J. S. Dinning, S. A. Azzam, and W. J. Darby. Vitamin E Responsive Megaloblastic Anemia in Infants with Protein-Calorie Malnutrition. Am. J. Clin. Nutrition, *12*, 374 (1963).

R. C. Bozian, J. L. Ferguson, R. M. Heyssel, G. R. Meneely, and W. J. Darby. Evidence Concerning the Human Requirement for Vitamin B_{12}. Am. J. Clin. Nutrition, *12*, 117 (1963).

J. Lemley-Stone, W. J. Darby, and G. R. Meneely. Effect of Dietary Sodium: Potassium Ratio on Body Content of Sodium and Potassium in Rats. Am. J. Cardiol., *8*, 748 (1961).

G. R. Meneely, J. Lemley-Stone, and W. J. Darby. Changes in Blood Pressure and Body Sodium of Rats Fed Sodium and Potassium Chloride. Am. J. Cardiol., *8*, 527 (1961).

G. R. Meneely, C. O. T. Ball, J. B. Youmans, W. J. Darby, L. K. Dahl, and C. G. Hames. Letters to the Journal: Sodium Chloride in Heart Disease. J. Am. Med. Assoc., *178*, 865 (1961).

A. S. Mangay-Chung, W. N. Pearson, W. J. Darby, O. N. Miller, and G. A. Goldsmith. Estimates of the Folic Acid, Vitamin B_6, Pantothenic Acid and Vitamin B_{12} Intake of Adult Humans by Dietary Analysis. Am. J. Clin. Nutrition, *9*, 573 (1961).

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W. N. Pearson, E. R. Brodovsky, E. R. Carnes, and W. J. Darby. Ultramicro-Method for Assay of Pteroylglutamic Acid (Folic Acid) Activity. Anal. Chem., *31*, 1113 (1959).

W. J. McGanity, E. B. Bridgforth, and W. J. Darby. Vanderbilt Cooperative Study of Maternal and Infant Nutrition. XII. Effect of Reproductive Cycle on Nutritional Status and Requirements. J. Am. Med. Assoc., *168*, 2138 (1958).

W. J. Darby, E. B. Bridgforth, J. le Brocquy, S. L. Clark, Jr., J. Dutra de Oliveria, J. Kevany, W. J. McGanity, and C. Perez. Vitamin B_{12} Requirement of Adult Man. Am. J. Med., *XXV*, 726 (1958).

W. R. Faulkner, F. R. Blood, and W. J. Darby. Effect of Folic Acid Deficiency on Myoglobin Concentration in Skeletal Muscle of the Guinea Pig. J. Nutrition, *66*, 361 (1958).

W. J. Darby, E. Jones, S. L. Clark, Jr., W. J. McGanity, J. Dutra de Oliveira, C. Perez, J. Kevany, and J. le Brocquy. The Development of Vitamin B_{12} Deficiency by Untreated Patients with Pernicious Anemia. Am. J. Clin. Nutrition, *6*, 513 (1958).

A. S. Mangay, W. N. Pearson, and W. J. Darby. Millet (*Setaria italica*): Its Amino Acid and Niacin Content and Supplementary Nutritive Value for Corn (Maize). J. Nutrition, *62*, 377 (1957).

W. N. Pearson, S. J. Stempfel, J. S. Valenzuela, M. H. Utley, and W. J. Darby. The Influence of Cooked vs. Raw Maize on the Growth of Rats Receiving a 9% Casein Ration. J. Nutrition, *62*, 445 (1957).

M. P. Martin, E. Bridgforth, W. J. McGanity, and W. J. Darby. The Vanderbilt Cooperative Study on Maternal and Infant Nutrition. X. Ascorbic Acid. J. Nutrition, *62*, 201 (1957).

R. G. Tucker, C. O. T. Ball, W. J. Darby, W. R. Early, *et al.* Chronic Sodium Chloride Toxicity in the Albino Rat. III. Maturity Characteristics, Survivorship, and Organ Weights. J. Gerontology, *12*, 182 (1957).

G. R. Meneely, W. J. Darby (by invitation), J. Lemley-Stone (by invitation), R. G. Tucker (by invitation), and C. O. T. Ball (by invitation). Survival of Rats Prolonged by Adding Potassium in Diets Containing Toxic Levels of Sodium Chloride. Proc. Am. Phys. Soc., Am. J. Phys., *187*, 617 (1956).

J. E. Dutra de Oliveira, W. N. Pearson, K. P. Misra, G. W. Hudson, and W. J. Darby. The Effect of X-Irradiation on the Vitamin Excretion of the Rhesus Monkey (Macaca Mulatta). J. Nutrition, *59*, 527 (1956).

J. E. Dutra de Oliveira, J. G. Coniglio, K. P. Misra, W. N. Pearson, J. A. Efner, and W. J. Darby. A Study of Blood and Urinary Vitamin Concentrations and of Fat Balance in the Rhesus Monkey (Macaca Mulatta). J. Nutrition, *59*, 515 (1956).

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W. J. Darby, C. S. Song, and W. N. Pearson. Effects of Anorexia and X-Irradiation on Vitamin B_6 Excretion in Rats. Am. J. Physiol., *184*, 309 (1956)

J. van Eys, O. Touster, and W. J. Darby. The Purification of a Glucuronide of Nicotinic Acid from Rat Urine. J. Biol. Chem., *217*, 287 (1955).

W. J. Darby, E. Bridgforth, M. P. Martin, and W. J. McGanity. The Vanderbilt Cooperative Study of Maternal and Infant Nutrition. IX. Some Obstetrical Implications. Obstetrics and Gynecology, *5*, 528 (1955).

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SPECIAL REPORT

E. Gutierrez, W. N. Pearson, and W. J. Darby. Survey of the Laboratory Teaching of Biochemistry in Schools of Medicine in the United States, 1963–64.

Senator YARBOROUGH. This record will receive widespread study by people in your field and I would like to have your publications listed in the printed record.

Dr. DARBY. Fine.

Senator YARBOROUGH. Thank you.

Dr. DARBY. As you know, I am director of the division of nutrition of the Vanderbilt University School of Medicine, and professor and chairman of the department of biochemistry and professor of medicine in nutrition in that institution.

In association with my colleagues at Vanderbilt and elsewhere, and with many students and trainees, currently and in the past, I have participated in nutrition surveys of special groups and areas in Tennessee, in North Carolina, and on the Navaho reservation.

Since about 1955 our group has been very heavily committed to efforts to fulfill what we believe to be a responsibility toward improving nutrition in the protein deficient and protein-calorie deficient developing areas of the world.

During this time we have not had sufficient resources nor personnel to maintain continuing assessments of individuals and population groups in this country, which activity characterized the earlier program of the Vanderbilt nutrition unit, especially in the State of Tennessee, but we have maintained an awareness of the few studies which have appeared.

Senator ELLENDER. Dr. Darby, you say because of lack of funds you weren't able to continue certain studies you were making of individuals.

Dr. DARBY. Yes, sir.

Senator ELLENDER. Did you conduct a sufficient amount of these studies to come to any kind of conclusion as to what was the trouble? You were evidently looking for something and I presume you found something.

I wonder if you would be kind enough to give us an overall picture of what you found as to the cause of the trouble?

Dr. DARBY. Earlier we were concerned with the problems of malnutrition in the immediate region in Tennessee and North Carolina and

first concerned with the development of nutrition survey methodologies.

I think it is fair to say that Dr. John Youmans, one of my teachers, and the group working with him were the people who developed the form of the nutrition surveys which have been widely used in this country and abroad with the components of the dietary survey, the clinical survey, biochemical measurement of nutriture, and then the interpretation of these. Earlier, of course, in the early 1940's and late 1930's one found quite a lot of clinically evident nutritional diseases in our region.

We had, of course, in the twenties and thirties, a great deal of pellagra in the south, as I am sure you remember. We had nutritional anemia. We had some evidences of thiamine deficiency.

Evidences of vitamin A deficiency were found and then in the later studies gradually many of these classical diseases disappeared.

Senator ELLENDER. Such as?

Dr. DARBY. Well, such as pellagra. Pellagra disappeared. It is rare to see a clinical case of pellagra in our region today.

Senator ELLENDER. Is that because of a change in diet?

Dr. DARBY. I am sure that is largely because of a change in diet.

Senator ELLENDER. You are not certain of it?

Dr. DARBY. Well, I am certain that there has been a change in diet, yes, sir, and I am certain that the disappearance of pellagra reflects the fact that people have a better diet today than they had. Or rather that fewer people have such a poor diet—let me put it that way—as they had in the 1920's and 1930's.

On the other hand, we have seen continuing evidence that a considerable segment of our people have relatively low dietary intakes, dietary intakes that fall into the unacceptable range. It was, as I have indicated, in the 1950's that we turned our attention elsewhere so that for the period since then we really can't speak authoritatively of the nutritional level of the people in our immediate region.

Senator ELLENDER. Well, I wonder in the studies you made in the past whether or not you obtained sufficient evidence to indicate what the trouble was, what was the cause of it? This committee I think is desirous of finding out what the trouble is so we can try to remedy the situation.

So far we found that vitamin A is missing, vitamin D, and others as well. A good deal of that is due to a lack of knowledge by the people dealing with these children.

In other words, the people at home didn't know how to inject or how to make it possible for the family to have vitamin D or vitamin B, or whatever vitamin was necessary, and I wonder if you came to any conclusion in any of the studies you made.

Dr. DARBY. The lack of knowledge by people, the consumer, by the person in charge of producing or obtaining the food to feed the family, certainly is a major cause of malnutrition. Along with this goes a lack of understanding of how to purchase food, what foods to buy with the money available, and in many situations the lack of funds to buy food.

Senator ELLENDER. Would you say that the lack of education was one of the principal reasons?

Dr. DARBY. Yes, sir. I think the lack of education at all levels, the lack of professional education, the lack of education of the housewife,

the lack of education of the child, the lack of education of the community workers in the field of nutrition is a very major cause of the residuum, shall we call it, of malnutrition in this country.

RECENT STUDIES OF THE VANDERBILT GROUP

During the past 2 years we have begun to reorient our program to give greater emphasis on problems at our doorstep. This reorientation in part reflects our increased awareness of the continued existence of pockets of malnutrition which awareness stems from the experiences of Dr. James P. Carter of our staff in relation to his work with the Citizens Committee on Hunger and Malnutrition in the United States, and the improved assessment of nutritional status (nutriture) of patients in our hospital which recently has been made possible by some increased laboratory resources and enhancement of our clinical personnel.

Two of my colleagues, Dr. Harold Sandstead and Dr. James Carter, in association with other younger members of the house staff of our hospital and some of our interested medical students, have repeatedly identified frank cases of deficiency states such as marasmus, nutritional anemias, scurvy and even beriberi on the wards of our hospital.

Although the majority of these cases of deficiency diseases that appear on the wards of the hospital are medically conditioned deficiencies, practically all of them would have been prevented had the patients and their physicians utilized proper understanding of nutrition and diet.

Senator YARBOROUGH. What do you mean by medically conditioned deficiencies?

Dr. DARBY. By medically conditioned deficiencies, Senator, we mean a deficiency of a nutrient which results in spite of consumption of a diet which might be adequate for most persons, but because of either interference with absorption of nutrients or excessive loss or increased requirement is not adequate for this patient.

In certain diseases, such as febrile illnesses, there is an increased requirement of nutrients, protein for instance. There is a decreased absorption in diarrheal diseases and if one has blood loss for any reason, such as bleeding peptic ulcer or parasitic infestations that cause blood loss, this will decrease the amount of iron in the body and increase the body's requirement of iron.

Women very frequently, because of abnormal menstruation, may have increased requirement of iron.

These are the sort of things that we mean by medically conditioned.

Now, if you increase the intake of nutrients sufficiently you can overcome these deficiencies and prevent them. Part of good medical care is assuring that the patients with these medical conditions have adequate intakes of those nutrients for which they might become efficient.

Senator YARBOROUGH. Doctor, a few minutes ago you were talking about widespread pellagra during the twenties and thirties in the Southern States.

There was also at that time a very widespread prevalence of worms in children. That is largely gone now. Was that due to any nutritional deficiency, or was that due to sanitation deficiencies?

Dr. DARBY. This was largely due to lack of sanitation, proper sewage disposal and the fact that in many of the areas children went barefooted for long periods of time in the summer months.

There is a little evidence that if one improves the nutrition of children who are parasitized, children with worms, there will actually be a decrease in the worm load. But it is difficult for us to separate the other improvements that oftentimes accompany improved nutrition under those circumstances.

Senator YARBOROUGH. Thank you.

Senator ELLENDER. Doctor, I notice a significant statement here that you made in your statement. You said that all would have been prevented, that is, the difficulties you speak of would have been prevented, "had the patients and their physicians utilized proper understanding of nutrition and diet."

Do we understand that even the physicians didn't know what to do at that time?

Dr. DARBY. Senator, I am afraid that we don't teach nutrition adequately even in our medical schools and our dental schools.

Senator ELLENDER. Well, why is that? Is this something new that should have been taught before or just exactly why is it that nutrition wasn't taught?

Dr. DARBY. I want to give you a very serious answer and I wish I knew why it is. I think it is because of lack of recognition on the part of many of our faculties, our university administrators, lack of priority which they assign in giving funds and faculty support to the area of nutrition.

Now, for most of my medical educational career I have been trying to correct this and it is an uphill battle.

Senator ELLENDER. Well, my only son happens to be a surgeon, a doctor, and my youngest brother, and from them I obtained this information, just informally: that the biggest killer is overeating and not eating the right thing.

Would you agree with that?

Dr. DARBY. Overeating?

Senator ELLENDER. Yes, and not eating the proper food results in death in many cases that could have been prevented had the people involved not eaten so much as they did and then eaten the right foods.

Dr. DARBY. You are very correct that obesity is a form of malnutrition and, as I in my prepared statement here note, it is associated with an increase in morbidity and mortality.

Senator ELLENDER. Now, you said here that these diseases which you mentioned could have been stopped had the patient as well as the physician known more about it.

Could you tell us whether or not the patients involved here had sufficient funds to buy the proper food, if they had enough money to buy the proper food?

Dr. DARBY. Some of them did and some didn't.

Senator ELLENDER. You didn't keep a record of that in your studies?

Dr. DARBY. I can't give you any such statistics; no, sir.

Senator ELLENDER. It is just a general observation I suppose.

Dr. DARBY. It is a general observation.

Senator ELLENDER. Thank you.

Senator YARBOROUGH. Proceed, Dr. Darby, with your regular statement.

Senator COOK. Mr. Chairman.

Senator YARBOROUGH. Senator, if we would let the doctor read the statement I believe he answers most of these questions. I believe we would have more orderly procedure if we permit the doctor to make his statement. Of course you gentlemen have a right to interrupt if you challenge any statement.

Senator ELLENDER. That is why I asked the questions, Senator.

Senator YARBOROUGH. I am not trying to cut any Senator off, but I have glanced through his statement. I believe he answers many of these questions if we give him a chance to read it first and then come back and ask some questions of anything he hasn't covered.

Senator ELLENDER. What caused me to ask the question——

Senator YARBOROUGH. I am not criticizing you at all.

Senator ELLENDER (continuing). Was at the end of page 2 if the doctor doesn't know and the patient didn't, well how would you expect anyone else to know.

Senator YARBOROUGH. Senator, I am not criticizing the questions at all. I have been guilty of the same thing. I have asked him two or three, but as I look ahead I see he has answered most of our questions. I am making this as a suggestion only.

Senator ELLENDER. I simply wanted to emphasize it, that's all.

Senator YARBOROUGH. Proceed, Dr. Darby.

Dr. DARBY. In addition, my colleagues have explored leads which indicate the presence of malnutrition in groups elsewhere. For example, Dr. Carter in collaboration with Dr. Jean Van Duzen and Mr. John Secondi, one of our medical students, have reviewed the records of suspected cases of malnutrition at the United States Public Health Service Hospital in Tuba City on the Navajo Reservation.

This review was carried out last summer. These records reveal that during the 5-year period, 1963–68 there were 4,355 admissions to the pediatric service of this USPHS Indian hospital, 616 cases with a diagnosis of malnutrition, 15 of which had kwashiorkor and 29 had marasmus.

Kwashiorkor, as you know, is a very severe form of protein calorie malnutrition. The infant fails to grow, becomes edematous, has skin changes, dermatitis, changes in his hair which frequently becomes depigmented.

He develops diarrhea and liver disease, fatty liver. This condition is associated with a very high mortality rate and high susceptibility to various infections.

Marasmus, on the other hand, is a similar type of starvation except that one doesn't see the same skin lesions nor does one see the edema. The marasmic child is the small child who looks like the picture of a child in a famine area, just skin and bones, as it were.

Senator YARBOROUGH. Do those two terms that you used there, Doctor, in just plain English mean that they are starving?

Dr. DARBY. They are starving and they are starving from a lack of both calories and proteins.

Senator ELLENDER. Did you find out what they were eating? Do the records show it?

Dr. DARBY. We do know what they were eating. Frequently they were being fed such things as a cereal gruel, or very diluted milk, or the people were attempting to feed them on the same foods that adults in the household were eating such as bread and beans, food that is quite unsuitable, of course, for children at the age of 6 months to 4 or 5 years.

Senator ELLENDER. You would charge that to ignorance; would you?

Dr. DARBY. A combination of ignorance and the lack of availability of foods.

Senator ELLENDER. Would it be possible for a child to have a stomach full and yet suffer from starvation if you don't give him the proper food?

Dr. DARBY. It is possible. In fact, classical kwashiorkor is such a syndrome where the child may have all the calories he needs but he lacks protein and other nutrients. So, as you just indicate, he may starve literally with his stomach full.

Senator ELLENDER. And it may be that although he is not hungry, he just eats these foods. In Africa I have seen children there 3 or 4 years old with potbellies. They were full of banana and coconuts, stuff like that, but no milk or anything that would furnish proteins.

Dr. DARBY. This is correct.

Senator ELLENDER. And they didn't seem hungry, but yet they were on the verge of starvation.

Dr. DARBY. That is correct.

Senator ELLENDER. Thank you.

Senator YARBOROUGH. Proceed, Doctor.

Dr. DARBY. Dr. Carter has, with colleagues from Meharry Medical College and the University of South Carolina, studied a group of children in Beaufort County, S.C., and again detected growth retardation, biochemical evidences of low intakes or deficiencies of vitamins A and C, and other evidences of poor nutritional health and environmental conditions.

Additionally, what we may call probing studies of preschool children in two nurseries in Nashville, Tenn., including biochemical determinations on 77 children, reveal instances of definite deficiencies of iron, vitamin A, and folic acid.

I emphasize that these were children regarded as not ill by their parents and were not children who have been brought to the physician for care.

Because of these evidences of malnutrition in our region, we are intensifying our research in this area with the dual objectives of defining the dimensions and causes of this problem locally and of making our students—medical students, graduate students, students in the allied medical professions, and I might add the people in the community—aware of the problems of malnutrition and the importance to health of an adequate diet.

That we are meeting with some success in this latter effort is indicated by the fact that an increasing number of students in our school wish to become responsibly involved in helping to assess this problem and to learn more about nutrition.

Indeed, a group of students in our university is taking the initiative of planning an organized conference on our campus which will deal

with these matters and will be scheduled for sometime in the fall of 1969.

NEEDS FOR NUTRITION EDUCATION IN PROFESSIONAL SCHOOLS

I emphasize the responsible participation by and concern of, students in these matters because the correction of malnutrition can only be effected by an alert, aware, informed group of professional personnel—physicians, dentists, teachers, community health personnel, and others.

From my experience as a medical educator I believe that involvement of the student with visible evidences of the problems affords the finest stimulus to his learning about nutrition, to his constant awareness of its importance and his appropriate integration of nutritional knowledge into his regular daily assessment of the ill and in the planning of their care. Few medical or dental schools have effective teaching in nutrition.

As I said earlier, this lack has been of concern to some educators and seriously considered at two major national conferences, the first on nutrition teaching in schools of medicine sponsored jointly by the American Medical Association's Council on Foods and Nutrition and the Nutrition Foundation, and the second on nutrition teaching in schools of dentistry sponsored by the latter foundation and MIT.

Both of these conferences resulted in strong recommendations for the incorporation of nutrition units in our medical schools and dental schools, but despite this, relatively little progress has been made due to shortage of personnel, of funds and, I must say, to apathy of most university administrations.

THE NATURE OF MALNUTRITION

You have had presented before this committee much evidence that malnutrition exists in this country, especially among low-income groups. The preliminary data from the initial locations of the national nutrition survey reveal some evidence of growth retardation in preschool children, an unexpected amount of goiter—iodine deficiency—a disturbing neglect of dental care, anemia due to iron deficiency, a few clinical cases of rickets or vitamin D deficiency, an unexpected frequency of low levels of vitamins A and C, and of chemical measurements of protein.

Other striking instances of nutrient inadequacies from among these preliminary data are likely to be more apparent as data are available from other States and geographic areas or cultural groups. This expectation is strengthened by the differences in findings, which have already been reported to you, between the Texas and Louisiana surveys.

In order to assess the nature of the problems of malnutrition in our country, to understand their cause and to design effective preventive measures, it is of primary importance that as a first step the planned national nutrition survey be completed. Completion even of the projected studies in the first 10 States will provide, however, but a broad outline of the problem. Provision must be made for carrying these similar programs ultimately into all States.

Some workers tend to discount the importance of the undernutrition observed in studies in this country because of the relatively low incidence of occurrence of clinically evident severe classical deficiency diseases such as pellagra, beriberi, or kwashiorkor. Dr. McGanity re-

ported to you that the biochemically determined nutriture, or nutritional level, of the survey sample in his State was not dissimilar to that of populations studied in middle America.

Senator YARBOROUGH. By middle America, you mean Central America?

Dr. DARBY. Yes, sir.

Senator YARBOROUGH. The only reason I ask is some people may think it means the Midwest. Down in our region we use that terminology for the countries south of Mexico and north of Colombia. Thank you for the clarification.

Dr. DARBY. On the other hand, the evidences of classical deficiency diseases in the region are less in the United States than in developing areas. The explanation of this often is missed. The populations, from the study of biochemical levels, are at similar levels of nutriture and degree of nutritional risk but those in the United States are in an otherwise more protected environment, more hygienic, with less exposure to severe infectious diseases and, hence, subjected to less stressful insults which precipitate the classical severe syndromes of deficiency disease.

NECESSITY FOR CONTINUED NUTRITIONAL SURVEILLANCE OF THE POPULATION

Of utmost importance in design of an effective national nutrition program is provision for a continuing nutritional surveillance of the population through a carefully planned monitoring type of repetition of observations in order to detect changes in nutriture of the population which may reflect purposeful increases or unsuspected decrements in the nutrient supply.

To illustrate the need for this let us consider the situation relative to iron and iron deficiency. Enrichment with iron of flour, bread and cereal products was initiated over a quarter of a century ago. Yet the evidence is accumulating that we still have iron deficiency within the population—perhaps even more than formerly. Had there been continued nutritional monitoring of our population, this situation would have been detected and I believe no doubt remedied years ago.

The position relative to iodine deficiency and goiter and iodized salt is similar. Even though the continued presence of goiter had been highlighted in one State, Michigan, by a report in the Journal of the American Medical Association by Dr. Josef Matovinovic of the University of Michigan 2 or 3 years ago, this did not have the effect such as the discovery of this continued deficiency as part of a national nutrition study will make.

The pattern of food consumed, and this is it seems to me another important point, by the American public constantly is undergoing a change.

This is well reflected in the U.S. Department of Agriculture's analysis and in market trends. For example, the consumption of snack foods and of preprepared or partially cooked convenience foods has increased greatly in recent years. We are on the threshold of an expanded production of new industrially produced foods which either will displace or simulate traditional foods.

Nutritional scientists as represented by the members of the Council on Foods and Nutrition of the American Medical Association and the

Food and Nutrition Board of the National Academy of Sciences have considered and recently published guidelines designed to assure sound nutritional quality of such products.

Even though all manufacturers adhere to these guidelines, the anticipated changed origin of our food supply over the next decade or so is such as to demand that there be established a mechanism for constant surveillance of nutriture of our population. The basis of some of these potential developments is already widely described in the lay press, and I noted and you may have seen an article in the current Esquire as an example. This is a semihumorous presentation of such foodstuffs which are near to market readiness at the present.

Continued monitoring must be planned, executed, and reported in such manner as to be most informative and useful. Both the need for the information and economy of scientific effort demand this. By reference to economy of scientific effort I wish to emphasize that these studies are costly, as you appreciate from the film which you saw on the Texas study and the discussions of Dr. Schaefer. It takes a lot of personnel; and we don't have a large number of trained personnel at this moment, so we must conserve these personnel and use them to best advantage.

A recently unpublished review made by Dr. Davis of Arthur D. Little, Inc., of studies on nutritional status reported in the United States since approximately 1950 well illustrates the difficulties involved in attempting to compare nonstandardized studies.

Because of the lack of uniformity in experimental design and reporting, it was impossible to reevaluate the data on any basis than the particular author's standards, whatever standards he used, for the categories or levels of nutriture and his classification of them as low or deficient.

Accordingly, the tremendous effort represented by the some 50 studies chosen for review give but an indication that some significant percentage of diets are below half or two-thirds of the recommended dietary allowances in one or more nutrients, and similarly that a percentage of blood or urinary values for vitamins were judged by the investigator to be low or deficient.

OTHER FORMS OF MALNUTRITION

For a moment I should like to turn away from deficiencies in nutrition and remind you of other important forms of malnutrition, particularly excessive caloric intake which leads to obesity and influences a wide variety of disease states, and I would like to turn also to the special importance of proper nutrition for individuals with various metabolic diseases such as atherosclerosis, osteoporosis, diabetes mellitus, chronic renal disease (including that greatly increasing number of individuals dependent upon renal dialysis), gluten sensitivity, lack of certain digestive enzymes for sugars, the inborn errors of metabolism such as PKU, which I am sure you are familiar with, a condition known as galactosemia where there is a defect in the metabolism of the sugar galactose, and so on.

It has been estimated that there are nearly 7 million late adolescents and adults who are 20 percent or more above desirable weight. The overall death rate of obese individuals is 174 percent of that of individuals of normal body weight. The death rate from diabetes and

renal disease in obese individuals is 257 and 162 percent, respectively, of the death rate of individuals of normal weight. The death rate from atherosclerotic heart disease is 1.6 times greater among obese individuals than for the total population.

Since 80 percent of obese adolescents in childhood remain obese during their entire lifetime, intensified efforts in prevention or correction of excess fatness early in life is important, in other words, early teaching of nutrition.

Any national nutrition program must be concerned with this broad range of problems and must be designed to reduce to a minimum the risk factor of malnutrition, whether this be a deficiency or an excess or a diet of unsuitable composition for the individual, as may occur in instances of metabolic disorders.

PROPOSED EFFECTIVE NUTRITION PROGRAM

Recognizing the nature, scope and need for an effective national nutrition program, there was convened in November and December 1966, a panel of some 25 expert consultants to advise the USPHS nutrition program, as represented by Dr. Schaefer's office, as to the form of and needs for an effective program to be projected over a 5-year period. It was my privilege to serve as chairman of that group, and I commend the program outline as set forth by this group to your committee's consideration.

In brief, these consultants recommended the establishment of a center to provide nutrition baselines for planning, conducting and coordinating nutrition programs and services, to develop a national nutrition policy consistent with the achievements of national health goals for all ages of the population, to identify in order of priority the major nutrition problems affecting the health of the people of the United States and develop programs to overcome these problems, and to inform the general public about nutrition needs, and to support nutrition education programs for professional health personnel.

This group emphasized the need to develop nutritional guidelines and programs for prevention and control or reduction of the nutritional risks relative to major chronic or metabolic diseases. Finally, the group recognized the important responsibility of the United States in international nutrition, especially in relation to the developing countries, and urged that there be established within the Public Health Service an office with sufficient resources for training, research, and education effectively to assist the less developed free world countries in combating malnutrition, to provide guides and technical assistance to aid selected food-short countries and to coordinate the nutrition program's international activities with those of appropriate U.S. Government agencies, international and multilateral agencies, host country governments, private foundations and others.

It is my considered judgment that all facets of these proposed nutrition programs urgently are needed. They will require special funding of some magnitude. The cost estimate for domestic studies and developments for the 5-year period is $54.8 million, attaining by 1972 a level of approximately $16 million annually.

The estimate for the envisioned program of metabolic diseases for a 5-year period is $40.2 million, attaining an annual level of approximately $10 million by 1972.

The budgetary needs for the program in international malnutrition for the 5-year period total some $49.3 million, attaining the level of approximately $10 million annually by 1972.

In other words, this total program would cost over an initial 5-year period about $150 million and attain a continuing annual level of $36 to $50 million by the end of that period.

Surely the contribution to be made to improved health in the United States, to assured continuation of good health in our country and to reduction of morbidity and mortality abroad by reduction of this greatest health problem in the world, malnutrition, warrants such a small investment by the United States.

Thank you, gentlemen.

Senator YARBOROUGH. Dr. Darby, on this group that was set up in November and December, this panel of consultants to advise the U.S. Public Health Service on the nutrition program, you state that you commend the program outlined as set forth by that group to this committee's consideration.

Do you have a copy of that here with you, the recommendation of that committee that was convened in November and December of 1966 to recommend an effective national nutrition program? There was a recommendation you say here.

Dr. DARBY. Yes, there was a recommendation.

Senator YARBOROUGH. If you do not have that here, I would like to obtain that and file it in the record.

Dr. DARBY. I don't have a copy of that with me, but I am sure I have one in my file.

(The prepared statement and information requested follow:)

PREPARED STATEMENT BY WILLIAM J. DARBY, M.D.

I appreciate this opportunity to appear before you and participate in these hearings on problems of nutrition and related human needs.

My professional interest has been focused on research and education in the field of nutrition since my first scientific publication in 1933 and my experience embraces the spectrum of nutritional biochemistry, clinical nutrition, nutrition surveys and governmental planning of nutrition programs. This latter has in large measure resulted from direct participation in the nutrition work sponsored by the former Interpartmental Committee on Nutrition for National Defense and included serving as director of surveys in six developing countries. Additionally, I have repeatedly served in advisory capacity and as a consultant for the World Health Organization and other United Nations agencies with responsibility for nutrition planning.

As you know, I am Director of the Division of Nutrition of the Vanderbilt University School of Medicine, and Professor and Chairman of the Department of Biochemistry and Professor of Medicine in Nutrition in that institution. In association with current colleagues, former students and trainees and, earlier, a number of distinguished teachers at Vanderbilt University, I have participated in nutrition surveys of special groups and areas in Tennessee and North Carolina and on the Navajo Reservation.

Since about 1955 our group has been very heavily committed to efforts to fulfill what we believe to be a responsibility toward improving nutrition in the protein deficient and protein-calorie deficient developing areas of the world. During this time we have not had sufficient resources to maintain continuing assessments of individuals and population groups in this country, which activity characterized the earlier program of the Vanderbilt nutrition unit, but we have maintained an awareness of the few studies which have appeared.

Recent Studies of the Vanderbilt Group.—During the past two years we have begun to reorient our program to give greater emphasis on problems at our doorstep. This reorientation in part reflects our increased awareness of the continued existence of pockets of malnutrition which awareness stems from the

experiences of Dr. James P. Carter of our staff in relation to his work with the Citizens Committee on Hunger and Malnutrition in the United States, and the improved assessment of nutritional status (nutriture) of patients in our Hospital made possible recently by enhanced personnel and laboratory resources. Colleagues of mine, especially Dr. Harold Sandstead and Dr. James Carter, in association with younger members of the house staff of our Hospital and interested medical students, have repeatedly identified frank cases of deficiency states such as marasmus, nutritional anemias, scurvy and even beriberi on the wards of our Hospital. Although the majority of these are medically conditioned deficiencies, practically all would have been prevented had the patients and their physicians utilized proper understanding of nutrition and diet.

In addition, my colleagues have explored leads which indicate the presence of malnutrition in groups elsewhere. For example, Dr. Carter in collaboration with Dr. Jean Van Duzen and Mr. John Secondi, one of our medical students, have reviewed the records of suspected cases of malnutrition at the USPHS Hospital in Tuba City on the Navajo Reservation. These records reveal that during the five-year period, 1963–1968, there were 4,355 admissions to the Pediatric Service of this USPHS Indian Hospital, 616 cases with a diagnosis of malnutrition, fifteen of which had kwashiorkor and 29 had marasmus.

Dr. Carter has, with colleagues from Meharry Medical College and the University of South Carolina, studied a group of children in Beaufort County, South Carolina, and again detected growth retardation, biochemical evidences of low intakes or deficiencies of vitamins A and C, and other evidences of poor nutritional health and environmental conditions. Additionally, "probing" studies of preschool children in two nurseries in Nashville, Tennessee, including biochemical determinations on 77 children reveal instances of definite deficiencies of iron, vitamin A, and folic acid. I emphasize that these are children regarded as non-ill by their parents and are not children who have been brought to the physician for care.

Because of these evidences of malnutrition in our region we are intensifying our research in this area with the dual objectives of defining the dimensions and causes of this problem locally and of making our students—medical students, graduate students, students in the allied medical professions—aware of the problems of malnutrition and the importance to health of an adequate diet. That we are meeting with some success in this latter effort is indicated by the fact that an increasing number of students wish to become responsibly involved in helping to assess this problem and to learn more about nutrition. Indeed, a group of students in our University is taking the initiative of planning an organized conference on our campus which will deal with these matters and will be scheduled for sometime in the fall of 1969.

Needs for Nutrition Education in Professional Schools.—I emphasize the responsible participation by and concern of students in these matters because the correction of malnutrition can only be effected by an alert, aware, informed group of professional personnel—physicians, dentists, teachers, community health personnel and others. From my experience as a medical educator I believe that involvement of the student with visible examples of the problems affords the finest stimulus to his learning about nutrition, to his constant awareness of its importance and his appropriate integration of nutritional knowledge into his regular daily assessment of the ill and in the planning of their care. Few medical or dental schools have effective teaching in nutrition. This lack has been of concern to some educators and seriously considered at two major national conferences, the first on nutrition teaching in schools of medicine sponsored jointly by American Medical Association's Council on Foods and Nutrition and the Nutrition Foundation and the second on nutrition teaching in schools of dentistry sponsored by the latter Foundation and M.L.T. Both recommended the incorporation of strong nutrition units in our schools, but despite this, relatively little progress has been made due to shortage of personnel, of funds, and to apathy of most university administrations.

The Nature of Malnutrition.—You have had presented much evidence that malnutrition exists in this country, especially among low income groups. The preliminary data from the initial locations of the National Nutrition Survey reveal some evidence of growth retardation in preschool children, an unexpected amount of goiter (iodine deficiency), a disturbing neglect of dental care, anemia due to iron deficiency, a few clinical cases of rickets or vitamin D deficiency, an unexpected frequency of low levels of vitamins A and C, and of chemical measurements of protein. Other striking incidences of nutrient inadequacies among these

preliminary data are likely to be more apparent as data are available from other states and geographic areas or cultural groups. This expectation is strengthened by the differences in findings already observed between the Texas and Louisiana surveys. In order to assess the nature of the problems of malnutrition in our country, to understand their cause and to design effective preventive measures, it is of primary importance that as a first step the planned National Nutrition Survey be completed. Completion even of the projected studies in the first ten states will provide only a broad outline of the problem. Provision must be made for carrying these similar programs ultimately into all states.

Some workers tend to discount the importance of the undernutrition observed in studies in this country because of the relatively low incidence of occurrence of clinically evident severe classical deficiency diseases such as pellagra, beriberi, or kwashiorkor. Dr. McGanity reported to you that the biochemically determined nutriture of the survey sample in his state was not dissimilar to that of populations studied in Middle America. On the other hand, the evidences of classical deficiency diseases in the region are less in the U.S. than in developing areas. The explanation of this often is missed. The populations are at similar levels of nutriture and degree of nutritional risk but those in the U.S. are in an otherwise more protected environment, more hygienic, with less exposure to severe infectious diseases and, hence, subjected to less stressful insults which precipitate the classical severe syndromes of deficiency disease.

Necessity for Continued Nutritional Surveillance of the Population.—Of utmost importance in design of an effective National Nutrition Program is provision for a continuing nutritional surveillance of the population through a carefully planned monitoring type of repetition of observations in order to detect changes in nutriture of the population which may reflect purposeful increases or unsuspected decrements in the nutrient supply.

To illustrate the need for this let us consider the situation relative to iron and iron deficiency. Enrichment with iron of flour, bread and cereal products was initiated over a quarter of a century ago. Yet the evidence is accumulating that we still have iron deficiency within the population—perhaps even more than formerly. Had there been continued nutritional monitoring of our population, this situation would have been detected and no doubt remedied years ago.

The position relative to iodine deficiency and goiter and iodized salt is similar. Even though the continued presence of goiter had been highlighted for Michigan by a study reported by Dr. Josef Matovinovic of the University of Michigan two or three years ago, such individual reports do not make the impact on policy makers of a national systematic study.

The pattern of food consumed by the American public constantly is undergoing a change.—This is well reflected in the U.S. Department of Agriculture's analysis and in market trends. For example, the consumption of snack foods and of pre-prepared or partially cooked convenience foods has increased in recent years. We are on the threshold of an expanded production of new industrially produced foods which either will displace or simulate traditional foods. Nutritional scientists as represented by the members of the Council on Foods and Nutrition of the American Medical Association and the Food and Nutrition Board of the National Academy of Sciences have considered and recently published guidelines designed to assure sound nutritional quality of such products. Even though all manufacturers adhere to these guidelines, the anticipated changed origin of our food supply over the next decade or so is such as to demand that there be established a mechanism for constant surveillance of nutriture of our population. The basis of some of these potential developments is already widely described in the lay press—indeed, humorously depicted in the current issue of *Esquire*.

Such continued monitoring must be planned, executed and reported in such manner as to be most informative and useful. Both the need for the information and economy of scientific effort demand this. A recently unpublished review made by Dr. Davis of Arthur D. Little, Inc. of studies on nutritional status reported in the United States since approximately 1950 well illustrates the difficulties involved in attempting to compare non-standardized studies. Because of the lack of uniformity in experimental design and reporting, it was impossible to reevaluate the data on any basis than the particular author's standards for the categories or levels of nutriture and his classification of them as low or deficient. Accordingly, the tremendous effort represented by the some 50 studies chosen for review give but an indication that some significant percentage of diets are below half or two-thirds of the Recommended Dietary Allowances in one or more

nutrients, and similarly that a percentage of blood or urinary values for vitamins were judged by the investigator to be low or deficient.

Other Forms of Malnutrition.—For a moment I should like to direct your attention away from the deficiencies in nutrition and remind you of other important forms of malnutrition, particularly excessive caloric intake which leads to obesity and influences a wide variety of disease states and to the special importance of proper nutrition for individuals with various metabolic diseases such as atherosclerosis, osteoporosis, diabetes mellitus, chronic renal disease (including that greatly increasing number of individuals dependent upon renal dialysis), gluten sensitivity, lack of certain digestive enzymes for sugars, the "inborn errors of metabolism" such as PKU, galactosemia and so on.

It has been estimated that there are nearly seven million late adolescents and adults who are 20% or more above desirable weight. The overall death rate of obese individuals is 174% of that of individuals of normal body weight. The death rate from diabetes and renal disease in obese individuals is 257 and 162%, respectively, of the death rate of individuals of normal weight. The death rate from atherosclerotic heart disease is 1.6 times greater among obese individuals than for the total population. Since 80% of obese adolescents in childhood remain obese during their entire lifetime, intensified efforts in prevention or correction of excess fatness early in life is important. Any national nutrition program must be concerned with this broad range of problems and must be designed to reduce to a minimum the risk factor of malnutrition, whether this be a deficiency or an excess or a diet of unsuitable composition, as in the instance of the metabolic disorders.

Proposed Effective Nutrition Program.—Recognizing the nature, scope and need for an effective National Nutrition Program, there was convened in November and December, 1966, a panel of some 25 expert consultants to advise the USPHS Nutrition Program, as represented by Dr. Schaefer's office, as to the form of and needs for an effective program to be projected for a five-year period. It was my privilege to serve as Chairman of that group and I commend the program outline as set forth by this group to your Committee's consideration.

In brief, these consultants recommended the establishment of a Center to provide nutrition baselines for planning, conducting and coordinating nutrition programs and services, to develop a national nutrition policy consistent with the achievements of national health goals for all ages of the population, to identify in order of priority the major nutrition problems affecting the health of the people of the United States and develop programs to overcome these problems, and to inform the general public about nutrition needs, and to support nutrition education programs for professional health personnel.

This group emphasized the need to develop nutritional guidelines and programs for prevention and control or reduction of the nutritional risks relative to major chronic or metabolic diseases. Finally, the group recognized the important responsibility of the United States in international nutrition, especially in relation to the developing countries, and urged that there be established within the Public Health Service an office with sufficient resources for training, research and education effectively to assist the less developed free world countries in combating malnutrition, to provide guides and technical assistance to aid selected food short countries and to coordinate the nutrition program's international activities with those of appropriate U.S. government agencies, international and multi-lateral agencies, host country governments, private foundations and others.

It is my considered judgment that all facets of these proposed nutrition programs urgently are needed. They will require special funding of some magnitude. The cost estimate for domestic studies and developments for the five-year period is $54.8 million, attaining by 1972 a level of approximately $16 million annually.

The estimates for the envisioned program of metabolic diseases for a five-year period is $40.2 million, attaining an annual level of approximately $10 million by 1972.

The budgetary needs for the program in international malnutrition total some $49.3 million, attaining the level of approximately $10 million annually by 1972.

This total program would cost over an initial five-year period about $150 million and attain a continuing annual level of $36–$50 million by the end of that period.

Surely the contribution to be made to improved health in the United States, to assured continuation of good health in our country and to reduction of mor-

bidity and mortality abroad by reduction of this greatest health problem in the world, malnutrition, warrants such a small investment by the United States.

(Additional material submitted by Dr. William J. Darby:)

SUMMARY OF PROPOSAL FOR ESTABLISHMENT OF A NATIONAL CENTER FOR NUTRITION

The problems of improving the nutritional health status of not only the poor but the entire population of the United States is clearly a health problem. For this reason it is recommended that a Center be established within HEW, to be located in the developmental stage pending further study of the most effective administrative placement, within the Health Services and Mental Health Administration. This Center will be responsible for U.S. activities in nutrition, both domestic and international.

A. DOMESTIC

1. The establishment of an intelligence system for the collection, evaluation and dissemination of information on nutrition and health-related problems.
2. Providing for continuing assessment of nutritional status, in conjunction with state health programs, to provide an effective federal/state program for the maintenance of continuing surveillance over illnesses and impairments to health which are caused by or are related to food.
3. Developing, testing and evaluating effective remedial and preventive measures, including incorporation of nutrition in educational programs.
4. Developing operational procedures that would make possible the application of research findings and the integration of new information into applied programs directed to the improvement of health of the people of this nation, and evaluating the effectiveness of these programs.
5. Develop and support nutrition manpower training programs for medical, professional paramedical and educational personnel.
6. Providing guidance and direction to federal, state and local agencies, the food industry, and the public on nutrition as it relates to health and its relationship to diseases and impairments of man.
7. Serve as Secretariat and administrative arm of an Interdepartmental Committee on Nutrition for the development of a comprehensive and coordinated federal effort in the field of nutrition, both domestic and international.
8. Provide technical assistance and financial support to states where needed, to insure food hazard control and nutrition programs which will insure the health of the population.
9. Provide for continuing evaluation of the health implications of food fortification and supplements and establish standards and guidelines in this field to insure that safe practices are followed.
10. Support studies to develop up-to-date information on the nutrient requirements for health of all age groups and for the sick.
11. Support research on identified gaps in nutrition knowledge and application with special attention to new food sources—bacterial fermentation, petroleum, the sea, etc., to insure safety and nutritional adequacy.

B. INTERNATIONAL

In implementation of the President's directive that the U.S. take the lead in combating malnutrition throughout the world, the Center would:

1. Continue the collection of information on the ecology of malnutrition in the less developed countries of the world.
2. Upon foreign government request, plan and conduct nutrition surveys where needed and make appropriate recommendations.
3. Support nutrition education at all levels, but primarily at the mother and community worker levels.
4. Support and encourage the development of low-cost formulated foods and local fortification of cereal products for the purpose of combating malnutrition in vulnerable groups—based on local resources.
5. Design and undertake evaluation of the health benefits accruing to the consumer as a result of all or any of these programs so as not to perpetuate unproductive ones.

PART I.—MALNUTRITION IN VULNERABLE POPULATION GROUPS

Problem

While there has not been a comprehensive evaluation of nutritional status in the United States, the limited information available indicates that certain population groups within the country suffer from or are potentially vulnerable to disease conditions related to nutrient deficiencies. Despite adequate supplies of food within this country persons in these vulnerable groups do not consume adequate quantities of essential nutrients because of (1) inability to purchase adequate diets, (2) ignorance of dietary values of the foods available, (3) cultural patterns and dietary practices which restrict the quantities or types of foods consumed, (4) physical problems which make consumption of an adequate diet difficult, (5) increased nutrient needs because of physiological stress or disease, and limited sources of specific nutrients in the foods available for consumption. Combinations of these factors enhance the potential for the occurrence of deficiencies.

Deficiency diseases or conditions related to inadequate nutrient intakes reported in various population groups include: anemia, goiter, underweight, retarded physical growth, increased susceptibility to infectious diseases, impaired learning ability, reduced work capacity, dental caries, and health problems in pregnancy and child birth. According to some estimates anemia exists in 10 percent or more of the women in the childbearing ages, and other health problems associated with deficient nutrient intakes have been reported in children, adolescents, the elderly, individuals in distressed areas, young men of military age found unacceptable for the draft, and the American Indians.

Changes in the food consumption practices in the United States, and the development of more complex processed food products has made it more difficult to determine the nutritional adequacy of the diet, and to determine the relationship between diet and health status. No comprehensive guidelines have been developed to assist food producers and processors in relation to the nutritional health of the population; as a consequence the health input into the development of new foods and food sources is often limited.

Goals and target dates

1. To serve as the Center for providing nutrition baselines for planning, conducting and coordinating nutrition programs and services; and as such to serve in an advisory capacity to the Secretary of Health, Education, and Welfare, to the Surgeon General, and to all Bureau and Regional Offices of the Public Health Service, to other governmental departments and agencies, concerned with special programs affecting the nutritional health of the people, such as the Department of Defense and the Department of Agriculture.

2. To develop and establish a sound national nutrition policy which will contribute to and be consistent with the achievement of national health goals for all ages of the population.

(*a*) To develop practical dietary guidelines for the maintenance of good nutritional status among vulnerable groups and for the total population, during normal activities, as well as during periods of physiological stress.

(*b*) To establish nutritional guides for use in food distribution programs aimed at improving the growth and development of children.

(*c*) To provide guidelines in nutrition for use of professional staff of all sectors of public health.

3. To identify, in order of priority, the major nutrition problems affecting the health of the people of the United States and develop programs to overcome these problems.

(*a*) To determine over a 3-year period the prevalence of nutritionally related disease conditions.

(*b*) To reduce the incidence of nutritional anemia currently reported in vulnerable population groups, especially infants and pregnant women from low socio-economic areas.

(*c*) To eradicate iodine deficiency and endemic goiter in the United States within 4 years.

4. To keep the general public informed about nutritional needs; how these may be met; any changes affecting available foods which supply essential nutrients, and any specific stress factors which may alter nutrient requirements, such as drugs and certain non-nutrient components of foods.

5. To assist in the development of better knowledge on the part of the general population with respect to the role of nutrition in health; through planned education programs in nutrition for professional health personnel as well as others involved in services directed toward improving and maintaining health levels of the population at all ages.

6. To determine normal variation in tissue levels for all essential nutrients from birth through old age, and the effect of physiological stresses and diseases on these levels.

7. To determine the relationship of nutrition to dental health, particularly as related to dental caries in children and to periodontal diseases.

Legislative authority

Public Health Service Act, including provisions under recent amendment which provides for assistance in the extension and improvement of health planning and services (S. 3008).

Constraints

Information on nutritional-health problems in the United States is fragmentary. This lack of information has prevented the development of realistic guidelines for program planning to improve the nutritional status of the vulnerable and other population groups.

Improving diets is largely an educational activity. No plan has been developed for a comprehensive national education program in nutrition designed to assist all members of the health professions and all segments of the population in understanding the role of nutrition in achieving a desirable health status. Nor have programs been organized for those supplying food to the population. These failures in part may be attributed to (a) an insufficient number of trained personnel to support such programs, both in federal agencies, and in state and local agencies and private organizations; and (b) inadequate representation of the subject in educational institutions preparing physicians, dentists, teachers, and health workers in all categories.

There is no identified *health* authority in the federal government for establishing and maintaining guidelines for nutritional health.

There are no official channels for planning with nutrition segments of other programs in the Public Health Service or the Department for an organized approach to nutrition problems affecting health.

OBJECTIVES BY ACTIVITY

Research

1. Compile and interpret existing information concerning nutritional deficiencies and related disease in the United States, and maintain a continuing surveillance of such information.

2. Conduct an epidemiological evaluation of national nutritional health status to assess the prevalence of specific nutrient deficiency diseases, including anemia, goiter, retarded growth and related conditions. A random sample of population groups from approximately 20 areas of the country would be selected on the basis of economic status, ethnic background, educational achievement, and environmental factors. Seasonal variation would also be evaluated. The total sample would include approximately one million persons, and the study would extend over a period of 5 years. Following standardization studies the evaluation would require a 3-year period, utilizing the resources of local and state health departments, schools of public health, and medical research and educational institutions. The budget for 5 years has been estimated at $13.55 million, approximately 1.4 cents per year for each person in the United States.

3. Stimulate research directed toward the further development of procedures for assessing sub-optimal nutritional states in man, with particular attention to those contributing to chronic diseases, reduced work capacity, and impaired learning ability. These activities will be primarily supported by extramural research grants. The type of research activities anticipated during the 5-year period include the establishment of normal tissue levels for all essential nutrients, the relationship of nutritional state to performance (both physical and mental), the relationship between sub-optimal nutrition and susceptibility to infectious diseases, identification of food sources of certain nutrients such as iodine and trace minerals, development of simple and rapid procedures for evaluating nutritional status in relation to the effect of environmental stresses on nutrient requirements and the quantitative determination of the requirement for any nutrient for which it has not been defined. Research will also be conducted on moti-

vation and methodology in effecting realistic education programs for the general population and for appropriate inclusion in educational institutions. It is anticipated that research support will increase significantly over the 5-year period. Expenditures during the 5-year period are estimated to be at $18.8 million.

Facilities

Support will be given to the organization of a research center to develop more sensitive means for detecting nutritional abnormalities in tissues in man and for methods for altering those affecting health under various stress conditions. Direct research project support would be anticipated once the center has been established. The developments of this center are described in Part II.

Demonstration

1. To plan and support programs directed toward reduction of nutritional anemia including education and other preventive measures required—for example, increasing the amount of iron in the diet of the vulnerable groups. Costs for these activities are $550,000 for 5 years, with no expenditures until second year when data from evaluation become available.

2. Initiate an education program in those areas of the country where endemic goiter is identified by epidemiological evaluation. If necessary, establish guidelines for legislation requiring iodization of all salt in endemic goiter areas. The cost of this program will be approximately $50,000 per year for 4 years. Studies on food sources of iodine will be supported as indicated under Research, Item 3.

3. Development of guidelines for education programs in nutrition in cooperation with other federal agencies active in nutrition, including groups within HEW such as Children's Bureau, Food and Drug Administration, Office of Education, and other groups such as O.E.O., and appropriate agencies within the Department of Agriculture. Assist local and state health departments in the development of demonstration projects designed to educate all segments of the community, but especially those in the vulnerable groups to the importance of maintaining dietary intakes consistent with nutrient levels essential for good health at all ages. Total support over the 5-year period would be $400,000. First year support would be $25,000. Some activities carried out under the training program would be a part of this overall program.

Provision of technical and professional personnel

1. To meet the need for trained nutrition personnel for public health activities, support will be given to official health agencies with programs for the development of personnel specializing in nutrition. Assistance will also be provided both to students and to institutions preparing students to work in operating nutrition programs. It is hoped that during the 5-year period local health units including state and local health departments, voluntary health agencies, and educational institutions will initiate programs of their own to insure a continuing supply of personnel with training in public health nutrition. A total expenditure of $4.6 million is projected over the first 5 years.

2. Special effort will be directed toward improving nutrition understanding of the physician, dentist, and all public health workers. Support will be given to medical schools for the development of coordinated nutrition programs involving existing preclinical and clinical activities. The support should allow the schools to establish a staff of two or three persons, and a nutrition diagnostic laboratory program comparable to those common in endocrinology, hematology, and other sub-specialities. Support for a minimum of 5 years in each school will be needed. Funds for each school per year are estimated to be $100,000, or $500,000 for the 5-year period. Initial programs could be started in two to four schools during the first year (FY 1969) if preliminary planning were initiated early in FY 1968. Two to four schools would be added in each successive year. First year funds would be $400,000 and total support for 5 years would be $6.7 million.

Similar programs would be developed for dental schools and schools of public health. The number of schools in these areas is less than for medical schools, thus only two to three schools would be supported the first year, and one or two added in the following years. The program in the dental schools would be similar to that for the medical schools, and the cost would be approximately the same. Total funds for the first year would be $200,000 and for the 5-year period would be $3.0 million.

The program in schools of public health would be developed with less specific emphasis on diagnostic laboratory support, but more on the incorporation of the nutrition components essential for each segment of health planning and services.

One or two schools would be selected during the first year, and one or two added in each succeeding year. Funds for the first year would be $160,000 or $80,000 per school. The total funds for 5 years would be $2.4 million.

3. Assistance will be provided to professional and consumer groups for inservice training in nutrition designed to contribute to or extend ongoing community nutrition programs and to initiate new programs. These inservice programs will be initiated in six to eight locations as demonstration projects for periods of 2 years each. Support will be approximately $200,000 each over the 2-year period. Approximately 150 persons will be reached by the training program in each location during each period. It is anticipated that support for these programs will become the responsibility of state and local agencies. Guidelines for education programs in nutrition and for appropriate nutritional material will be developed for these training activities. In order to maintain a continuous awareness on the part of educators it is essential that this activity be carried out on a permanent basis. Expenditure of approximately .8 million dollars per year on a continuing basis after the first 2 years is anticipated. Total budget for a 5-year period would be 2.8 million dollars and would include the cost of developing guidelines and nutrition materials specifically aimed at overcoming nutrition problems discovered during the epidemiological evaluations and supporting inservice training programs. Funds for the first year would be $160,000.

Technical assistance

1. Establish an advisory committee to the Surgeon General to assist in the development of a national nutrition policy consistent with the national health goals.

2. Establish a coordinating group from appropriate agencies authorized to develop national guidelines for food and nutrition programs, taking into consideration the nutrition problems known to exist in the vulnerable groups as well as less threatened segments of the population. Support for these activities would be $500,000 over the 5-year period; or $100,000 per year.

3. Develop procedures for effective evaluation of nutrition programs directed toward improving the nutrition and dietetic compound of health services including the educational aspects.

4. Develop guidelines for educational programs in nutrition which can be implemented by federal, state, and local health agencies in cooperation with qualified private groups.

First year support for all of these activities would be $300,000 and would be used for evaluation of national, state, and local nutrition and health oriented programs. The second year, likewise, would be used for evaluation, but limited advisory services in programming would be available to other agencies, as information on nutrition is obtained in epidemiological evaluation. Anticipated expenditure for 5 years is $3.0 million. (Research, paragraph 2)

Cost estimates

[In millions of dollars rounded to one decimal]

Fiscal year:	
1969	3.0
1970	7.2
1971	13.2
1972	15.8
1973	16.6

The total for the 5-year period is $54.8 million.

PART II.—DEBILITATING METABOLIC DISEASES

Problem

There is a high incidence and resulting mortality and morbidity from the debilitating metabolic diseases in the United States. At one extreme are diseases such as atherosclerosis, especially of coronary and cerebral arteries, osteoporosis, diabetes mellitus, renal disease and rheumatoid arthritis, which affect a very large proportion of the population; at the other are the so-called "inborn errors of metabolism" such as PKU, galactosemia, Wilson's disease, Celiac disease, Hartnup's disease and others which affect few individuals but in which the genetic factors are rather clearly defined. It is apparent that all individuals inherit varying degrees of susceptibility to such diseases but that the development of these diseases is at least partially determined by the diet consumed by the individual. In all instances, prevention or effective control of these diseases

require minimization of stress on the metabolic processes through the control of the environment including diet.

Nutrient intakes exert a profound effect on body weight and composition, tissue levels of metabolites and the general well-being of the individual. A number of chronic disease problems can be directly related to food intake. For example, it is estimated that there are approximately 36.8 million individuals of 15 years of age in the United States who are 20 percent or more above desirable weight. The overall death rate from causes in obese individuals is 174 percent of that of individuals of normal body weight. The death rate from diabetes and renal disease in obese individuals is 257 and 162 percent respectively of the death rate for individuals of normal weight. The death rate from atherosclerotic heart disease is 1.6 times greater among obese individuals than for the total population. Studies indicate that 80 percent of obese adolescents and children remain obese during their entire lifetime. Therefore, prevention or correction of excess fatness should be aimed more particularly at these obese adolescents and young children.

The effects of many of the inborn errors of metabolism are preventable or modified by diet since they often involve inabilities to metabolize common dietary constituents. Since these diseases often result in permanent impairment of mental or physical health, they constitute a serious health and economic burden and require prompt diagnosis and treatment. The number of such abnormalities now known is large and increasing at a rapid rate. In view of the seriousness of such diseases and the complexity of the dietary treatment, false diagnosis leading to extensive and unnecessary treatment can be as serious as a failure in diagnosis. Thus, there is a great need for methods allowing early and accurate diagnosis and improved dietary methods for control.

Optimum nutrition and performance of the individual requires modification of the diet in relation to the metabolic pattern of the individual. Similarly, differences in metabolism imposed by different physiological or disease states may require dietary modification for optimal nutrition. For example, dietary manipulation may be required for the optimal outcome of pregnancy, maximum resistance to pharmacological agents, rapid recovery from serious injury or disease, and retarding the aging process.

Goals and target dates

1. To develop the nutritional guidelines and components for programs for the prevention and control of the major chronic diseases (e.g. atherosclerosis, osteoporosis, diabetes, renal disease).

2. To define the relationship of obesity to health status, develop guidelines and evaluate pilot programs for the prevention of obesity particularly in adolescents, and provide technical guidance to federal, state, and local health organizations in conducting effective programs for the maintenance of physical fitness.

3. To develop guidelines for the early detection and treatment of the nutritional aspects of debilitating metabolic phenomena and for legislation on continuing surveillance of the infant population for hereditary metabolic diseases responsive to diet.

4. To define the specific dietary conditions for the optimal physiological and psychological well-being and performance of the varying segments of the U.S. population.

Legislative authority

Public Health Service Act, including provisions under recent amendment which provides for assistance in the extension and improvement of health planning and services (S. 3008).

Constraints

The constraints given under Part I will pertain to the activities described in this part. Of particular importance is the lack of adequate information on nutritional health problems and the insufficient number of trained personnel to undertake effective remedial programs in the area of nutrition. Additional constraints that are more specifically related to the debilitating metabolic diseases are related to the lack of satisfactory techniques for determining the presence of many chronic diseases in their earlier stages and to determine the susceptibility of individuals to these chronic debilitating diseases.

There is at present no mechanism which allows for a systematic transfer of new research information on these diseases to the appropriate state and local public health groups who have the responsibility to initiate preventive pro-

grams. The determination of incidence of metabolic diseases and continuing surveillance of the newborn population for the presence of these diseases is not possible unless effective regulations are enacted enabling state health departments to maintain a constant record of affected individuals.

OBJECTIVES BY ACTIVITY

Research

1. The true definition of obesity, its consequences in different segments of the population, and its relationship to various causes of health is still unknown. It may be assumed that prevention is more desirable and easier to accomplish than treatment. It is proposed that anthropometric measurements be taken on school children from ages 8 to 18 over a 5-year period to evaluate the prevalence of obesity. Such data will be supplemented with information upon food habits, nutrient intakes and activity levels. Measurements upon 200,000 children and adolescents in cooperation with state and local public health services and schools and with attention of the proper statistical sampling of the population should identify major factors leading to obesity and provide the data for follow-up studies on the outcome of obesity in later life. It is anticipated that this will cost $400,000 per year or a total of $2 million.

2. To develop and field test improved simple methods for the early diagnosis of inborn errors of metabolism, systematically determine their prevalence, and establish genetic histories. Research effort is badly needed to develop improved simple, rapid methods of detecting these inborn errors as early as possible. The cost of this is estimated at 5 million dollars over a 5-year period.

3. To stimulate research directed toward:

(*a*) The development of the appropriate nutrition programs for the prevention and control of the important chronic diseases in the United States.

(*b*) The development of specific tests for the early detection of the debilitating phenomena that relate to those hereditary metabolic diseases with nutrition aspects.

(c) Effect of nutrient intake, especially of gross nutrients, on regulation and control of metabolism and their specific roles in reducing metabolic stress such as associated with atherosclerosis, infectious diseases, physical injury, insult of food hazards, etc.

(d) Defining the effect of specific intakes upon the maintenance of optimum health in individuals and groups with differing metabolic patterns due to inherited tendencies, disease states, or physiological states such as infancy, adolescence, pregnancy, lactation, and aged.

(e) The development of optimal diets to yield maximal physical and mental development and performance.

Support for these five activities would be $25,000,000 for the 5-year period and $2,500,000 for the first year.

4. The provision of adequate information upon the composition and nutritional quality of the United States food supply with special attention to the newer methods of processing and preparation.

Facilities

Support the establishment of a laboratory center for the determination of a normal variation in levels of nutrients and metabolites in body tissue in order to set standards and guidelines for early detection of metabolic stresses and to relate physiological performance to the levels of metabolites. Research activities within the center shall include studies relating to the development, performance and longevity of man as related to his nutritional status and as affected by both physiological and psychological factors. Pending the establishment of a permanent laboratory center it is considered necessary to contract services in existing laboratories. Funds for support of this research are under the section of Research. Funds for the first year will be $500,000 and will be used to develop plans for a permanent laboratory facility including the design of a facility in relation to the research activities which have been proposed. It is hoped that construction of the laboratory can be initiated for FY 1971 and that the center will be operating by the end of FY 1972.

Demonstration

To devise an effective pilot program for preventing obesity and maintaining physical fitness in adolescents. This program should be related to the proposed PHS program for physical fitness. It is possible that this activity should be largely educational in nature, coupled with efforts of voluntary health and phy-

sical fitness youth clubs. This would involve preparation of educational materials, popular articles, films, and spots for radio and TV, as well as technical services to the state and local public health services. This would cost approximately $300,000 for the first year, and a total of 2.1 million dollars for 5 years. It is anticipated that support would be required by local and state health groups involved in carrying out this program. While direct grants to such organizations might be necessary in the initial phase, long-term support should be supplied by state health departments. Any federal support should be in the area of program development.

Services

1. To serve as a clearinghouse for information concerning the role of nutrition in the prevention and treatment of chronic and debilitating diseases. Develop liaison with agencies in the Public Health Service having responsibilities for specific disease programs, agencies with responsibility for a specific population group, such as the Children's Bureau, and state and local health departments which have public education responsibilities related to various chronic diseases.

2. To disseminate guidelines for detection and dietary treatment of inborn errors of metabolism.

The funds required for these service activities will be approximately $75,000 for the first year, and $475,000 for the 5-year period.

Provision of technical and professional personnel

Support should be given to nutrition education facilities, particularly those training applied nutrition personnel in the fields of nutrition education and material development. Nutrition training support for physicians, dentists, and public health workers is described in Part I, Provision of Technical and Professional Personnel. This support should be through existing educational institutions, and should be related to the needs for personnel arising from problems identified during the first years of the program. Funds for the first year should be $100,000 to support an evaluation of current personnel in these fields, and training facilities presently available. Second year funding should be increased by $200,000 to support training in activities in two university departments. The support should be extended to four additional universities per year until a total of twenty units are being assisted. This assistance should not be for a period less than 5 years. Total funds for the 5-year period, $3.6 million.

Technical assistance

To develop appropriate nutrition education material and training aids for dietary management of the different chronic metabolic diseases in collaboration with other federal agencies. This will require approximately $200,000 per year.

Cost estimates

[In millions of dollars]

Fiscal year:	
1969	$5.08
1970	6.77
1971	7.75
1972	9.30
1973	11.30

The total for the 5-year period is $40.2 million.

PART III.—INTERNATIONAL MALNUTRITION

Problem

On March 31, 1965, President Johnson in his annual report to Congress on PL 480 indicated that hunger and malnutrition were still the greatest health problems in the world and announced the policy decision of the U.S. government to take the initiative in assisting the less-developed free world countries to combat malnutrition.

In these countries, there are currently approximately 667 million children in the 0–14 years age group. This number is expected to double by 1986. Available information indicates that 50 percent of the 0–6 age group and 30 percent of the 7–14 age group, or 269 million children are suffering serious malnutrition—a figure expected to increase to 276 million in 1968 and 329 million in 1975. Thus, child malnutrition alone constitutes a major deterrent to future social and

economic development of the countries affected because of the health implications and the importance of children in the long-range development of their societies. Under the current Food for Peace program, wherein 2.5 billion dollars of U.S. agricultural commodities are made available annually, only 2 percent of the preschool children and 15 percent of the 7–14 year age group in the recipient countries are receiving this food assistance.

While the incidence of undernutrition and malnutrition has been identified through nutrition surveys to also be high in the older age groups of these friendly countries, the pressing need is to combat malnutrition in infants and young children, pregnant and nursing women. In most areas food production is increasing at a slower rate than population growth. If this trend continues the general level of nutrition of the population will not rise and malnutrition among the most vulnerable groups (pregnant and lactating women, infants and children) will become more widespread.

Therefore, for the foreseeable future there will be a critical need for greatly expanded assistance from the U.S. in the form of:

(*a*) providing leadership and guidance to countries attempting to resolve their nutrition problems, through the incorporation of nutritional considerations in ongoing technical assistance, commodities exports and development assistance programs, including those directed toward increasing food production, improving food conservation and distribution, as well as the initiation of new U.S. government nutrition activities and approaches;

(*b*) development of key personnel and institutions in the host countries to initiate or expand nutrition training, research, and applied nutrition programs;

(*c*) health epidemiological studies with a major nutrition components; to establish baseline data and evaluate the effectiveness of ongoing programs.

Goals and target dates

The specific goals during the next five years are:

1. Establish within the PHS structure an office with sufficient resources (training, research, education) to orient and implement the U.S. government's policy to effectively assist the less-developed free world countries in combating malnutrition:

(*a*) Develop practical guidelines for use in Food for Peace programs directed toward increasing the number of preschool child recipients from 5 million to 60 million and eliminate malnutrition in these children through all available means including local food stuffs, nutritionally fortified formuated foods based on host country resources or provided by the U.S. and unprocessed Food for Peace commodities.

(*b*) Maintain the current number (65 million) of recipients under school feeding programs, but greatly enhance the nutritional benefits obtained therefrom by (1) improving the nutritional quality of the meals provided, and (2) providing of Food for Peace commodities on a donated basis only to those localities of greatest need.

(*c*) Restructure food assistance to the adult populations so that, with the exception of disaster relief and special work programs, recipients are limited to the nutritionally vulnerable groups, and foods are distributed on the basis of dietary requirements.

2. To provide guidance and technical assistance to carefully selected food-short countries in planning and implementing meaningful programs to resolve critical food and nutrition problems.

3. Coordinate the Nutrition Program's international activities with those of U.S. government agencies, other governments, international and multilateral agencies, host country governments, private foundations, and others.

Legislative authority

International Education Act and, after approval by Congress, International Health Act.

Policy issues

Traditionally, U.S. assistance to the food-short areas has for the major part, consisted of agricultural commodities provided through the Department of Agriculture and distributed through the Office of Material Resources of AID with the technical assistance of the Office of Technical Cooperation and Research.

On July 20, 1965, AID Administrator David E. Bell, proposed that the overseas AID Missions in all countries receiving food assistance initiate programs to combat preschool child malnutrition and reorient Food for Peace programs to allow nutrient balance in production. He further proposed that several carefully selected countries be chosen for the launching of comprehensive pilot programs wherein massive U.S. capital, commodity and technical assistance would be made available in support of a major effort within the host country to increase food production and overcome malnutrition.

The ICNND, now replaced by the NS/OIR/NIH, has for many years been the recognized U.S. leader in the field of international nutrition. Through several PASA's, TCR/AID now utilizes NS/OIR as a major technical resource in terms of programming and implementation of the supportive research, nutrition education and evaluation of the nutrition aspects of this agency-wide multifaceted program. It seems essential to continue this international leadership within the context of the responsibilities of the new organizational unit.

Constraints

1. Lack of adequately trained personnel and supportive institutions in the countries to plan and carry out nutrition programs of a magnitude capable of making an impact on the malnutrition situation.
2. Lack of nutrition education in the host country from the grass root levels through policy making individuals.
3. Lack of career framework within the U.S. in which to develop and fit people devoting their life to international nutrition.

OBJECTIVES BY ACTIVITY

Research

1. Establish contracts with institutions to:

(*a*) provide technical guidance to host countries in the development of comprehensive nutrition programs in consonance with national development plans;

(*b*) extend project assistance in the areas of nutrition, health and food science;

(*c*) provide guidance in the development, testing and evaluation of food mixtures and formulated foods produced either in the U.S. or the host country; an

(*d*) conduct training as required to achieve the goals established under the terms of each contract.

We anticipate that 3 five-year contracts will be established in FY 1969 at an average level of approximately $500,000 per year, increasing to 5 contracts in FY 1970 and 8 contracts in FY 1971.

2. Organize and conduct additional health/nutrition assessments in those countries wishing to undertake or expand nationwide efforts to resolve nutritional problems, e.g. South Pacific Mandate Islands, Indonesia, The Sudan, Tunisia, Uganda. Two assessments are planned per year at an average cost of $150,000 per country.

3. Design and implement evaluation of the effectiveness of nutrition programs in countries where the U.S. government is providing Food for Peace commodities. There will be an average of five countries evaluated per year, at a cost of $50,000 per country.

4. Stimulate and program research abroad where there is an abundance of clinical material and investigators competent to attack serious malnutrition problems of fundamental importance, such as

(a) the relationship between malnutrition and mental and neurological development;

(b) the relationship between malnutrition and infectious diseases;

(c) exploring all avenues for reaching the preschool child;

(d) nutrition and family size;

(e) toxemia of pregnancy in relation to nutrition;

(f) nutrient requirements at high altitudes.

The anticipated funding level in FY 1967–1973 is: $.6 million, $1.2 million, $1.5, $1.8 and $1.8 million. In addition, PL 480 funds will be requested in the amount of $1 million for the first fiscal year and $2 million per year for the four succeeding years.

5. Maintenance of information on food composition throughout the world including the establishment of central information files, develop and maintain regional food composition tables, support the development of foreign laboratories for food analysis research. Two year support of foreign laboratories, $20,000 per year each) would be phased as follows:

Fiscal year:	
1969	$40,000
1970	100,000
1971	100,000
1972	100,000
1973	100,000

Facilities

None required at this time.

Demonstrations

Develop nutritional guidelines and implement appropriate field testing procedures for the timely application of research findings emanating from both domestic and international research activities. It is anticipated that field testing would be conducted in conjunction with country nutrition programs, through collaboration with international health agencies, and supported from international nutrition research grant funds.

Services

Periodic regional nutrition seminars will be sponsored in French-speaking Africa, English-speaking Africa, Latin America, the Near East and South Asia and the Far East to permit within each region the rapid transfer of knowledge and experience gained in those countries sponsoring comprehensive nutrition programs, and promote the initiation of regional nutrition activities to resolve common problems and achieve common goals. Three seminars will be held per year at a cost of $50,000 each. Clearinghouses of nutrition information within regions will be established (an advanced plan is in existence for implementation in the Far East and in Latin America). Additional funding for support to these clearinghouses and counterpart at the nutrition program's office is $100,000 a year.

Provision of technical and professional personnel

1. Build up a staff within the capabilities needed to understand the problems of international malnutrition in their diverse human anthropological, agricultural, economic and medical aspects.

2. Prepare background documents and information reviews on specific countries or areas eligible for large-scale U.S. assistance in support of comprehensive attacks on malnutrition.

3. Through a corps of specialized consultants, provide to U.S. government agencies and foreign governments technical and scientific advice on those aspects of food and nutrition which pertain to public health at an anticipated funding level of approximately $175,000 per year.

4. A U.S. nutrition career development program will be initiated to provide training in institutions abroad for 15 M.D.'s or Ph. D.'s in the areas of public health nutrition and food science. Two-year assignments are envisioned. The cost of this program will be $450,000 during the first year and $900,000 per year thereafter.

5. Support and assist in the screening, selection, and training of foreign participants in the areas of public health nutrition and food science. This will be accomplished through contracts and grants with domestic and foreign institutions. Average funding requirements per trainee are estimated at $10,000 for 380 participants, with a total budget of $3.8 million over a 5-year period.

6. Prepare technical and other information materials including prototype mass media material, such as handbooks, for use in nutrition training programs in medical schools, schools of nursing, public health schools, nutrition education for teachers, the Peace Corps, the Food for Peace program, etc. Anticipated funding levels for FY 1969–1973 are: $100,000 per year through 1973.

7. Underwrite technical service contracts for (a) documentation and retrieval of international nutrition research information, and (b) development of a complete scientific nutrition manpower roster (domestic and foreign). Anticipated cost of these contracts is $300,000 per year.

Technical assistance

Consultants from this office as recruited through this office will be employed in providing technical assistance in the nutritional and health aspects at all levels in agriculture, food science, health research, and education.

Planning

1. Contact on a formalized basis the offices of international agencies in charge of policy making and implementation of nutrition programs at all levels.
2. Through our Embassies and USAIDs abroad, contact the host country governments with the purpose of close cooperation in planning.

Cost estimates (in millions of dollars rounded to one decimal)[1] [2]

Fiscal year:	
1969	$4.8
1970	7.0
1971	8.8
1972	9.0
1973	9.0
Total	38.6

[1] Includes the following administrative and backstopping services (not included within the budgetary requirements listed for objectives by activities): 1969, 0.30; 1970, 0.33; 1971, 0.33; 1972, 0.35; 1973, 0.35; and total, 1.7.

[2] Does not include the following Public Law 480 funded to be requested: 1969, 1.0; 1970, 2.0; 1971, 2.0; 1972, 2.0; 1973, 2.0; and total, 9.0.

Senator YARBOROUGH. You have been studying this problem, I take it, at least since 1933 when you had your first scientific publication in this field, for at least that long, Doctor, is that correct?

Dr. DARBY. Yes, sir.

Senator YARBOROUGH. Have these studies disclosed the existence of people who just do not have and cannot get enough food or the right kind of food for proper nutrition?

Dr. DARBY. Yes. Yes; there are people who simply can't get enough of the right kind of food.

Senator YARBOROUGH. Is it not fair to say that it is difficult to teach nutrition to a people who can get only certain types of packages of food and have no money or other means, where they are suffering from malnutrition themselves, and have no other means of supplementing that diet? If they can't get anything else to eat, it is pretty difficult to teach them proper nutritional habits, isn't it?

Dr. DARBY. Well, yes; but again I think we have made relatively little effort to teach nutrition in conjunction with such provisions of foods. I think there has been relatively little serious effort, in part because of lack of personnel, put into teaching the recipient of any sort of food aid that is provided under welfare programs about proper nutrition.

Senator YARBOROUGH. They just issue the packages of foods once a month and don't teach them what a good diet would be along with it? Is that your point?

Dr. DARBY. I think this has largely occurred, and there has been relatively little effort put into teaching them how best to spend the little bit of money which they have. If one receives, say, one type of food which let us say is a representative of a meat or protein group, it is not necessary to go out and buy other foods representative of this group. It is better to go and spend your money for something else. "You have enough of this. Now, here is what I think you should buy"—is the advice which should be given.

I think this kind of teaching has really not been widely associated with our programs. Now, I say this without in any sense condemning the personnel associated with the programs because this is a tremendously time-consuming occupation, as you can see, if you have to spend time going over the household budget and finances of each recipient.

Senator YARBOROUGH. Dr. Darby, I taught school in the rural schools of east Texas for 3 years, 6 miles from a highway or a railroad. From what I observed there the home demonstration agents hired by the counties were doing more along this line than anybody else in the whole society, more than the medical part of society, anybody. They were doing more to teach people something about food values at that time, and that has been a good many years ago.

Dr. DARBY. I think that our home demonstration agents, also our county agents, very frequently have done a tremendous job of this sort. I fear, however, that even in teaching our newer generation of these personnel we have decreased the amount of this kind of practical applied nutrition knowledge that we are giving them and I fear that perhaps because of the improvement in the groups they are working with they have been giving attention to the better groups economically in the community and less time in recent years to the poorer groups who are more exposed to malnutrition because of economic limitations.

There are other groups, of course, that are quite effective in community programs, the public health nurse, and social and community workers. There are nutritionists in some of our counties, a few, and in some of our cities. Nutritionists are rare in almost all State health departments. Again, the numbers of these are exceedingly small compared to the need.

Senator YARBOROUGH. From your observation do you find that the lack of money to purchase food is as much a cause of malnutrition, more than ignorance among the poor, or what do you think about that?

What is your evaluation of that situation? What causes malnutrition among the poor? Is it lack of money, or is it ignorance, or a combination of both?

Dr. DARBY. It is a combination, and this gets to what motivates people to buy what they buy. Sometimes an individual, no matter what his financial limitations are, will spend money for things that are unwise purchases for him.

Senator YARBOROUGH. They will go hungry to get a color TV, won't they?

Dr. DARBY. Yes; because he wants a color TV, even though that means that he eats less well or he buys, oh, an expensive, relatively for him expensive, piece of jewelry or something for his wife when this money could be used for something else.

I think that we have to consider in our society not just the absolute minimum of money that a person could get by on if he spent every penny of it very, very wisely, but we have to consider that in our society there are all sorts of pressures on people. There are all sorts of prestige items that an individual must have. A child going to school must have this, that, or the other in order to be with the other children, and these are sometimes given priority over spending to meet the abso-

lute minimal requirements in foods. I think we will not get away from this.

Senator YARBOROUGH. Of course, what we consider in Government in old-age pension programs, and aid to dependent children, and all these programs, is only an absolute minimum amount of money for proper diet and some kind of shelter and minimal amount of clothing; you are saying that isn't enough. You have to consider the other needs of man in addition to minimal food, clothing, and shelter.

Dr. DARBY. We have to allow a little bit here and, Senator, I am not arguing personally for any particular increase in any of our welfare programs or any of our security programs, but I am pointing out that this is the way people behave, and that if people have just exactly the amount of money which if wisely spent, would provide them with a minimum of clothing, a minimum of food, a minimum of housing, and a minimum of heat, they are going to be below the minimum in some of these. They are going to be vulnerable.

Senator YARBOROUGH. You are pointing out barriers to adequate diet of people on very low incomes?

Dr. DARBY. That is correct.

Senator YARBOROUGH. Senator Ellender?

Senator ELLENDER. Doctor, do you think you have made a sufficient study of this matter so as to be able to write out a prescription of what children or grown people ought to eat so as to attain the proper number of vitamins and what have you? I am asking the question because you are suggesting here studies, more studies. In my opinion that won't do any good. If we know the answer now, why don't we put it into effect now? You have been studying this since 1933, I think you said, haven't you?

Dr. DARBY. I have been studying some aspects of nutrition; yes.

Senator ELLENDER. It strikes me in that length of time if we don't know now we never will know, and I wonder why more studies? Why not get the people who have made these studies together and try to make a determination of what is necessary and then we might go a step further in our efforts to assist with the problems? I don't know whether it would be legal or not, but today you buy enriched bread, you buy enriched foods of different kinds, and, as you pointed out, many people, especially the housewife, instead of cooking a meal will go to a grocery store and just buy a little package in which there will be a dinner for four.

It might be practical for us through some law, if it is legal, to have those meals properly vitaminized. In other words, put in enough D, and A, and B, and iron, and so forth, so as to meet at least the minimum requirements.

Dr. DARBY. Senator Ellender, we do have a prescription. We have a prescription which changes about every 5 years one way or another with our increased knowledge and this is the Recommended Daily Allowances of the Food and Nutrition Board of the National Academy of Sciences-National Research Council. These do set the needs, the level of nutrient intake, for the nutrients for which we have sufficient knowledge that will protect the individuals of various age groups and various physiologic times, such as during pregnancy, lactation, and so on, and this serves us as this prescription.

This is under constant study and revision. The most recent revision came out in November of last year, or December. I am a member of the Food and Nutrition Board and just this past week at the meeting of the Board we were considering the organization of our next reassessment of knowledge concerning allowances because constantly we are learning more about how much of given nutrients are required and also even about new nutrients which are required, that is, new requirements of nutrients.

It was not many years ago that we didn't know that the human required vitamin B_6, for example. It was not very long ago that we didn't know about the human needs for folic acid or vitamin B_{12} or for zinc.

In fact some of this knowledge is of quite recent origin. Currently nutritional scientists are looking very, very hard at the trace element needs of man and our information here is still incomplete.

Now as to why we need continuing surveillance studies of our population: This is because as the food supply or consumption pattern changes there are alterations in our diet. Even though we try to maintain the nutrient level by enrichment programs and fortification programs, there may be increases or decreases in nutrients or factors that we don't know about, and I can give you some very good examples of this.

We don't know accurately the nutrient level at the present time or the intake level of iron in this population. We are seeing an increased amount of goiter, as you have heard. Now, this is despite iodization of salt. The same was true of iron, as you just noted. It is necessary for us to continue to inspect the patient, if you will, in order to determine whether he is being well fed.

Now, this need is going to continue. Changes in nutrient intake are going to continue. The need for monitoring will continue because of alterations in our food patterns. We are eating a diet today, you and I, that I am sure is quite different than we ate 30 years ago. Maybe it has most of the same nutrients in it, but our diet is from a different source. Thirty years from now we are going to be eating foodstuffs produced in still quite different ways.

For example, we are seeing industrially produced proteins introduced into the market. Now, there is no reason why these can't be quite good. In fact, I think nutritionally they will be excellent as they come on the market. But they will be produced from sources, to go a little bit out if you will, like fermentation of petroleum, which process is being studied and developed right now.

As these proteins are produced and introduced into our diet, they are likely to carry with them a different set of trace nutrients than the protein that we get from beef or from pork or from milk.

I don't know what is likely to turn up in this transition. I don't think anyone can tell.

Senator ELLENDER. In that connection, wouldn't it be a good idea, before this food is permitted to go on the market, to look into that before people buy it? We do that for other commodities that are produced, for instance, to use on the farm, what effect it will have on the foods you produce and things like that.

It strikes me that with all of these new methods, some ways and means could be worked out whereby before these foods are put on the market a study could be made as to their effect.

Dr. DARBY. Senator Ellender, it is precisely for that reason that we need these continuing studies.

Senator ELLENDER. Now, on the other hand, even after you know what the food should be, do you think that the knowledge could be disseminated by our present extension service, which you are well familiar with I suppose, and also these centers we have throughout the country? There are health centers. I know we have them scattered all over my State of Louisiana, but in many other States I find that they are not there, and I am just wondering if the health centers as well as the extension service, both handled by women and by men, could be used as a vehicle to give knowledge to families as to what foods to eat so as to get the proper amount of nutrients, proper amount of vitamins, and so forth.

Dr. DARBY. I think it is very important that such information be disseminated by these centers. I don't think that this will reach all of the people who must be reached. No one institution in our society will do this. Schools will come the nearest to doing it, as I see it, because of the longer, continued contact and more constant contact of the schoolteacher with the child.

I think schools, and by this I would include all levels of schools from preschool up through the university level, will be the most effective institution for education.

Again, however, you will not get across certain kinds of education there because certain of this should be related to individuals with special needs, such as only can be done through health centers.

Senator ELLENDER. Well, we have, I think we have at present sufficient ways and means to disseminate the knowledge and allow us to cope with it. As you say, we have in the schools our school lunch program and it strikes me that the food served to the children ought to be passed on by a dietitian under certain rules and regulations. We could learn from experience instead of going into new studies and new surveys.

I suppose because of these hearings we are going to have a lot of bills introduced as to the best way to handle the problem, but I believe that with the tools we have at hand we ought to be able to do the job.

Dr. DARBY. The school feeding program or school lunch program is, of course, supervised by dietitians at the administrative level, and they have, I believe, quite good standards. There is, however, relatively little education at the school level, at the recipient level, concerning nutrition.

This again is in part because of the shortage of personnel, and also in part I think because there is no assignment of time in the curriculum, in the teaching program, of the school for nutrition education.

Senator ELLENDER. Thank you, Mr. Chairman.

Senator YARBOROUGH. Senator Percy.

Senator PERCY. Thank you, Mr. Chairman.

Mr. Chairman, I would like to divide my time between now and 12 noon, if I may, with Senator Cook, as he has a 12 o'clock appointment also.

Senator YARBOROUGH. Fine. Dr. Darby is the first witness, and we have another witness and we are supposed to be in session from 10:30 until 12, but I am going to extend this session beyond 12 o'clock, at a minimum to 12:30, and I think until 1 o'clock, to try to hear all the witnesses who have gone to the trouble to come here, so any cooperation you can give so everyone will have an opportunity to be heard will be appreciated. I canceled two other engagements to stay.

Senator PERCY. Thank you.

You just mentioned that there was no provision for nutrition education in the curriculum. I was interested that some of your medical students are becoming interested in this field and are going to conduct a conference. Can we think ahead and not wait for that conference? Are there any recommendations you can make as to how medical students can play a role with, say, welfare agencies in trying to detect malnutrition or undernutrition? If there are working students, could Federal funds be provided so they could carry on work-study programs in this field of nutrition rather than an unrelated-type work program?

Dr. DARBY. It is a very interesting thought, Senator Percy. There are some mechanisms available at present. Most of the medical schools currently have summer programs, summer fellowship type of programs, for their students. Where there is an active nutrition interest in the medical school, and I hope I am not immodest by saying such as at Vanderbilt, some of the students are attracted to work in that fellowship program in what we might think of as community nutrition and do just as you suggest.

Indeed, that is how Mr. Secondi, whom I mentioned, worked on the Navajo Reservation. Some students were working down in Beaufort County. Some are working in our immediate community.

I think an expansion of this program with some more direction toward nutrition and with assistance to establish a nutrition leader or nutrition leaders in the medical schools would get students working in contact with the nutrition problems and aware of them.

Now, this, indeed, is almost what the National Conference on Nutrition Education in Medical Schools recommended. They recommended that each medical school have a unit in nutrition where one or more, at least one, but preferably more, physicians and scientists were giving constant attention to teaching of nutrition, to getting it integrated into preventive medicine, into surgery, into medicine, pediatrics, and so on.

Senator PERCY. We all know that there has been little progress in increasing nutritional training, and you have mentioned that is specifically due to shortage of personnel, funds, and just apathy on the part of university administrators.

You have gotten it started at Vanderbilt. How did you overcome at least apathy then? Where did you get the funds and personnel, and what can you recommend so that other medical schools can undertake similar programs?

Dr. DARBY. It is a long story how it got started at Vanderbilt, but it had some very interested and effective people such as Dr. John B. Youmans there in the department of medicine, and because of his abilities he made this a prestigeous subject for students to be interested in and for fellow faculty members to be interested in. Then the school personnel became very active in nutrition survey work, and

medical students, graduate students, and other faculty members became involved in these surveys. And, as I believe we all realize, when you see and experience the problem yourself, then you have a much better understanding of it, and so there was created an atmosphere, of receptivity and interest.

Then some funding came from private foundations such as the Rockefeller Foundation, Nutrition Foundation, and subsequently some from the U.S. Public Health Service to provide for personnel and resources to enlarge this program. I think what is needed now in order to accomplish this elsewhere in the country is to make available a reasonable sum of earmarked funds per school for this purpose.

You couldn't do it in every school in 1 year, but a reasonable sum of money per school on a continuing basis to highlight nutrition education and nutrition work would stimulate the medical school, the dental school, the school of agriculture, or whatever one of the professional schools needs this sort of stimulus.

I think then if, say, $100,000 a year were provided to a school or $150,000, or whatever, that one would see greatly enhanced teaching and interest in nutrition in our professional schools, and participation by the students in applied programs.

Senator PERCY. Lastly, Dr. Darby, I noticed in an article by Dr. Hurley in the December issue of Nutrition Today a dramatic statement that actually as a cause of death, birth defects are outranked only by heart disease. We know that not only is it a great cause of death but also that in the malnourished mother and in the malnourished infant we also have lack of brain growth, mental retardation. The child starts behind the eight ball before society is able to offer any of its opportunities to it.

In areas where we have evidence now of malnourishment and where there is a large preponderance of malnutrition among infants, what are we doing to see that in those areas we fortify baby foods; that we get in as early as we possibly can?

What further steps can be taken now to arrest as early as possible something that we are becoming increasingly aware of as a great danger for our society?

Dr. DARBY. The infant foods, broadly speaking now, which are on the market are rather carefully designed nutritionally in this country. I think we are very fortunate in this country because of the high sense of responsibility of industry and the encouragement that our Food and Drug Administration has given in this direction. Now, however, where the problems are likely to occur it seems to me is where these foods either can't be afforded or are not utilized because of the ignorance of the mother. That is, these foods may not be utilized because she can't afford them or they may not be utilized because she is ignorant as how best to feed this child.

As far as the diet of the mother during pregnancy, the effectiveness of our teaching programs varies tremendously.

In general, however, I must say that most of them are relatively ineffective because the physician is interested in controlling the weight of the mother and the mother is afraid to eat certain things because she is afraid she will gain weight. I think I would have to say that the teaching of nutrition in pregnancy in most places is either nonexistent or it is very poor.

Senator PERCY. Thank you very much.

Thank you, Mr. Chairman.

Senator YARBOROUGH. Senator Cook?

Senator COOK. Thank you, Mr. Chairman.

Going back to your prepared statement, Dr. Darby, where you say that "practically all would have been prevented had the patients and their physicians utilized proper understanding of nutrition and diet," now, we are talking about a large segment of the population of the United States that is at or below the poverty level, and who are on surplus foods made available by the various departments of the Federal Government.

If the required foods are not available in these programs, really this statement is of no great significance, is it?

What I am really trying to say to you is that, regardless of all of the teaching and regardless of all the understanding on the part of the physician, on the part of the mother, if these things are not available, then we haven't really come close to solving this problem at all, have we?

Dr. DARBY. Agreed; if they are not available or if they are not available to the individual through use of the limited funds that are spent by that individual elsewhere for foods.

Senator COOK. Now when you talk about the fact that schools in this country and universities are not vitally interested—at least you feel that they are not taking the movement that they ought to take—I assume that you have a number of counties in Tennessee, and I know we have a number of counties in Kentucky, where the only foodstuffs in any significant amount that many, many families receive are surplus commodities. Would it be practical for your department at Vanderbilt to acquire from the Department of Agriculture the 22 items that are presently available in the surplus food commodities and see what kind of diets can be created out of these foodstuffs and then recommend to this committee products that should be added to this list so that we can at least provide—not study, but provide—the proper foodstuffs for these families?

Dr. DARBY. This type of analysis could be done, and the yardstick that I feel should be utilized for it, of course, would be the yardstick of meeting the recommended dietary allowances by the combination of foods or additional foodstuffs that might have to be added to such combination.

Senator COOK. For instance, Dr. Schaefer the other day had statistics that showed the lack of protein, calories, vitamin B, vitamin C, niacin. Now, it would not be hard for your department at Vanderbilt to recommend foodstuffs that could be integrated into the present system that would make up for all of these lacks?

This would not be a difficult thing; would it?

Dr. DARBY. No; this would not be a great problem. This, Senator Cook, it seems to me is the kind of thoughtful analysis that well could be done by one of the State agencies, let us say a State department with a proper nutrition department, or some other State department or welfare department of the State with proper nutrition personnel in the agency.

Senator COOK. I think the thing that bothers me is we know what we are now distributing, but we haven't got somebody who is telling us

what we ought to add to the list to see to it that the proper quantity of what an individual needs to be a performing citizen, not only in school, but in industry, as Senator Percy brought out the other day, is being provided.

Dr. DARBY. Yes, sir.

Senator COOK. Thank you.

Senator YARBOROUGH. Dr. Darby, in keeping with this very cogent suggestion by Senator Cook, does the State Department of Health of Tennessee or Kentucky or other States to your knowledge have a nutritional division that studies this? Are they equipped to do this at the State level in any appreciable number of the States?

Dr. DARBY. Yes; there are units or divisions or nutrition programs in State health departments. They have insufficient staff at least in my State.

Senator YARBOROUGH. Certainly the U.S. Public Health Service or some of the State departments should have done this already. To your knowledge has this been done yet? Has any department of the Federal Government or any State that you know of made a survey of these 22 foods to see whether there is sufficient nutrient intake if they are properly distributed, properly prepared, and properly served to the average person, and what is lacking? Has that yet been done?

Dr. DARBY. I really can't answer your question "Yes" or "No," because I don't know the answer. I don't know how many people have done this, but I would be confident that the nutrition advisers in our State health departments have looked at this type of an analysis and have spoken to some of the people they teach about it, but here the difficulty is that we have very few nutrition advisers in most of our State health departments.

There are a few exceptions to this like New York and California, but very few posts are filled. I am not sure that these advisers are consulted by those agencies that are responsible for distribution and for teaching at the local level.

Senator YARBOROUGH. You have a recommendation here that there be nutrition teaching in schools of medicine and in the schools of dentistry. Well, that would hardly scratch the surface, would it? If we just had strong nutritionists, they are needed there, as you have so vividly pointed out, but don't we need these units in all schools?

Dr. DARBY. We need them in all schools. I would comment that when one says schools of medicine today, one must recognize that he is talking about developing a whole cadre of health-related personnel because our medical schools don't just teach those who come out with the M.D. We teach perhaps five or maybe t0 times as many people who are in the allied medical professions, who are dieticians, who are graduate students, who are scientists, who are teachers at all levels, physiotherapists, all levels of allied medical professions.

Senator YARBOROUGH. Isn't a great deal taught on nutrition in the homemaking courses or domestic arts, as we call them, home economics in the high schools and colleges?

Dr. DARBY. I have made no survey of this but I have the distinct impression that there is less attention given today to the subject of nutrition and foods in home economics than was given a number of years back, let us say 20 years ago. I think Dr. Hansen could give you more direct information on that than I can.

Senator YARBOROUGH. I think that is a field that we need to explore because that is the vital place where a generation ago a great deal was taught about nutrition in those places.

Dr. DARBY. In fact, this is where a great deal of our nutrition knowledge and planning originated.

Senator YARBOROUGH. We have had a lot of testimony. We heard testimony here on, I believe it was the 9th of January, that 12 to 15 million people in the United States with incomes of less than $2,000 per year couldn't possibly purchase an adequate diet since they would have to spend $1,284 a year on foods. That was the family income. Would you agree that the people couldn't purchase that much food for a family with that income with the proper nutrients in it?

Dr. DARBY. I haven't tried to work this out, but I would think this sounds very reasonable that they could not.

Senator YARBOROUGH. You have mentioned the fact that you are one of the folks who are reviewing this problem of the national nutrition survey findings. What is the nature and status of the evaluation efforts? Do you have adequate staff to do this? Surveys are being made, as I understand it, in 10 States now. You have recommended that be expanded to all 50 States. Do those of you who are reviewing the findings have a separate staff for that and do you have adequate staff to review these findings?

Dr. DARBY. No, we do not have a separate staff, nor an adequate one for the most effective effort.

Senator YARBOROUGH. You have recommended over the next 5 years a total of $150 million. You have broken it down in your statement by categories, that is, $150 million for the whole 5 years, beginning with a smaller amount now and building up to an annual level of $50 million for the last of the 5 years. Is that to get the staff to complete the findings, to complete the surveys in the States and get the staff to evaluate what they show?

Dr. DARBY. This would go considerably beyond just those needs; it would provide funds for support of a good deal of work other than evaluation of these surveys. It would permit a needed educational development plus a good deal of the total nutrition program that is needed.

Senator YARBOROUGH. This would cover all facets, such as income of the family, the ignorance of people about nutrition, many of the questions asked by Senator Ellender? This survey would get information at all levels, is that right?

Dr. DARBY. Yes.

Senator YARBOROUGH. To find a complete picture of the nutritional needs in relationship to the changing food habits of the people?

Dr. DARBY. That is correct.

Senator YARBOROUGH. Anything further, Senators?

Thank you very much, Dr. Darby.

Dr. DARBY. Thank you.

Senator YARBOROUGH. Our next witness is Dr. Gaurth Hansen, vice chancellor, Utah State University, Logan, Utah.

Dr. Hansen, you may proceed in your own way.

STATEMENT OF R. G. HANSEN, PH. D., PROFESSOR AND ACADEMIC VICE PRESIDENT, UTAH STATE UNIVERSITY

Dr. HANSEN. My own particular interest is that of a biochemical assessment of nutrient status. Therefore, the comments that I will make will reflect this bias. My specific laboratory research interest is more closely related to metabolic diseases—these were mentioned by Dr. Darby—and some of the enzyme defects or hereditary defects which lead to metabolic diseases.

In the interest of conserving time maybe I should go to my own prepared statement and read this for you.

Senator YARBOROUGH. All right; go right ahead, please.

GOALS OF A NUTRITION PROGRAM

Dr. HANSEN. Many people are malnourished. Either through lack of adequate resources or appropriate information, they consume the wrong type or improper quantities of food. Consequently optimum nourishment is a significant problem of the economically disadvantaged—and also of the affluent.

There are various categories of malnutrition: Starvation which may be terminal, undernutrition resulting from too little food and which can lead to starvation (often termed "malnutrition"), and consumption of food of the wrong type or in excess.

Nutrient intake is critical for the mother during maternity and for the child immediately after birth, particularly after the postnursing period. Difficulty with undernutrition experienced during development or soon after birth results in stunted growth and sometimes impairment of mental function.

Another crucial period in life as it relates to nutrition is during adolescence, when rapid growth and physiological maturity takes place. The most common problem of the mature adult in the United States in my estimation is overeating.

The primary goal of nutrition is to determine the optimum food needs of the human of all ages and stages of development.

ASSESSMENT OF NUTRIENT STATUS

Malnutrition is difficult to characterize, and consequently it is ill-defined biologically and physiologically. Malnutrition as a physiological condition is sometimes without obvious clinical symptoms but with critical implications to the human. There are several professional groups who are interested in the adequacy of nutrient intake: The physician, the biochemist, and the nutritionist. These are to mention some of the disciplines. Each of these three specialists has a place in assessing nutritional status; when applied in coordination they provide the basis for assessment of the adequacy of the diet for many of the important nutrients.

From a nutritional point of view, the medical doctor on examination of the patient observes the consequences of food that was con-

sumed during the previous months or year. In some cases more than a year of faulty food consumption may exist before human malfunction is clearly visible to the physician. Nevertheless, irreversible damage to the human may have taken place during this time.

With many nutrients malnutrition may be objectively measured by biochemical procedures. In a real sense the biochemist measures what the subject consumed in the more immediate past and thus recent nutritional history is reflected. With some critical nutrients it is possible to take samples of blood or urine and from a chemical analysis determine the nutritional adequacy of the diet. The biochemist provides a supplemental index of nutritional health which is highly reliable.

The nutritionist is the third party with concern for the adequacy of diet. He has an interest in the foods that are immediately consumed. The grocery list may be checked but this is difficult to relate to the food intake of the individual members of the family—the children, adolescents, or the adults. By the interview process the nutritionist can also ask for recall of the individual foods consumed but this is somewhat subjective. Much food is eaten outside of the home but the value and amount of such food is difficult to assess. Few people will allow observation while eating and fewer still will permit sampling this food for chemical analysis. This latter procedure has the greatest potential for a more precise estimate of nutrient intake.

Efforts in combating malnutrition in underdeveloped countries has assisted in the preparation of valuable guidelines for measuring nutrient status. A series of standards have been developed for some of the more critical nutrients which enable judging of the adequacy of food. For example, in Turkey latent scurvy in the population was encountered. According to the clinician and dentist, an excessive amount of bleeding and swollen gums was seen, but bleeding and swollen gums have multiple causes. According to the assessment of the nutritionist, the intake of ascorbic acid, or vitamin C was found to be minimal. The biochemists were able to establish that the blood cells and circulating blood plasma had a dangerously low content of vitamin C. The three measurements—the physician's examination of the patient, the nutritionist's evaluation of the food, and the biochemist's measurement of vitamin C levels in the blood—when collectively applied indicated widespread vitamin C deficiency—in many cases bordering on scurvy.

From experience such as this, both in the United States and abroad, working guidelines have been established which reflect the best judgment of experts in the field.

To describe nutrient status, as determined by biochemical analysis correlated with the clinical and dietary intake results, it has been useful to designate the population studied in one of four broad categories: "deficient," "low," "acceptable," and "high." These are expressions of nutritional levels as defined biochemically. The diet of a person leading to a "deficient" level of a nutrient should be regarded as critically inadequate. The diet of a person in the "low" category is also of major concern and means of improvement should be sought. The quantitative values which relate to the broad guidelines are stated for the major nutrients, and this is in a manual which I think is already on file with your committee.

To validate our chemical methods in Turkey, vitamin C was given in tablet form to those who were deficient and resulted in improved blood levels. Furthermore, members of the survey team from the USA were sampled and found to have blood levels in the "acceptable" or "high" range. Hence, a considerable amount of experience of this type both in the United States and abroad with many of the primary nutrients now permits a valid assessment of the adequacy of the food which is eaten. This biochemical analysis, together with the clinical observations and a study of the food consumed, is the basis for the confidence in the methodology which we have.

I chose this particular incident to give an example of the many, many more kinds of studies which now back up the assessment of nutrient status.

For the specific surveys that are now going on and are about completed in Texas and Louisiana, about 25 percent of the total number of individuals in the survey were eventually examined biochemically. For this purpose blood specimens were collected and the following determinations were made for hemoglobin, hematocrit, vitamin A and carotene, total serum protein and electrophoresis, vitamin C, serum folate (and red cell folate if serum folate was low.)

Urine specimens were also collected and determinations were made for creatinine, riboflavin, thiamine, urea nitrogen, iodine, glucose, and protein. The latter two are qualitative rather than quantitative analyses.

The methodology employed is largely outlined in the Manual for Nutrition Surveys. Special attention was given to all pregnant and lactating women and all children up to 36 months of age. For a quality check on the analysis, biological standards were regularly employed especially for vitamin A, carotene, hemoglobin, vitamin C, and protein.

From a biochemical point of view I would like to comment briefly on the data which I have seen; that is, the preliminary data, and I would like to emphasize this, from the Texas and Louisiana surveys. The data that include analyses of 1,200 different samples. These varied according to the determinations that I have here in my prepared statement. From a preliminary summary of this analysis you can see in the deficient category something in the order of 1 percent of the terms up to 8.3 percent in the case of hemoglobin were observed to be deficient. In the low category 6.7 up to about 16.2 were observed to be in the low category. From my point of view the deficient category is something that ought to be examined very soon. It is something that needs serious consideration for correction.

The low category is something that from a nutritional point of view certainly deserves improvement. Of the biases that are in this example, about 50 percent of the people or families had an average annual income of less than $3,000.

But aside from this, there are scattered values from populations of all ethnic groups and many different levels. I think it is important to say that in this connection one needs an examination of the total data. He needs to see the correlations or the possible correlations between the dietary intakes and the biochemical analysis. He needs also to see any possible correlations between what the clinician saw in these, so therefore at this time these are preliminary but it seems to me that within a month or two one can substantiate these more fully.

The Department of Agriculture has been criticized for its inability to artfully manage an abundant food supply in order to effect a cure of nutritional diseases among the impoverished. My own personal point of view is that this is expecting too much of the Department of Agriculture, which is fundamentally an agency with expertise and advice in the production and processing of adequate quantities of wholesome food. The USDA and the Nation's land-grant universities have encouraged sound action programs for farmers which have resulted in a most efficient food producing system. Success in food production on the farm stems largely from the following practices: new crop and animal varieties, more fertilizers, improved cultural practices, and development of effective procedures for handling food.

The Department of Agriculture it seems to me has been burdened with food commodities in excess of their abilities to dispose of them.

In the announcement of the food stamp program in Utah the objectives I found were stated as twofold: One, to influence the Nation's economy by increasing consumption of agricultural products, and two, to improve the nutrition of low-income groups. It is questionable whether these two goals are compatible—perhaps for correction of starvation, but for an enlightened program concerned with prevention of malnutrition they are separate problems. These surplus foods have also dominated agricultural policy even at the research and development level, and perhaps to a damaging degree. Most certainly sometime in the future the population of the United States will catch up and maybe surpass our ability to produce food.

This may sound like a dire prediction but one wonders. We in the United States have developed eating habits that are beyond reach for much of the rest of the world. Many people of the world are currently surviving on diets primarily of plant origin, and it is possible that animal agriculture in the United States may of necessity give ground in the future to the production of plants for direct consumption of man.

Americans have become overconcerned with the economics of food disposal regardless of their nutrient quality. With respect to capacity to produce the right kind of food in satisfactory yield we have dangerously ignored the future problems of the country and the present problems of much of the world. Only recently have we begun to give limited attention to the development of efficient plant and animal varieties for nutrient quality. Here in the United States a strain of corn has been developed containing better quality protein and with the potential of improving corn for direct consumption by man. Promising new high yielding strains of rice have been developed at the Institute in the Philippines to increase the food supply of the rice consuming population, and there are encouraging prospects in development for wheat and other crops.

When plant materials are consumed directly by the human—without the animal as an intermediary—the available land will support a larger population. Nevertheless, foods of animal origin contribute

valuable nutrient supplements to the diet. Supplementation of plant foods with chemically synthesized nutrients will become a practical means of feeding people. Through such procedures, world agriculture could support many more people. Although it is difficult to predict when the population will outstrip the food supply, sound agricultural policy and new research and development could delay that time.

ORGANIZING FOR CORRECTION OF MALNUTRITION

In spite of the fact that there are divisions of Federal, State, and local government which are vitally concerned with nutrition, there has been a hesitation to recognize that, in fact, the United States does have a problem of malnutrition. At this juncture in history the nutritional adequacy of the Nation's food supply becomes an extremely critical issue and one deserving the attention and efforts of the best minds in medical and agricultural science, government, and, indeed, all agencies interested in the welfare of man and his social progress.

The correction of malnourishment is one of the principal challenges facing public health agencies, nutritionists, biochemists, medical practitioners, and, for that matter, all of science, technology, and industry. Many of the same methods and procedures are useful in monitoring the diet of all individuals, including the starving, the undernourished, the adequately nourished, and the overfed. Science is providing the tools and competence to monitor the food supply, to assess its effects when consumed by humans, and to keep the human population under constant surveillance for optimum nutrient intake. The adequacy of our food supply in quantity, nutritional quality, safety, and future needs are of critical concern.

Widespread malnutrition has been observed in underdeveloped countries. A realistic, selfish concern for our own future dictates that malnutrition of any person should not be ignored.

One of my personal concerns is that Federal, State, and local private agencies organize: (1) To educate the public to the treatment of malnutrition, (2) to determine the adequacy of the present diet to meet the needs of all Americans, (3) to provide methods for continuing assessment of nutritional adequacy of our food, (4) to give adequate consideration for future needs for food.

It is unforgivable that we should have the sophistication to develop the tools for assessment of malnutrition, and further to have the economic viability and food producing capacity to prevent malnutrition; but not the ability to organize to correct the problem. It is my hope that we can coordinate our efforts to provide a focus for planning and action to correct this deficiency.

Currently no agency of the Federal Government is primarily responsible for nutrition. Thus, I am asking for one nutritional agency as an arm of the Government with primary responsibility for the nutritional health of man and to provide constant surveillance to the adequacy of our food supply. All agencies of Government that have an interest should be called upon to cooperate.

(Dr. Hansen's prepared statement follows:)

PREPARED STATEMENT OF R. G. HANSEN, PROFESSOR OF CHEMISTRY AND ACADEMIC VICE PRESIDENT, UTAH STATE UNIVERSITY

MALNUTRITION IN THE USA

I. VITAE

Dr. R. Gaurth Hansen is currently a Professor of Chemistry and Academic Vice President at Utah State University. Dr. Hansen received his B.S. from Utah State University and the University of Wisconsin in Chemistry, and his Ph.D. from the University of Wisconsin in Biochemistry in 1948. His professional experience includes that of Graduate Assistant in Research and Teaching. Biochemistry, at the University of Wisconsin from 1944 to 1948; Assistant Professor of Medical Biochemistry from 1948 to 1950 at the University of Utah; Associate Professor and Professor of Agricultural Biochemistry at the University of Illinois from 1950 to 1957; Professor and Chairman of Biochemistry (Agriculture, Medicine, Science) at Michigan State University from 1957 to 1968. Dr. Hansen spent Sabbatical Leave at the University of Cologne, Institute of Biochemical Genetics.

Dr. Hansen belongs to the American Society of Biological Chemists, the American Chemical Society, the American Institute of Nutrition and the American Society of Experimental Biology. He received the Borden Award for research from the American Institute of Nutrition in 1960 and the Sesquicentennial Award of the University of Michigan in 1967 (Honorary Alumnus).

Dr. Hansen is currently a consultant to the United States Public Health Service, Nutrition Study Section, and the American Medical Association Council on Foods and Nutrition, and the North Central Regional University Accrediting Association.

As a biochemical consultant to the U.S. Interdepartmental Committee on Nutrition for National Development, Dr. Hansen was a member of team assigned to review the health and nutritional status of Turkey (1957), Ecuador (1959), Thailand (1960), Venezuela (1963), and Nigeria (1965). This assignment included two or three months in each country with host personnel to organize a laboratory and give assistance to a program of health evaluation. Subsequent visits have been made to each country to review and present a report of findings to local health agencies.

Dr. Hansen is responsible for about 90 papers published in books and scientific journals, including research concerned with a) intermediary metabolism of carbohydrates; b) mechanism of formation and utilization of galactose in animals and in humans; c) metabolic disorders of humans, especially hereditary galactosemia; and d) mechanism of enzyme action.

II. GOALS OF A NUTRITION PROGRAM

Many people are malnourished. Either through lack of adequate resources or appropriate information, they consume the wrong type or improper quantities of food. Consequently optimum nourishment is a significant problem of the economically disadvantaged—and also of the affluent.

There are various categories of malnutrition: starvation which may be terminal, undernutrition resulting from too little food and which can lead to starvation (often termed "malnutrition"), and consumption of food of the wrong type or in excess.

Nutrient intake is critical for the mother during maternity and for the child immediately after birth, particularly after the post-nursing period. Difficulty with undernutrition experienced during development or soon after birth results in stunted growth and impairment of mental function. Another crucial period in life as it relates to nutrition is during adolescence, when rapid growth and physiological maturity take place. The most common problem of the mature adult in the U.S. is overeating.

The primary goal of nutrition is to determine the optimum food needs of the human of all ages and stages of development.

III. ASSESSMENT OF NUTRIENT STATUS

Malnutrition is difficult to characterize, and consequently it is ill-defined biologically and physiologically. Malnutrition as a physiological condition is sometimes without obvious clinical symptoms but with critical implications to the human. There are several professional groups who are interested in the adequacy

of nutrient intake: the physician, the biochemist, and the nutritionist. Each of these three specialists has a place in assessing nutritional status; when applied in coordination they provide the basis for assessment of the adequacy of the diet for many of the important nutrients.

From a nutritional point of view, the medical doctor on examination of the patient observes the consequences of food that was consumed during the previous months or year. In some cases more than a year of faulty food consumption may exist before human malfunction is clearly visible to the physician. Nevertheless, irreversible damage to the human may have taken place.

With many nutrients malnutrition may be objectively measured by biochemical procedures. In a real sense the biochemist measures what the subject consumed in the more immediate past and thus recent nutritional history is reflected. With some critical nutrients it is possible to take samples of blood or urine and from a chemical analysis determine the nutritional adequacy of the diet. The biochemist provides a supplemental index of nutritional health which is highly reliable.

The nutritionist is the third party with concern for the adequacy of diet. He has an interest in the foods that are immediately consumed. The grocery list may be checked but this is difficult to relate to the food intake of the individual members of the family—the children, adolescents, or the adults. By the interview process the nutritionist can also ask for recall of the individual foods consumed but this is somewhat subjective. Much food is eaten outside of the home but the value and amount of such food is difficult to assess. Few people will allow observation while eating and fewer still will permit sampling this food for chemical analysis. This latter procedure has the greatest potential for a more precise estimate of nutrient intake.

Efforts in combating malnutrition in underdeveloped countries has assisted in the preparation of valuable guidelines for measuring nutrient status. A series of standards have been developed for some of the more critical nutrients which enable judging of the adequacy of the food. For example, in Turkey latent scurvy in the population was encountered. According to the clinician and dentist, an excessive amount of bleeding and swollen gums was seen, but bleeding and swollen gums have multiple causes. According to the assessment of the nutritionist, the intake of ascorbic acid, or Vitamin C was found to be minimal. The biochemists were able to establish that the blood cells and circulating blood plasma had a dangerously low content of Vitamin C. The three measurements (the physician's examination of the patient, the nutritionist's evaluation of the food, and the biochemical's measurement of Vitamin C levels in the blood) when collectively applied indicated widespread Vitamin C deficiency—in many cases bordering on scurvy.

From experience such as this, both in the U.S. and abroad, working guidelines have been established which reflect the best judgment of experts in the field. To describe nutrient status (as determined by biochemical analysis correlated with the clinical and dietary intake results), it has been useful to designate the population studied in one of four broad categories: "deficient", "low", "acceptable", and "high". These are expressions of nutritional levels as defined biochemically. The diet of a person leading to a "deficient" level of a nutrient should be regarded as critically inadequate. The diet of a person in the "low" category is also of major concern and means of improvement should be sought. The quantitative values which relate to the broad guidelines are stated for the major nutrients on pages 235 and 244 of the *Manual for Nutrition Surveys*, second edition, 1963, published by the Interdepartmental Committee on Nutrition for National Development.

To validate our chemical methods, Vitamin C was given in tablet form to those who were deficient and resulted in improved blood levels. Furthermore, members of the survey team from the USA were sampled and found to have blood levels in the "acceptable" or "high" range. Hence, a considerable amount of experience of this type both in the U.S. and abroad with many of the primary nutrients now permits a valid assessment of the adequacy of the food which is eaten. This biochemical analysis, together with the clinical observations and a study of the food consumed, lends confidence to the methodology.

Biochemical sampling procedures for survey purposes

The dieticians randomly selected half of the families which were examined clinically for dietary study. In turn, fifty per cent of the households which were to undergo complete dietary evaluation were randomly selected for biochemical evaluation. Since all members of these households were analyzed, about twenty-

five per cent of the total number of individuals in the survey were evaluated biochemically. For this purpose blood specimens were collected and the following determinations were made for hemoglobin, hematocrit, Vitamin A and carotene, total serum protein and electrophoresis, Vitamin C, serum folate (and red cell folate if serum folate was low). Urine specimens were also collected and determinations were made for creatinine riboflavin, thiamine, urea nitrogen, iodine, glucose (qualitative), and protein (qualitative). The methodology employed is largely outlined in the *Manual for Nutrition Surveys*. Special attention was given to all pregnant and lactating women and all children up to 36 months of age. For a quality check on the analysis, biological standards were regularly employed especially for Vitamin A, carotene, hemoglobin, Vitamin C, and protein.

IV. MALNUTRITION IN TEXAS AND LOUISIANA

The proportion of the population surveyed in Texas and Louisiana with less than the minimum standard of acceptability for some of the critical biochemical measurements are summarized in the table below:

PERCENTAGE OF POPULATION RECEIVING LESS THAN ACCEPTABLE AMOUNTS OF NUTRIENTS AS MEASURED BIOCHEMICALLY

[Number analyzed: Texas, 750; Louisiana, 500]

	Deficient	Low	Total deficient and low
Vitamin A	1.9	11.1	13
Vitamin C	4.6	11.4	16
Hemoglobin	8.3	6.7	15
Plasma protein	7.4	8.6	16
Serum albumin	2.8	16.2	19
Riboflavin	6.2	12.8	19
Thiamine	1.0	8.0	9

The 750 people sampled from Texas and the 500 from Louisiana are somewhat representative of all races and economic means, but they do contain a bias for the economically disadvantaged. The data are also preliminary and it will be another month or two until the surveys are completed and the results evaluated statistically. Recognizing the biases, and even in expectation of more complete analysis of the data, it is possible to single out some significant problems. For purposes of this discussion the biochemical values for those people surveyed with less than the minimum acceptable values are treated in two categories, "deficient" and "low". (These terms are defined in the previous section.)

It is surprising to see that for the nutrients listed from 9 to 19 percent of the population had less than acceptable blood or urine levels. Of critical importance are the values which are "deficient". These are from 1 to 7.4 percent of the population depending on the nutrient. Immediate steps should be taken to correct food intake in this "deficient" group. Of major, but less critical concern, are the people with biochemical values in the "low" range which are from 6.7 to 16.2 percent of the people sampled. Every measure should be taken to improve their food intake since many of those sampled may be on a downhill track physiologically. If allowed to go on uncorrected serious consequences can result.

V. FOOD PRODUCTION IN THE U.S.A.—A PROBLEM OF SURPLUS

The Department of Agriculture has been criticized for its inability to artfully manage an abundant food supply in order to effect a cure of nutritional diseases among the impoverished. My own personal point of view is that this is expecting too much of the Department of Agriculture, which is fundamentally an agency with expertise and advice in the production and processing of adequate quantities of wholesome food. The USDA and the nation's Land Grant Universities have encouraged sound action programs for farmers which have resulted in a most efficient food producing system. Success in food production on the farms stems largely from the following practices: new crop and animal varieties, more fertilizers, improved cultural practices, and the development of effective procedures for handling food.

The Department of Agriculture has been burdened with food commodities in excess of their abilities to dispose of them.

In the announcement of the Food Stamp Program in Utah the objectives were stated as twofold: (1) To influence the nation's economy by increasing consumption of agricultural products, and (2) to improve the nutrition of low income groups. It is questionable whether these two goals are compatible—perhaps for correction of starvation, but for an enlightened program concerned with prevention of malnutrition they are separate problems. These surplus foods have also dominated Agricultural policy even at the research and development level, and perhaps to a damaging degree. Most certainly sometime in the future the population of the United States will surpass our ability to produce food.

We in the United States have developed eating habits that are beyond reach for much of the rest of the world. Many people of the world are currently surviving on diets primarily of plant origin, and it is possible that animal agriculture in the United States may of necessity give ground in the future to the production of plants for direct consumption of man.

Americans have become overconcerned with the economics of food disposal regardless of their nutrient quality. With respect to capacity to produce the right kind of food in satisfactory yield we have dangerously ignored the future problems of the country and the present problems of much of the world. Only recently have we begun to give limited attention to the development of efficient plant and animal varieties for nutrient quality. Here in the United States a strain of corn has been developed containing better quality protein and with the potential of improving corn for direct consumption by man. Promising new high yielding strains of rice have been developed at the Institute in the Philippines to increase the food supply of the rice consuming population, and there are encouraging prospects in development for wheat and other crops.

When plant materials are consumed directly by the human—without the animal as an intermediate—the available land will support a larger population. Nevertheless, foods of animal origin contribute valuable nutrient supplements to the diet. Supplementation of plant foods with chemically synthesized nutrients will become a practical means of feeding people. Through such procedures, world agriculture could support many more people. Although it is difficult to predict when the population will out-strip the food supply, sound agricultural policy and new research and development could delay that time.

VI. ORGANIZING FOR CORRECTION OF MALNUTRITION

In spite of the fact that there are divisions of Federal, State, and local government which are vitally concerned with nutrition, there has been a hesitation to recognize that, in fact, the United States does have a problem of malnutrition. At this juncture in history the nutritional adequacy of the nation's food supply becomes an extremely critical issue and one deserving the attention and efforts of the best minds in medical and agricultural science, government, and, indeed, all agencies interested in the welfare of man and his social progress.

The correction of malnourishment is one of the principle challenges facing public health agencies, nutritionists, biochemists, medical practitioners, and, for that matter, all of science, technology and industry. Many of the same methods and procedures are useful in monitoring the diet of all individuals, including the starving, the undernourished, the adequately nourished, and the over-fed. Science is providing the tools and competence to monitor the food supply, to assess its effects when consumed by humans, and to keep the human population under constant surveillance for optimum nutrient intake. The adequacy of our food supply in quantity, nutritional quality, safety, and future needs are of critical concern.

Widespread malnutrition has been observed in underdeveloped countries. A realistic, selfish concern for our own future dictates that malnutrition of any person should not be ignored.

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No agency of the Federal Government is currently primarily responsible for nutrition. Thus, I am asking for one nutritional agency as an arm of the government with primary responsibility for the nutritional health of man and to provide constant surveillance to the adequacy of our food supply. All agencies of Government that have an interest should be called upon to cooperate.

Senator YARBOROUGH. Thank you for this very fine paper, Dr. Hansen, this cogent paper, with so much stated in such few words.

Senator Ellender, do you have any questions of Dr. Hansen?

Senator ELLENDER. I would like to know how Dr. Hansen proposes to carry out these four problems at the conclusion of your statement. I thought we had in HEW some department to tell us what are the best foods to eat and then obtain the facts, and then the next question would be how to disseminate those.

Don't you think we now have in Government a sufficient number of people working to determine what a good diet is?

Dr. HANSEN. I think a categorical answer to your last question is yes.

Senator ELLENDER. The question then comes to the dissemination of this knowledge. It strikes me that we have now, and it has been very successful since 1914, the Extension Service, and we have both men and women working in that department and they have been successful in disseminating knowledge to rural homes.

We have a home economics lady in most of the places where you have the Extension Service and I am wondering if you couldn't utilize that department to disseminate the prescription of whatever conclusions that are reached by HEW, or facts that are determined. One witness has been studying this since 1933 and it seems to me that we have enough knowledge now to determine what foods are good and what foods are bad, and what foods will produce iron and what foods will produce vitamin A, B, and C. Then it is just a question of acquiring those. Am I not correct in that?

Dr. HANSEN. I think that certainly the Extension Service in the past has done a good deal both at the home level and the level of the primary producers, the primary food producer. It is a question in my mind whether the Extension Service now recognizes the need for programs in malnutrition. I think it may in part be a question of emphasis.

I think the Extension Service by training and by background is prepared to do this kind of thing if in fact they are conscious of the problem. The current nutrition surveys are going to help to make them conscious of the problem and we can expect the Extension Service to do more for us but by and large the Extension Service is most effective in contacting the segment of the population which does not need it at the present time.

Senator ELLENDER. What I am driving at is this: The situation that all the haranguing is about and a lot of people are thinking about, those conditions are known now. It would be advisable in my opinion to utilize the people we now have in the various departments to disseminate that knowledge. Every county agent is not an expert farmer but yet he was able to take information that was obtained through experimentation and give it to the farmers and have the farmers grow better crops through the use of more fertilizer or better seed, and better conservation of their land, and the use of water, things like that.

We don't need experts to disseminate that knowledge. We have it there now. We have a good school program. Let's make it better by making a determination of what food will produce the results that you say are necessary.

Dr. HANSEN. Well, I think certainly we can, but this will require some reorientation of the extension people but I think also we can't overlook the public schools. It seems to me we have to get into the public schools if we are going to make serious progress with this.

Senator ELLENDER. Now as to the schools, we have the school lunch program. It has been on the books now since 1940.

Dr. HANSEN. What proportion of the population is affected by the school lunch program? Is it the population that really needs it?

Senator ELLENDER. I know the shortness there, that is, that you are not reaching all of them, but that is not the fault of the Washington level. A lot of the local people are not trying to help out in these programs.

Take in New York City, for instance, or Boston, and other large cities where you have a lot of difficulty. You can't get the local people interested in providing for a school lunch program. They want the Federal Government to do it all. It strikes me that with the tools at hand, if we got the proper assistance at the local level, we wouldn't have any problem. That is what I have been contending throughout. A lot of these programs like the school lunch program have been on the books for a long time but it is a lack of local people to participate in these programs that has given us the trouble. A lot of them want the Federal Government to step in and do the local job.

I don't think that is the way to do it.

Dr. HANSEN. I really don't think I have the answer with regard to organization, and I am sure that the school lunch program, the food stamp program, the commodity distribution program, all have their effect, but it seems to me as we find malnutrition it is important at this point in time to resolve that we are interested and to determine to what extent malnutrition occurs across the United States. And as one finds it and identifies it it is important to give consideration to what you would like to do, that is, certainly improve the extension programs outlook and concern for nutrition, but I think we also have to get into the public schools.

I am concerned in my own State that fewer people participate in the food stamp program than they did in the commodity distribution program, and especially I am told by the welfare agency there that in many cases it is a matter of scheduling the money to buy the food stamps even though potentially it has a very good effect and it could improve nutrition.

I think certainly food stamps, school lunch, commodity distribution, all have the potential, but somehow or other we are just not getting this to all of the people. I think this is the point.

Senator ELLENDER. Well, now, the difference between the two programs is this: In the commodity distributions the Federal Government furnishes all of the food. I know some families that got as much as 4 pounds of butter per month who never had butter in their lives. The food stamp program was supposed to make it possible for a family to get a balanced diet and all that the Secretary of Agriculture would

require is that in order for a family to be able to obtain stamps they should at least spend as much money for food as they did in the past, and then the Government would supplement that.

Dr. HANSEN. Yes, I understand.

Senator ELLENDER. You understand that. Insofar as the surplus program is concerned, we are trying to get out of that because there is a lot of food wasted. It is given in bulk and much of the food, some of it, is too starchy. In other words, you can't balance it, and as chairman of the Committee on Agriculture and Forestry I have been trying to get the local people, that is in all States, to emphasize the food stamp program rather than depend on the bulk distribution. This is not only because it will give a more balanced ration, but I think the people as a whole would benefit more from it, that is, from the food stamp program.

Dr. HANSEN. I tend to agree with you because this then allows the element of personal choice in the matter and as far as the commodity distribution, it is commodities that are available but again I was concerned about the broadness of the coverage. Are we getting enough people involved in the food stamp program?

Senator ELLENDER. You say your State is not participating in the food stamp program. Let's get busy and get Utah started and get the other States started. Then get the extension service in your State busy to disseminate knowledge as to what is a good balanced ration and work that out from Washington. I believe it would settle this thing in a short period rather than keep on investing and trying to get people to give us advice and maybe that advice would be forthcoming 5 years hence.

I would rather do it now.

Dr. HANSEN. Senator Ellender, this implies that the extension service also has the same charge in urban areas as it has in rural areas. I like that assumption.

Senator ELLENDER. Well, it has. We amended the bill. I don't remember when, but you have that same service now to the cities.

Dr. HANSEN. I think this is an important philosophical point, to get into.

Senator ELLENDER. Certainly, and the trouble is the cities will not contribute a nickel to get the extension service in and that is where some of the trouble lies, at the local level.

Thank you, Mr. Chairman.

Senator YARBOROUGH. Dr. Hansen, the problem of the school lunch program in my State was that for years two of the four largest cities would not participate in it on the theory that it was socialism, but I think we have finally broken that down in the last 2 years. I think those of us in public office have a responsibility to try to accomplish these things, to try to bring to the people this nutritional need, and I think these hearings are serving a function.

Let me ask you a question. On this survey that is summarized on page 8 of malnutrition in Texas and Louisiana, do you think the fact that a sample is taken in two States is adequate for a national picture of 50 States?

Dr. HANSEN. No.

Senator YARBOROUGH. That is regional, in one region alone, the Southwest and, as pointed out there, there is quite a difference in the

diets in Louisiana and Texas due to the ethnic backgrounds and other reasons of the population.

Dr. HANSEN. No, I should like very much to see this cover the entire United States because I am sure there will be peculiarities due to the region.

Senator YARBOROUGH. Would these nutritional deficiencies probably be different due to the composition of the soil in different areas from which the plants are grown?

People eat a good bit of food that is canned or processed locally.

Dr. HANSEN. I think the dietary habits and, the selection of food, are extremely important components of this and it would seem to me that it would be fallacy to assume that we know the problems in the whole United States just from the results of these two surveys. I think we certainly do need this but we also need a continuing assessment because the whole base is changing. I am impressed by the fact that several hundred new packaged foods appear on the market each year. I am concerned about the use of fortified flour, for example, in preparation of these.

In view of the problems of goiter that we found, I am concerned about the use of iodized salt in these foods, these prepared foods that are appearing on the market. I think we need a continuing assessment of the foods that we are consuming as well as broader coverage in the United States.

Senator ELLENDER. Will the Senator permit an observation?

Senator YARBOROUGH. Certainly.

Senator ELLENDER. The last statement you made there about studying the food itself I think would be more important than the locality. A lot of people, say in my State, depend on California for fruit. They depend on other States for other food that is canned, and it strikes me that, as I suggested to the preceding witness, it might be well to look at the feasibility and possibility of getting food so cooked or so presented to the public with some of the vitamins in it, just like you do for milk. When I buy milk I am going to buy it with vitamin D in it. I don't know what good it will do me but I do that all the time, and it costs me 2½ to 3 cents a quart more, but I do it. If the food processors were able or could be made to place in some of these foods the proper ingredients to create vitamin D, or whatever vitamin is needed, we would have an answer to much of our problem.

Dr. HANSEN. I think the food industries in the United States have a tremendous capacity and if properly encouraged, I think this should be one of the important consequences of this survey, to give them guidance into the kinds of food supplements that are important for the American food market at the present time.

I think we have the capability within our food industries to do a great deal toward correcting the deficiencies and malnutrition which we find. There is no doubt about it.

Then there is still a problem of getting people to eat it, teaching them the proper habits, and also I suppose getting them the economic means to buy it.

Senator YARBOROUGH. Dr. Hansen, this survey if made nationwide might well reveal that supplements are needed to food in one area of the country and different supplements in another area, would it not?

Dr. HANSEN. Well, I'm impressed with the mobility of food in the United States. I think it is more the personal eating habits of the individual than the food itself. We can provide appropriate foods on the grocery store shelf with the information that we have. We still need to determine what people are eating. It is extremely difficult to determine what the individual members of the family eat and to give them guidance in what they should select.

Senator YARBOROUGH. You could survey the food itself that is offered for sale from now 'til doomsday and unless you have this survey of the people that you recommend you won't know whether there was nutritional deficiencies just by looking at the food on the grocery store shelf and know what is in that food, would you?

It takes a survey of the people to find out what they are eating, and what their deficiencies are.

Dr. HANSEN. That is a very good point. It is part of the total problem. One has to look at both the recipient and the food itself. I am sure you are right.

Senator YARBOROUGH. Thank you.

Any further questions, Senator?

Senator ELLENDER. No, I don't; except, as you said, it is my belief that we need a study of the food itself, particularly in our country where we get potatoes from Maine to Idaho that are eaten in Louisiana. The food is not grown locally. You get wheat grown in Kansas, you get other wheat grown in Maryland, and some grown probably in Utah. It seems to me that a study of the food itself would be the primary objective.

Senator YARBOROUGH. Senator, this survey has shown certain nutritional deficiencies in our State. I am puzzled about those in Texas but the Senator from Louisiana has mentioned wheat from Kansas and citrus fruit from California. If he is not getting our good Texas citrus fruit, and our Texas wheat, I can understand the reason for the Louisiana problem, but it leaves me puzzled as to my own State.

Dr. Hansen, you mentioned the 90 publications which you have offered.

Would you file a list? Modesty has prevented you from filing it. Would you file a list for the committee because other people are going to study this record, other than people interested in nutrition, and a listing of those publications would be of help to many schools and many areas and governmental agencies. We want further information on certain aspects of this problem.

Thank you very much for your comprehensive paper here, and for the recommendations that you have made.

The committee is recessed until 10 o'clock tomorrow morning.

(Whereupon, at 12:40 p.m., the committee was recessed, to be reconvened at 10 a.m., Tuesday, January 28, 1969.)

NUTRITION AND HUMAN NEEDS

TUESDAY, JANUARY 28, 1969

U.S. SENATE,
SELECT COMMITTEE ON NUTRITION AND HUMAN NEEDS,
Washington, D.C.

The committee met at 10 a.m., pursuant to recess, in room 318, Caucus Room, Old Senate Office Building, Senator George McGovern (chairman of the committee) presiding.

Present: Senators McGovern, Ellender, Yarborough, Hart, Mondale, Kennedy, Pell, Percy, Cook, and Dole.

Also present: William C. Smith, staff director and general counsel.

The CHAIRMAN. Dr. Hegsted, we would be glad to hear from you if you would come to the table here.

Dr. Hegsted is professor of the Department of Nutrition of the Harvard University School of Public Health. He is also Chairman of the Food and Nutrition Board of the National Academy of Sciences, served on committees for the World Health Organization, the Pan American Health Organization, and the Food and Agriculture Organization affiliated with the United Nations.

Dr. Hegsted has participated in numerous international nutritional surveys and nutritional programs and is one of the outstanding authorities in the field of nutritional requirements and we are honored to have you with the committee today, Dr. Hegsted.

You may proceed in any way you wish.

STATEMENT OF DR. D. MARK HEGSTED, PROFESSOR, DEPARTMENT OF NUTRITION, HARVARD UNIVERSITY SCHOOL OF PUBLIC HEALTH

Dr. HEGSTED. Thank you very much. I am pleased to have this opportunity to appear before this committee. I am sure that it is understood that although I am the Chairman of the Food and Nutrition Board of the National Academy of Sciences National Research Council, I cannot speak for the Board except on those matters where the opinion of the Food and Nutrition Board is a matter of record.

You have heard, especially from Dr. Mead, some of the history of the late 1930's and early 1940's, shortly before and after the Food and Nutrition Board was formed. A considerable number of things were done at that time to improve nutrition of the U.S. population, such as the establishment of nutritional standards—the recommended dietary allowances—emphasis upon nutrition education, the fortification of certain foodstuffs with vitamins and minerals, et cetera, in which the Board was either instrumental or helpful.

It is perhaps worthwhile to consider some of the circumstances at that time which assisted the general effort.

This country had just emerged or was emerging from the great depression. A great many people could easily understand what it meant to be very poor and have too little food. Pellagra was a well-known scourge of the southern United States, rickets had been very common in many parts of the country, and other clear-cut deficiency diseases were easily visible.

The science of nutrition had made great strides and during the 1930's and 1940's all of the vitamins were isolated, their chemical structure determined, and commercial synthesis became possible.

To many of us at that time, knowing relatively little about human nutrition, it seemed that it should be very simple to determine how much of the various nutrients man needed and assure that these would be provided by the diet.

The severity of the depression, the coming of the war, and the prospects of a national and world food shortage provided a willingness in communities and in governments to cooperate and institute new programs.

Much of the malnutrition and poverty was in the agricultural sector in which organizations of the Department of Agriculture, such as the home demonstration agents, county agents, 4–H Clubs, and so forth, could be maximally effective.

Much of the severe malnutrition disappeared and pellagra and other well-defined vitamin deficiency diseases became rare. It is of interest that even in Britain, where food shortages were much more severe than in this country, it is generally thought that nutrition improved during the war.

It has not been possible to clearly define exactly which programs were responsible for this improvement.

In the years following the war, nearly all the groups that might have been vigilant and might have consolidated these gains developed a false sense of security. Most nutritionists became more interested in the biochemical function of the nutrients than in the relatively routine task of surveying the nutritional status of the population; indeed, it has been difficult to find funds to support nutritional surveys in the United States.

The Department of Agriculture became primarily concerned with our food surplus and its disposal and much of the population moved into the cities; the medical profession became more interested in overnutrition, which is still the problem that most physicians see; the United States assumed broad international responsibilities and the very critical nutritional problems in many developing countries attracted much attention, et cetera.

Many things obviously happened. I would, however, like to stress that in my opinion one of the mistakes that nutritionists made was that in their enthusiasm they were often uncritical and often made excessive claims which could not be substantiated upon more critical examination. Excessive claims do backfire, and it is important that we do not repeat this error now.

I have had the opportunity to review some of the preliminary findings of the national nutrition survey which have been presented to you by Dr. A. E. Schaefer. I believe that any reasonable consideration

of these findings will indicate that there are many nutritional problems in the United States today.

It would seem wise to have the methodology being used and the results of these surveys evaluated by an independent, qualified group. The past Under Secretary of the Department of Health, Education, and Welfare has asked the President of the National Academy of Sciences to have this function performed by the Food and Nutrition Board and we welcome this opportunity.

Unfortunately, the Board has not yet been able to begin this function because of a lack of funds.

I would like to point out that one of the questions members of this committee have repeatedly asked, and to which you would like a straight answer, will not be answered in the manner you would like.

This question is, "How many people in the United States are hungry, ill-fed, or malnourished?"

In nutrition we are dealing with some 40 to 50 essential nutrients, and good nutrition involves the proper amounts and ratios of all of these nutrients in the diet.

As a person becomes depleted in any of these nutrients, the tissue levels fall and, at some critical tissue concentrations, clinical disease appears. There is no satisfactory way in which we can equate a relatively low hemoglobin level due to iron deficiency and a low level of serum protein or vitamin C, for example.

Furthermore, the tissue level which produces disease may vary from one individual to another or may be detected by one technique or one physician and not another. The level of intake required to prevent disease may be assumed to vary from one individual to another.

Clearly, for each individual, for each population, and for each nutrient there will always be a zone of uncertainty in which one cannot be certain whether the intake is or is not adequate, whether the health of the individual is or is not compromised. One of the responsibilities of nutritional science is to decrease this area of uncertainty but informed judgment will always be required.

We must, however, develop a better appreciation of the concept of "risk." As the intake of any nutrient falls, or the tissue levels fall and approach the level known to be inadequate, the likelihood of danger is increased.

People with poor dietary habits must be considered to be exposed to a great risk of malnutrition. For example, in a group of Boston schoolchildren that we have studied, it is not uncommon for them to go to school without breakfast, to have a soft drink and candy bar for lunch, and to grab anything which may happen to be available in the kitchen when they arrive home from school. They may rarely have a real meal.

Even though most of these children escape serious nutritional disease, their nutritional situation cannot be considered satisfactory. They are a relatively high-risk population.

We cannot afford to wait until nutritional disease appears before action is taken nor can we afford to evaluate nutritional status or the need for nutrition programs on the basis of the amount of nutritional disease in the population.

Good programs must prevent disease from occurring. The lack of nutritional disease in a population does not necessarily indicate that

a nutrition program is not needed. It may indicate that a good program is operational. The danger is that a good program may not be self-sustaining just because it is successful.

Obviously, the first requirement of a nutritional program is that it assures that the intake of essential nutrients is adequate. The current nutritional surveys are directed primarily toward an assessment of nutrient intake.

However, we must not forget that we live in an age of rising expectations. It may be that simple diets such as cornmeal, fatback and greens, or rice and beans and a few vegetables are nutritionally adequate or can be made so by fortification with vitamins and minerals.

Indeed, if most of the people in a country consume such diets, this may be considered an adequate nutritional approach to their nutritional problems.

However, if your neighbors consume meat and milk and other foods generally considered to be desirable, it is unlikely that simple and monotonous diets can be considered adequate. Nutrition programs must relate to the food habits of the people they serve, and programs suitable in one part of the world are not necessarily suitable in another.

We know we could easily put together simple mixes which are nutritionally adequate for man, as we do for poultry and swine, but these will not do the job. The experience with K-rations during World War II vividly demonstrated that food is more than a simple carrier of nutrients. People can and do refuse food even when they are hungry and malnourished.

We need a great deal more effort to define not only what is absolutely necessary, but what is within reasonable expectation and acceptable, and what determines acceptability.

The current nutrition surveys are complicated and relatively expensive. They cover only one point in time and cannot cover the entire population. I feel that we must find simpler and more efficient methods to evaluate the nutritional status of the population.

Similarly, we must have means of evaluating the efficiency and effectiveness of any methods used to control malnutrition. It is clearly not enough to simply count counties where programs exist.

I would say that I am not entirely happy with the way the samples have been drawn for the nutrition surveys. These are supposed to represent a random sample from lower economic groups.

Obviously, we need some estimate of the magnitude of the nutritional problem. However, it is not very important to have an accurate figure showing that the number of people suffering from a nutritional deficiency is 5, 7, or 9 percent of the population when a prevalence of 5 percent represents an intolerable situation. We may never be able to completely eliminate certain nutritional problems, but we can decide that certain situations are simply not acceptable in this country.

It is probably more important to find out where nutritional disease occurs and where the risk of disease is high than to derive broad estimates of the prevalence of the disease in a State or in the country.

I would like to call your attention again to the situation with regard to dental health revealed by the surveys. This can be considered nothing less than a disgrace and a disaster and has long been familiar to people who have been concerned.

This situation occurs after many years of experience showing that the fluoridation of public water supplies is simple, cheap, and safe and will decrease the amount of dental caries by at least 50 percent from that found in low fluoride communities. There appears to be no possibility that the dental health problem in this country can be adequately met with typical curative dentistry. National programs should be considered.

A considerable number of people with goiter were found and it would seem clear that the simple iodinization of salt upon a voluntary basis is not doing the job. As expected, substantial evidence of iron deficiency anemia was found.

Although certain foods have long been supplemented with iron, it is clear that this program is not effective. These are examples of relatively simple kinds of programs, situations where we have fairly good ideas of what might or ought to be done, but we are not doing them effectively.

There are many other problems where we are uncertain what the most effective approach may be. These require study and experimentation, especially experimentation at the public health and administrative levels.

I think you would agree, that we would know a great deal more about what to do and how to do it if better objective data were available for evaluation of some of the current programs such as the school lunch and the food stamp programs.

It would seem clear that we cannot simply count how many programs there are—we need to know why some work and others do not, why certain activities are acceptable and others are not.

I believe it is obvious that the group responsible for a program is rarely, if ever, the best group to monitor that program. Objective, qualified appraisal of programs is needed, independent of those who are responsible for either the success or failures encountered.

Also, I think it should be clear that it is not satisfactory to evaluate programs from anecdotal information. Several reports that this committee has considered were simply anecdotal. While the usefulness of these is not denied, it is apparent that every program has its failures and successes; every program has its opponents and proponents and many of these can be identified.

There is reason to suspect bias in all such reports depending upon who selects the material or the witnesses and for what purpose. We need facts and figures, evaluated by experienced people who are not personally responsible for the programs.

I would add my agreement to the suggestion you have already heard several times; namely, that we need some focus on nutrition in the Government that is health oriented.

I believe that it is unreasonable to expect the Department of Agriculture to provide these kinds of health-oriented programs when their primary interest and responsibility must be directed toward the welfare of the producer rather than the welfare of the consumer.

Indeed, it is true that Agriculture has deliberately avoided the medical assessment of nutritional status, as they should. They have done the best job of collecting information on food and nutrient consump-

tion. However, one cannot disassociate food and the effects of food if we are to have adequate nutrition programs.

Nutrition does not fit nicely into the classical organization of Government agencies and it does not fit nicely into the classical organization of science teaching programs or university departments. Means must be found to integrate the components of satisfactory programs and this will present difficulties.

Although it is somewhat peripheral to the major interest of this committee which is primarily directed toward undernutrition, I would call attention to the fact that nutritional problems are not limited to poor people or due only to undernutrition or poverty.

It seems quite clear that the major killer in the United States, atherosclerotic heart disease, has a strong nutrition component. Some 20 percent of the population are estimated to be obese. Diseases of the gastrointestinal tract, diabetes, renal disease, hypertension, anemias, dental caries, the so-callled inborn errors of metabolism and many other important maladies involve nutrition in their treatment or prevention.

It is generally agreed that nutritional knowledge is poorly utilized in medicine and public health. The advances in food technology and the ingenuity of the food industry are constantly producing new and different foods.

In some ways nutrition education becomes more difficult because of the bewildering array of products now available to the consumer.

In addition, the total food intake of the American people continues to fall as we become less active physically. An adequate consumption of some nutrients becomes more difficult simply because there is less food to carry them to the mouth. These kinds of programs require thought, research and in many cases, policy decisions.

The evidence that you have heard indicates that there are many millions of people in the United States with varying degrees of malnutrition, partly associated with poverty.

However, I would hope that more meaningful ways can be found to deal with malnutrition in poverty areas than massive extension of welfare and food distribution programs.

It seems to me that in the food manufacturing and marketing industries there must be a great deal of experience and know-how that is relevant to these problems. Whatever is done to meet the problems of malnutrition will be important one way or another to many food industries.

Although I have no particular qualifications to speak in this area, I feel that more efforts are needed to utilize the expertise that lies in the responsible food industries and to get them actively participating in the development of solutions.

It is apparent, I think, that if the objectives of the Committee on Nutrition and Human Needs, which are stated to be the development of "programs which will assure every U.S. resident adequate food, medical assistance, and other related necessities of life and health" are to be achieved, we must develop a sustained effort which can be continually improved as we gain experience.

It seems to me that eventually it may require some basic philosophical changes in our outlook. I have never really understood our national priorities. This country feels that freedom from ignorance is so im-

portant that every child must be sent to school and our society is willing to pay the costs. We may not do an adequate job but I think our intent is clear.

On the other hand, relatively little is done to provide freedom from hunger and disease for our children, except in dire circumstances, and many attempts to provide such protection for children are considered an invasion of the rights of the parents.

We confidently expect that many improvements will come from the interests and efforts of this committee. It is apparent that you start from a rather weak base. Nutrition is poorly organized at the Federal level, Departments of Nutrition in the States are, with very few exceptions, weak and understaffed, there is a shortage of trained personnel and good training programs in the universities are few and their future somewhat uncertain, and nutrition education in medical and public health schools is a relatively minor activity.

We have been told so often that we are the best fed nation on earth, which may or may not be true, that most people believe it.

Only a very broadly based educational effort will be effective in developing the political and financial support that is needed. These hearings have already had an impact and continuing congressional interest will be required to reach these objectives.

The Food and Nutrition Board believes that we can be useful in this effort and the Board unanimously agrees that we are looking forward to providing any assistance wherever this may be appropriate.

Thank you.

The CHAIRMAN. Thank you very much, Dr. Hegsted. At several points in your testimony you have expressed recognition of the fact that I think the committee is becoming more aware of and that is the lack of educational effort in this field even on the medical school level and the failure to use nutritional knowledge in our health centers on any level to the degree that the situation requires.

I wonder if you could tell us what progress is being made to take advantage of the knowledge of nutritionists. Are you satisfied with the pace that the medical profession is now beginning to set or the priority they attach to this problem?

Dr. HEGSTED. No; I see very little change in medical education. There are discussions going on in some places but I think very little change. I think that most places don't know how to integrate nutrition into medical teaching.

It is primarily a matter of time in the curriculums.

As I said, nutrition doesn't fit well into the classical organization of medicine. All the classical departments were established before nutrition really became a science. No one is quite sure where nutrition belongs.

The curriculums are already full and it is like it is in the government. Nutrition is spread throughout departments which means, generally, that it isn't well done; I don't have a good positive suggestion.

The AMA Council on Food and Nutrition has suggested that every medical school at least ought to have one faculty position identified with nutrition so that there is some focus in the medical school.

The CHAIRMAN. Have you had any success in the post you hold at Harvard?

Dr. HEGSTED. Well, I am not entirely satisfied with our position at Harvard. We are in the School of Public Health and being in a School of Public Health you have relatively little effect on the curiculums in the medical school.

The CHAIRMAN. As I gather from your statement, what you are really suggesting to us is that we need a broad national program of nutritional education perhaps beginning with the medical schools but you would carry it beyond that into the whole educational program, is that correct?

Dr. HEGSTED. I think we need it at all levels. I think a lot of the effort obviously can't be done by the medical profession. It has to be done by paramedical and other kinds of programs as well.

I think one of the weaknesses is that we have expected doctors themselves to do more than they have time to do. If you are treating a lot of patients every day you obviously don't have time to spend an hour getting a dietary history and another hour instructing them how to eat, and some means has to be found I think to fulfill that function. I don't think that is well done at the moment.

The CHAIRMAN. In your statement, Dr. Hegsted, you say you hope that more meaningful ways can be found to deal with malnutrition in poverty areas than massive extension of welfare and food distribution programs, and you allude just very briefly to what the food industry might do.

Could you elaborate on that a little more specifically?

Dr. HEGSTED. Well, I qualified that also and said that I wasn't really qualified to speak in this area.

The CHAIRMAN. Yes, I understand that.

Dr. HEGSTED. But as near as I can tell the food industry has never really considered the problem, or maybe they have considered it but they have made relatively little effort to develop specific marketing programs or programs that are directed primarily toward malnutrition.

Now, it may be an impossibility but I have a feeling that our industries ought to be able to do almost anything if they put their mind to it. I don't believe they have put their mind to it. I would hesitate to make any specific suggestions but I feel that that group ought to somehow be brought in and put to work to advise us.

The CHAIRMAN. Don't you think that part of the problem there is the same problem that you have alluded to with reference to the medical profession?

The food industry has been more concerned about overnutrition and overeating than they have malnutrition or undernutrition?

Dr. HEGSTED. Certainly I am sure it is easier to sell foods to people that have money and overnutrition obviously is an important problem to a fairly large part of the population, the largest part, so I think it is not strange that the food industry devotes their primary attention to this part of the population, but I think they could well afford to consider in great detail what help they can render in this area.

The CHAIRMAN. Dr. Hegsted, I am not sure I understood the point you made with reference to your reservations about the national nutrition survey. You said you weren't entirely happy about the way the samples were drawn.

What do you mean by that?

Dr. HEGSTED. Well, I understand the directive from Congress was to provide an estimate of the number of people that were malnourished in the United States, and while I think that is of considerable importance, it doesn't seem to me very important to determine with any great accuracy how many this is, and I think more thought should be given to trying to find ways to find where the malnutrition is rather than simply take a State and pick out the census districts on some kind of a random basis. This may well miss areas that need to be studied, and I think the people familiar with the problems of the State should be involved in the selection of the samples.

Now, I may be misquoting the directive.

The CHAIRMAN. Let me just read you the directive here and see if you think this is too thoroughly drawn, doctor.

The Secretary of Health, Education, and Welfare, in consultation and cooperation with other officials of the Federal Government and of the States, shall make a comprehensive survey of the incidence and location of serious hunger and malnutrition and health problems incident thereto. He shall report his findings and recommendations for dealing with these conditions.

Dr. HEGSTED. Well, it says location. I guess I don't know enough about the nutrition surveys to be particularly critical about them, but I believe the sample has been drawn on some kind of a random basis to try and get an average figure. I am under the impression that there has been relatively little effort to locate specific areas that might be worth studying.

The CHAIRMAN. You have made reference in your testimony to some of the reports this committee has looked into. You referred to some of them as simply anecdotal. Which reports are you referring to there, Dr. Hegsted?

Dr. HEGSTED. Well, I am talking about reports such as, Hunger U.S.A.

Now, I think that was a very valuable report, but one doesn't know how representative the opinions expressed in there are, and I believe there was a report on the school lunch program that is primarily quotations of people who are either happy or unhappy with their particular situation. I think it is possible you can be led astray by those kinds of approaches, or at least they ought to be supplemented by a more objective approach.

The CHAIRMAN. I might just say those two reports antedated this committee. If they have been considered at all it is by individual members of the committee.

Dr. HEGSTED. I may have misstated my——

The CHAIRMAN. But I think you would agree that reports of that kind have served to focus public concern and public attention.

Dr. HEGSTED. I certainly agree with that.

The CHAIRMAN. I think the authors never really intended them as a definitive study of the problem. It is simply one designed to put the public spotlight on some of these problems that we ought to be dealing with.

Dr. HEGSTED. I think they were valuable but I think there is always a danger in those kinds of reports, and I assume that that is the reason the National Nutrition Survey was organized, or at least one of the reasons.

The CHAIRMAN. I think that is right and I would hope that throughout these hearings and in the investigations of this committee, both in Washington and in the field, that we would hold the very high standards and try to be as objective as possible in looking at the problem.

Senator Ellender?

Senator ELLENDER. Doctor, have you ever participated in any programs that would lead you to make a selection as to the best foods, let's say around Boston, Mass., for young children?

Dr. HEGSTED. I am not sure I can answer that.

Senator ELLENDER. Your experience has been mostly in teaching nutrition?

Dr. HEGSTED. Primarily, yes; teaching and research.

Senator ELLENDER. Would it be possible to prescribe a menu for children in a certain district that could be used from Boston to California?

Dr. HEGSTED. Well, I think areas within the United States deserve some different consideration based on availability of food and perhaps food habits.

Now, Dr. Mead testified that she thought—I think I am right—that racial differences in food habits were not very important in the United States any more but there are so many different kinds of diets that could be developed that would be satisfactory that I really can't answer your question.

Senator ELLENDER. The point that I am trying to stress is simply this: That we need to do something now in some areas, and studies on top of studies won't help too much. If we have a proper prescription now, let's say, of diet that would be applicable to Mississippi, Alabama, Texas, Louisiana, Massachusetts, or any State, we ought to find ways and means to apply it now and not wait for further studies.

Dr. HEGSTED. I agree with that and I think that is entirely possible.

Senator ELLENDER. Do you think that with the knowledge at hand we can proceed and do that now?

Dr. HEGSTED. I see no reason why we couldn't.

Senator ELLENDER. The next thing would be the method to disseminate this knowledge and, as you know, back in 1914 we established an Extension Service to disseminate knowledge to the farmers and that has worked very well.

I am just wondering if we could not use that same facility, the Extension Service, and have people who know something about nutrition participate with the Extension Service and disseminate knowledge as to what is the best food to be used or a combination of foods to be used in certain areas?

Dr. HEGSTED. I think so. Of course, this ought to be based partly on local price situations.

Senator ELLENDER. Local what?

Dr. HEGSTED. Local prices and availability. I would agree something like the Extension Service would be useful. I think it would probably have to be modified to be suitable for the cities where many of the problems are, but that was an effective mechanism.

Senator ELLENDER. What I have in mind is not exactly use the same method but use the same facilities they have. In other words, it strikes me that it would be just as easy for the Extension Service to say what good food will do for people as what good nutrition will be for a plant.

Once they know it they don't have to be an expert on the kind of nutrition needed for a plant. Yet if they are given, by some studies, what food would be good for plants the same thing could be done for human beings. All they need know are the facts and cooking techniques and then let them disseminate that knowledge among the people.

Dr. HEGSTED. I think that is right except that when people go to a market, as I pointed out, and there are, so I am told, maybe 10,000 items in the market now, it becomes a fairly difficult matter for a housewife to make that selection.

Senator ELLENDER. Then it goes back to education. The housewife should also be educated, and of course that will take some time.

Dr. HEGSTED. I am not proposing we don't do anything until we get everyone educated.

Senator ELLENDER. I notice here you made a statement about children in the Boston area that don't get any breakfast and then for lunch they buy a stick of candy and that's it. How would you stop a thing like that?

Dr. HEGSTED. I think Boston ought to have a school lunch program.

Senator ELLENDER. That is another thing I desire to raise. Why is it that Boston and many other cities in your area will not participate in the school lunch program? Have you any idea?

Dr. HEGSTED. I have some ideas, Senator, but I really don't know.

Senator ELLENDER. I wish you would express them. It wouldn't hurt you to do it, would it? What is the reason?

Dr. HEGSTED. I think there are a number of reasons.

Senator ELLENDER. Suppose you give us an idea why.

Dr. HEGSTED. One of the reasons is that there is a general impression that you need a hot school lunch and most of the schools in Boston were built long ago and have no kitchen facilities.

Now, we feel that as an immediate measure we ought to find some way to distribute sandwiches and milk prepared in some center. So far as I understand it the school committee has not decided to approach the problem that way, but that is one of the difficulties, that schools may not have facilities to prepare what is considered an adequate school lunch.

Senator ELLENDER. In order to meet that situation the Congress has enacted a law whereby people who don't have facilities can obtain money to establish them. Why don't they take advantage of that?

Dr. HEGSTED. I can't answer that.

Senator ELLENDER. The great difficulty, in my opinion, is that where there is a lot of criticism about programs the local people simply haven't taken advantage of them. The school lunch program has been on the books now since 1940. I fathered it with Senator Russell from Georgia and it has worked well in many States. Yet I find in large cities like New York, like Boston, and many cities in the northeast they won't use it.

Yet it has been available to them. It may be that the local people don't care to participate in it because, as you know, the cost is not entirely borne by the Federal Treasury. The local people bear the difference, by giving work in kind, preparing food, or the counties are furnishing money and the school district is also furnishing something. It would seem to me that a lot of this trouble could be eliminated if only we had more people willing to participate in these programs.

Dr. HEGSTED. I certainly agree and I hope that one of the things that will come out of these hearings is the stimulation of effort not only here but all over the country. I think that obviously these problems have to be solved partly at the local level. They can't all be solved by Washington.

Senator ELLENDER. The school program has been advertised considerably. The people know about it. Yet they won't participate in it. Should we recommend that the school program be broadened? How can we draw in these people who won't use it?

Dr. HEGSTED. I am not sure, Senator.

Senator ELLENDER. I don't know. It may be that some people just feel they don't need it. Perhaps it is thought to be necessary in only parts of the South, where the children don't obtain all the food they need.

Dr. HEGSTED. I feel certain that isn't true.

Senator ELLENDER. Of course, your statement is very general. I was very hopeful that we might get something concrete that we could follow through with but most of the witnesses so far who have appeared before us are professors of nutrition. They know a good deal about it, but as to how to get to the problem and how to prescribe what ought to be done, we are short on that.

Dr. HEGSTED. I agree that a lot of us have not had experience in the practical programs—I assume that the people who have worked on these programs will have more specific things to say about them than some of us have.

Senator ELLENDER. I am wondering what good is there in your teaching. You say you are a professor of nutrition at Harvard. What good comes out of it?

Dr. HEGSTED. Well, we train quite a few people in nutrition that we think do a useful job. Obviously we haven't solved the problem of malnutrition in the United States and I think there are a lot of reasons for that.

I don't think it is only the fault of the professors of nutrition.

Senator ELLENDER. Do these students teach in other schools?

Dr. HEGSTED. Well, there are several in the back of the room that have worked in programs in Washington. There are some that teach. There are some that work in hospitals. I think they are all doing a useful job but the numbers are fairly small, and, as I indicated, I think we have to have a fairly broad, continuous educational effort. Nutritionists usually talk to nutritionists, you know, and how to get the medical schools and other training facilities to really grapple with this problem I don't know.

Senator ELLENDER. Well, is it a very popular subject?

Dr. HEGSTED. No, it is not.

Senator ELLENDER. You don't have many interested in it?

Dr. HEGSTED. Well, we don't have anywhere the number that we think we should have.

Senator ELLENDER. Yesterday I made a suggestion and I am wondering what you think about it. As you said a while ago, you could put fluoride in water that would take care of the teeth of children whereby they would have less cavities. I wonder if the Government couldn't prescribe certain things that should be put in foods so as to get enough vitamins, A or B or C, whatever is needed.

Dr. HEGSTED. The Government, of course, has for a long time put certain vitamins and minerals in bread and wheat.

Senator ELLENDER. But that is only optional. That is not obligatory.

Dr. HEGSTED. It is required in many States. I am not sure of the exact number.

Senator ELLENDER. What do you think of a proposal of that kind so as to provide other vitamins? We have vitamin D in milk and you have other vitamins in other foods. Do you think that might be a good way to at least start out and see how it works and then maybe go from there to something better?

Dr. HEGSTED. I think we all agree that that is one approach that ought to be explored. It requires a fairly careful selection of appropriate vehicles. Twenty years ago bread was really a better vehicle than it is now because a lot of people are eating less bread, less cereals, than they did 20 years ago. That presumably is one of the reasons why the iron fortification program has been less effective than we expected it would be.

Senator ELLENDER. And I suppose that is due to the change in habits of people, because of the different foods that they eat now as compared to what they had 10 or 12 years ago.

Dr. HEGSTED. Yes.

Senator ELLENDER. And, of course, that means I suppose that this study that you speak of and others have spoken of must be continuous.

Dr. HEGSTED. I think they should be continuous.

Senator ELLENDER. I am very hopeful that this committee can find ways and means to allow us to improve health and nutrition and not have to wait until 10 years hence before we do something. We ought to be able to find something that will work now and not 2 years from now.

Dr. HEGSTED. I certainly agree with that but I hope that the effort will continue because I don't believe there is any pat solution to this that will solve it in the next 2 or 3 years and I am more concerned that we organize somehow a continuing effort that will keep abreast of nutrition over the years.

Senator ELLENDER. Thank you, Doctor.

Dr. HEGSTED. Thank you.

The CHAIRMAN. Senator Cook.

Senator COOK. Doctor, you say it was very simple to determine how much of the various nutrients man needed and assure that these be provided by the diet. You were talking in terms of some years ago. Could this be done now?

Dr. HEGSTED. Well, I think we know it is a lot less simple than we thought it would be and nutritional requirements can only be determined within some, I would guess, fairly broad margin of error. I don't think any of us really know how exactly we can define them or how useful it would be to exactly define them.

I think the variability in requirements must be fairly large. We would like to have techniques so we could say this person is or is not malnourished, but I doubt if we will have that in the next 50 years.

Senator COOK. As a matter of fact, enlarging on Senator Ellender's remarks about the school lunch program, it is broader than just where the school lunch program is or isn't; isn't it really? I think you use a perfect reference to two of my daughters when you say that at lunch-

time they will grab a Coke and a candy bar. Every time my 16-year-old is 2 pounds overweight she starves herself to death for 10 days and doesn't eat any lunch at all, so really the problem is much broader than whether a school assumes the responsibility for providing a proper diet or not.

We are really talking about the individual involved, aren't we?

Dr. HEGSTED. I think we are talking about both. I think if the child really doesn't have adequate resources that there certainly ought to be a school lunch program, but I would not indicate that a school lunch program would solve all of the nutrition problems of children and teenagers.

Senator COOK. You say in your statement that the department that administers the program should not be the department that analyzes and oversees that program. Dr. Darby yesterday suggested that we might put our community distribution program under the Public Health Service.

Admittedly, this would help only the welfare recipients, but at least this would be doing more than we are doing now.

Do you agree with this?

Dr. HERSTED. I am not sure I am qualified to talk about the mechanisms of doing this because I don't feel that I know enough about how they do it now or how Public Health Service would do it.

I have the general impression that the program ought to be associated with some health-oriented group, but whether that group would have to do the total effort I am a little uncertain.

Senator COOK. You also make the statement that the food industries ought to be doing a great deal more. First of all, when we talk about the food industries as such we are talking about providing a salable item. The poverty-level people are a group that very seldom buys the major products of the food manufacturer, anyway; is this not true?

Dr. HEGSTED. Well, I assume that is true, but the food that the poor people do buy must be a considerable item in the national picture.

Senator COOK. They buy on price, though. They don't buy what they really need for their families most of the time; is this not true?

Dr. HEGSTED. I think that is probably true, but it seems to me that if we knew what they bought and what the price situation was we might then be able to do something nutritionally with these products.

Senator COOK. You know, Doctor, one of the things that bothers me is I have a feeling that we can somehow or other monitor good diet under the food distribution program but I am afraid that this will be very difficult under the food stamp program, because the food stamp program will allow the head of the family, the mother, to buy anything she wants to. Under the commodity program I have a notion that we could create a proper diet with the distribution of proper foods. It is certain we are not doing this now.

What bothers me is, as we move away from food distribution, as poorly as it may be now, and more and more into food stamps, then we are going to see to it that the people get less and less of the things they really ought to have because they are going to buy things that really are not going to provide a proper diet.

Do you agree with that in essence?

Dr. HEGSTED. I certainly think that is a possibility and I would think that it shouldn't be too hard to get that kind of information.

I haven't seen any information on what people use their food stamps for and, as I indicated, it seems to me it gets more and more difficult for a housewife to select the proper diet from the grocery store because the number of food items continues to increase.

Senator Cook. And the number of exotics really. You can get it frozen or unfrozen or you can get it any way you want it, and you really aren't sure what its contents are at all, is this not correct?

Dr. Hegsted. That is certainly true for most people, yes.

Senator Cook. I find, Doctor, your statement most interesting because I don't think you diminished the problem at all but I do think you say that something can be done and I agree with you.

A doctor yesterday said that maybe we should review and survey all 50 States. I am not sure what that would really accomplish. For instance, let me ask you this. There are a great many stores that carry salt that is not iodized. Yet, we do find that some people in the country if they bought iodized salt this would be injurious to them also; wouldn't it?

Dr. Hegsted. I am not aware of people who would be injured by iodized salt.

Senator Cook. Don't you find cases, Doctor, where a doctor would prescribe that a patient who has a particular problem not buy iodized salt?

Dr. Hegsted. I can't comment on that. I am under the impression that if that happens it is very, very rare.

Senator Cook. Well, the point I am trying to make is, that I am worried about stabilizing all things that have to be consumed based on a survey that shows a particular lack in particular areas, because the thing you might require for one person may not be essential to another and as a matter of fact, might even be injurious to him.

Dr. Hegsted. Obviously, that has to be considered, but there are many countries where iodized salt is mandatory by law.

Senator Cook. Oh, really.

Dr. Hegsted. Yes, sir.

Senator Cook. Do you know those countries?

Dr. Hegsted. I can't name you some.

Senator Cook. Would you provide us with that?

Dr. Hegsted. Yes, I will.

(The information referred to follows:)

[Endemic Goitre, published by the World Health Organization, Geneva, 1960, pp. 455–456]

Excerpt From "Legislation on Iodine Prophylaxis," by J. de Moerloose

* * * In 1940, the New Zealand Medical Research Council's Thyroid Research Committee recommended that non-iodized salt should be supplied only to people asking specifically for it and although this policy has not been rigidly followed, 80% of the population were using iodized salt by 1957. In the United Kingdom, the Goitre Subcommittee of the Medical Research Council noted that although individual medical men had recommended the use of iodized salt within the district that they served, there had been no public demand for it.

In the Netherlands, on the other hand, attention was drawn to the danger of the public taking the initiative in regard to iodine phophylaxis. This may lead to excessive consumption of iodine with all its attendant dangers. For this reason it is essential to establish official standards.

It was probably because of the above considerations that the WHO Study-Group on Endemic Goitre recommended that "* * * all food salts should be iodized compulsorily in any country or area in which goitre is endemic, local variations in incidence of the disease being disregarded."

LEGISLATION

Most of the regulations relating to the iodization of kitchen salt and other methods of iodine prophylaxis date from 1950 onwards. However, the use of iodized salt was first made compulsory in 1924 (Switzerland, Cantons of Nidwalden and Vaud). Between 1924 and 1950, similar legislation was introduced in Canada (1949), Costa Rica (1941), Hungary (1948), Mexico (1942) and the Netherlands (1942).

Apart from these legal provisions, ministerial circulars were issued in some countries (Australia, 1923; Sweden, 1936, 1950) for the sole purpose of promoting iodine prophylaxis. In Switzerland also, cantonal health authorities issued circulars for the same purpose (for example, Canton of Zurich, 1923).

Nevertheless, most of the regulations of this nature have been introduced since 1950: Brazil (1953, 1956); Chile (1959); Colombia (1955) (under the terms of an earlier text of 1945 the Institute of Nutrition was created and the executive empowered to make the necessary arrangements in order to find economic ways and means of combatting goitre); Bulgaria (1956, 1958); Guatemala (1954, 1955); Panama (1955); Paraguay (1954) (text establishing measures of a temporary character only); Union of South Africa (1954) and Yugoslavia (1953). It seems also that the use of iodized salt is compulsory in some parts of Northern Nigeria. In the USSR, the Ministry of Health issued instructions on the iodization of kitchen salt in the period 1950–1955.

Of the legal texts mentioned above, the only ones making the use of iodized salt compulsory throughout the national territory are those of Canada, Colombia, Costa Rica, Guatemala, Panama, Paraguay and Yugoslavia. In Switzerland, where the authority in matters of health is decentralized, the measures are applicable throughout the cantons where they are promulgated.

In Brazil, Bulgaria, Hungary, Mexico and Peru, the legislation covers only the goitrous areas. In the Netherlands, the measures are applicable to certain communes. In Mexico, the law applies only to areas where more than 20% of the inhabitants are suffering from goitre, and in Brazil, only to those localities where the endemicity rate exceeds 15% in male and 25% in female children. It has been suggested that iodine prophylaxis be instituted when 10% or more of children between 7 and 15 years of age show visible enlargement of the thyroid gland.

In Paraguay, the 1954 legislation was of a temporary character only: it provided for the administration of iodized chocolate to schoolchildren for 30 weeks pending the introduction of prophylactic measures to cover the whole population.

The Chilean legislation authorizes the introduction of iodized salt but does not indicate whether its use is obligatory.

Obviously, the existence of a legislative text does not necessarily mean that it is applied. Stacpoole refers to the fact that in Mexico (where iodized salt was to be used in the goitrous regions, in which the endemicity rate was high) the technical and economic difficulties encountered were such that, several years after the promulgation of the regulations, only a few thousand people were consuming iodized salt. It is true that other techniques were used, but these were only for the benefit of schoolchildren.

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EXCEPT FROM "PRINCIPLES AND PROBLEMS OF CONTROL," BY F. W. LOWENSTEIN

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OBJECTIONS TO IODIZED SALT

One of the main objections put forward to the use of iodized salt has been that iodine may have a toxic effect, particularly if used over a long period. This statement goes back to some of the early experiences in France in the 1850's when relatively high doses of iodine were used. These trials had to be abandoned because of the reported toxicity. In the dosages used for the enrichment of salt, however, the possibility of a toxic effect is very remote as they are based on the physiological requirements for iodine which have been established by careful work. They depend also on the amount of salt consumed in different countries. In fact, the addition of small amounts of iodine to salt (1:10 000—1:100 000) is nothing but a restoration of a natural ingredient lost during the process of drying and/or refining; there are still some places—

or at least have been until recently—where people are using a crude salt which has enough iodine to prevent goitre. In this connexion it is relevant to mention that some sea-foods—such as cod, haddock, shrimps and lobster—contain more iodine per unit of weight than iodized salt.

There have been poorly-founded reports in the medical literature on cases of thyrotoxicosis (Jod-Basedow) caused by the use of iodized salt. These reports have been seized on eagerly by professional and non-professional opponents of iodization to discredit this measure and discourage governments and public health authorities from supporting iodization. Whereas, in Switzerland and the USA this campaign failed, it did succeed in Austria, where in 1933 the government stopped the general distribution of iodized salt, started in 1924.

If one looks carefully at the literature, the evidence for a toxic effect of iodized salt is, indeed, very meagre and, in the few cases published, extremely dubious. Flück has presented the results of a nationwide inquiry to more than 1600 physicians in Switzerland between 1922 and 1924. A frequency of thyrotoxicosis of 5 per 100,000 was found among both the persons who consumed iodized salt and those who did not use it. Among a total of 18 cases of thyrotoxicosis supposedly due to iodized salt, only in 5 could a definite time-relationship be established between the consumption of iodized salt and the development of the toxic goitre. Wagner-Jauregg showed that in quite a few of the cases diagnosed as toxic goitre due to iodized salt either the basal metabolic rate was not measured or, if it was, it was within the normal range. One woman actually ate the salt in large amounts because she thought that if a little was good for her, then a bigger dose would do her even more good. Among 2659 cases of hyperthyroidism, Kimball saw only six which might have been related to the consumption of iodized salt; all six were in women above 40 who had had a nodular goitre of long standing. In another paper, he demonstrated to the goitre surgeons of the USA, who were afraid that the use of iodized salt would cause an epidemic of toxic goitre, that among 1299 adults with long-standing goitre who had been taking iodized salt for five years there was not a single case of toxic goitre which could have been diagnosed as due to the use of iodized salt. The majority of the toxic patients were under treatment by a physician and had been advised, in most instances, against the use of iodized salt. In recent years, Perinetti (personal communication) reported that after the introduction of iodized salt (1:30 000) in Mendoza province of Argentina he has not seen one case of thyrotoxicosis that could be attributed to the use of this salt. Various authors, such as McClure in Michigan and Eggenberger in Switzerland, found a considerable *decrease* in thyrotoxicosis after the introduction of iodized salt. Nicod stated that at the time of writing (1953) no death from toxic goitre had occurred in three Swiss cantons since 1949 although iodized salt had been introduced in 1924, 1927, and 1946 respectively. By contrast, the cantons with the lowest consumption of iodized salt (particularly Aargau, where less than 10% of the salt consumed is iodized) continued to show a higher death rate from thyrotoxicosis. Clements presented evidence that the steady decline in death rates from thyrotoxicosis in Australia went hand-in-hand with the decrease in the incidence of endemic goitre.

It is possible that in rare instances a thyroid adenoma of long standing may become toxic in a patient taking iodized salt. The benefits from the use of iodized salt, however, to the people in an endemic goitre area far outweigh the risk of an occasional toxic effect. The same philosophy applies here as in other measures of preventive medicine, such as vaccination against smallpox where the risk of encephalitis is also very remote in comparison with the beneficial protection afforded to the overwhelming majority.

Mention should be made in this connexion of the fact that some persons show a hypersensitivity to iodine in the form of so-called iodine acne and iododerma of the bullous type. Dermatologists have been concerned with this problem for some time. Beerman, in a recent review, has shown that there is no agreement yet among dermatologists on the importance of this question. Thus, Bechet reported that 38% of 240 cases of acne had been using iodized salt over long periods and improved only after discontinuing the iodized salt and taking sodium chloride instead. On the other hand, Gaul and Underwood, in a three-year study of the effect of oral iodine on acne vulgaris, concluded that iodized salt does *not* have an unfavourable effect on the course of this disease. They even suggested that iodine deficiency may possibly be a contributory cause of acne. Iodine alone and its equivalent in iodized salt failed to produce pustular exacerbations. Without

entering into this controversy, it is safe to assume that there may be some persons who either are hypersensitive to iodine or may become sensitized through prolonged use of small doses of iodine; for such persons non-iodized salt should be made available on a prescription basis.

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Senator COOK. Thank you, Mr. Chairman.

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Dr. Hegsted, you pointed out that there were not enough doctors for people who depend upon medical doctors for a nutritionally balanced diet when there are some 40 to 50 nutrients needed for good nutrition.

What percent of the American people do you think see a doctor as often as once a year?

Dr. HEGSTED. I wouldn't have any idea, Senator, but I imagine relatively few.

Senator YARBOROUGH. Relatively few as often as once a year. Have you known people past middle age who have boasted they have never been to a doctor in their lives?

Dr. HEGSTED. Very often.

Senator YARBOROUGH. Certainly. So if people are failing to see a doctor very few people will ever have the benefit of a nutritional diet; is that not true?

Dr. HEGSTED. I am sure that is true. I am sure this has to be a public health program; it can't be done by the medical profession.

Senator YARBOROUGH. The dissemination of information must be much broader than to depend upon the medical profession, even the allied health profession.

Dr. HEGSTED. I think so.

Senator YARBOROUGH. You say, in effect, there is little use of arguing over whether the nutritional deficiency is 5, 7, or 9 percent of the population when a prevalence of 5 percent represents an intolerable situation.

Well, the surveys in Texas and Louisiana showed well over 5 percent, did they not?

Dr. HEGSTED. I didn't mean to indicate that 5 percent was the level. I was simply saying that any time it is over an intolerable level it doesn't seem to me very important whether it is a little or twice that amount.

Senator YARBOROUGH. We know that it is so great that something must be done.

Dr. HEGSTED. Something should be done about it.

Senator YARBOROUGH. And you point out here that you hope that many improvements will come from the efforts of this committee because we start from such a weak base and you point out that:

> Nutrition is poorly organized at the Federal level, Departments of Nutrition in the States are, with very few exceptions, weak and understaffed, there is a shortage of trained personnel and good training programs in the universities are few and their future somewhat uncertain, and nutrition education in medical and public health schools is a relatively minor activity.

So from all of this don't you think that this committee should go ahead at full steam and help increase public awareness of this deficiency in the education of our people in one vastly important field of public health?

Dr. HEGSTED. That is what I——

Senator YARBOROUGH. Doctor, as I have listened to this testimony day by day I have decided that the best diet of my life wasn't now, when I have gotten a little more affluent, but was in my boyhood when supposedly we had less because it was in a rural area, a wooded area, in the eastern part of Texas where the flora and fauna were basically the same from there to the Atlantic seaboard. I scribbled down here on a sheet of paper as you were testifying the things that I remember, the fruits and nuts we ate while in the woods as we hunted with our dogs.

I don't mean we would skip our meals at home either, but there was something to pull off a tree or off a plant from April to Thanksgiving, and I just wrote a few of these down which I remember.

I am certain I have forgotten some. For instance, spring plums. They were generally ripe by April, mid-April, sometimes early April; early summer grapes, mustang grapes. They came in mid-summer. They grew about that big and some smaller. Then came the possum grapes in the fall. These are delicious and they add variety.

The Indians used to make pemmican out of them, you know; muscadines in the fall; bull nettle, a nettle that had a kernel in it you could scrape out in the summer. Fall plums ripened with the frost, dewberries. They were on running vines. These are colloquial names. They may have other names in different parts of the country.

Dewberries grow in upright stems; wild persimmons. They didn't ripen well until the frost and were there until Thanksgiving, maybe Christmas if the coons and opossums didn't get them; hickory nuts, red horse, black horse, black walnuts, and huckleberries. These are just some of the things among nuts and fruits.

Are you familiar with all of those plants by the way?

Dr. HEGSTED. I haven't heard of most of them.

Senator YARBOROUGH. Then we had the regular flora in the orchards that I farmed on. We had pears, peaches, plums, and apples. We had to buy bananas and oranges.

Dr. HEGSTED. You probably had milk too, Senator.

Senator YARBOROUGH. Well, with the variety diet, and we had regular cooked foods and milk, I decided my diet has gotten more deficient through the years. Thank you very much.

I have studied your testimony carefully. It shows a great need for what this committee is trying to ascertain.

The CHAIRMAN. Senator Hart.

Senator HART. Mr. Chairman, and Doctor, I apologize for getting in late. I have read your statement and it is helpful. I have no questions.

The point you make about the center city schools in Boston having been built long before hot lunches were conceived to be a function of public schools is applicable to nearly every city center school in the country, isn't it?

Dr. HEGSTED. It certainly is applicable to many. I couldn't say every, but there are certainly many schools that have no facilities for hot lunches.

Senator HART. Any school that is labeled old—and that describes unhappily most center city schools—can safely be assumed to have been built without a kitchen, isn't that correct?

Dr. HEGSTED. I think so.

Senator HART. And as Senator Ellender has indicated, in the recent past Congress has responded with some money to enable a school district to establish some facilities. But if anything could be labeled too little, too late, that was that effort because for years many of us have been making the point that until you do establish the facility those who need it most cannot get the hot lunch. I hope that there will be a very substantial increase in the sums available for schools to establish that facility because you don't have to be a Ph. D. or an M.D. in nutrition to understand that absent that facility we are just kidding ourselves if we think that the children who are in greatest need are going to be participants in any hot lunch program.

Dr. HEGSTED. Of course we would like to see before those facilities are established sandwich and milk or some kind of a lunch established.

Senator HART. Agreed, but the suburban school with the kitchen is the dwelling that feeds the child the hot lunch until the city school gets the kitchen and that is the cart before the horse. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Mondale.

Senator MONDALE. Dr. Hegsted, in your statement you repeat a point that has been heard several times by this committee; you call for much greater involvement by the private sector, particularly food manufacturing and marketing industries to help find broader solutions to malnutrition in this country.

How do you recommend this be done?

Dr. HEGSTED. Well, the only place that I have thought particularly about it is within the functions of the food and nutrition board where I thought that we ought to have an industry committee that would supplement our efforts and try to develop at least a mechanism for starting.

Now, I am sure there are many other ways to get interested and concerned industrial representatives working on this, but that is the only one that I have thought particularly about.

Senator MONDALE. One of the standard suggestions that one hears these days about any social problem involves the private sector, and yet when they are asked to help usually what is required is some sort of combination, public and private effort.

In housing we use private lenders but we subsidize the interest rates to bring low-cost housing within reach to the lower income groups. We have now found through the National Association of Business Groups, through the jobs program, that they will hire the hard core provided the Federal Government picks up approximately $3,000 per year per man, the additional cost of dealing with the problem.

I think what we are finding is that the private sector has an enormous amount to offer. I believe that their expertise and willingness to help ought to be called upon, but my best guess is if we are going to really meaningfully involve them it probably will have to be coupled with some kind of financial assistance, if they are going to be involved in a sufficient magnitude to really be helpful in this area.

Would you agree with that?

Dr. HEGSTED. I would assume that is right.

Senator MONDALE. But you have no further comments in this field? Unfortunately, they have not testified before us, and I would hope, Mr. Chairman, at some point we might summon some of the top leaders in the food and distribution industry to gain their views on how they feel they might best become involved.

The CHAIRMAN. I agree, Senator Mondale, and we do have plans to call in some representatives from the food industry who are in a position to evaluate, including the chairman of the recently formed subcommittee of the Grocery Manufacturers Association. They will be testifying later on.

Senator MONDALE. I am glad to hear that.

Dr. Hegsted, you make the statement that you hope that more meaningful ways can be found to deal with malnutrition in poverty areas than massive extension of welfare and food distribution programs.

Do you intend by this statement to be critical of the school lunch, school breakfast programs that exist, as well as direct commodity distribution programs, and food stamp programs as a device?

Dr. HEGSTED. No, I certainly am not. I simply wanted to state that I thought there ought to be efforts toward other approaches.

Senator MONDALE. Fine. That is what I thought you meant but it is somewhat misleading. I noted in the testimony by Dr. Schaefer, and we have also heard this from others, that the age group that seems to be most seriously deficient in nutritional levels is the very young, and yet if I understand other testimony that we have received here they are the very persons who are most seriously and permanently damaged by malnutrition.

I think we have had testimony that from birth, well, really from conception, to age 4 is the most critical period of development. If an infant suffers from malnutrition it may well be stunted in body and mind and irreparably so by the age of 4 and further efforts after that to restore full mental or physical ability may be futile.

If I am correct in this, in the range of programs which might be recommended and undertaken by the Federal Government, would you recommend that the highest priority be placed on the malnutrition and nourishment problems of the very young?

Dr. HEGSTED. Well, I think certainly high priority should be put on them. If that were to be interpreted to mean that you would stop the school lunch program in order to develop a program for the very young, I think that would probably be a mistake.

It seems to me we should develop an overall program, preschool children are the most difficult group to get to. School lunch is relatively easy.

Senator MONDALE. The tragedy of this it seems to me is that with the school lunch program we have some system for dealing with the nutritional problems of youngsters at about age 5 or 6 at the earliest but by that time they may be so stunted in physical and mental ability that the lunch programs would be useless.

I am talking now about the poorest of the poor. We depend upon food stamp programs and direct commodity distribution programs to

the families to reach those infants and youngsters. Yet I think the evidence is that millions of them somehow don't get the assistance they need and I don't know of any other suggestion that we have had thus far for a vehicle for an institutional device to assure high quality nutrition for the very young.

Dr. HEGSTED. I don't feel that we do have any method yet to assure adequate nutrition and health care to the very young. I would object a little to your statement that the school lunch would be useless because of the previous damage.

I think the situation is not that bad.

Senator MONDALE. We have had testimony that 90 percent of a person's mental development is compressed within the first 4 years of a person's life and that if the child suffers from malnutrition during those first formative years, the mental damage can be such that it is irreparable later on.

Dr. HEGSTED. I am sure there is evidence of that type.

On the other hand, we don't know a great deal about how severe the malnutrition has to be. We really don't have very good data on the extent of permanent mental damage done at that time, so I certainly would not think that this is irreparable in the sense that it isn't worth doing after age 4.

That is all I am objecting to. This is a very difficult group to reach. There isn't any doubt about it, and as far as I know, there are no effective programs anywhere to reach this group.

Senator MONDALE. Mr. Chairman, I noticed yesterday that Dr. Darby referred to an unpublished review by Arthur D. Little entitled "Summary of Reviews of Studies on Nutritional Status in the United States" and I have a copy of that. I would ask that that be made part of the record.

The CHAIRMAN. Without objection it will be done.

(The information requested follows:)

MILES LABORATORIES, INC.,
Elkhart, Ind., January 9, 1969.

Hon. GEORGE S. MCGOVERN,
U.S. Senate,
Washington, D.C.

DEAR SENATOR MCGOVERN: We have followed the present hearings of the Senate Select Committee on Nutrition and Human Needs with more than ordinary interest. Miles Laboratories has made nutrition, especially as it involves vitamins and minerals, its special interest for a number of years.

Representatives of Miles have visited nutritionists and members of allied disciplines throughout the nation to keep abreast of progress in nutrition sciences. To a man, the leaders with whom they talked asked the same questions that have been repeatedly asked during the hearing: Who is affected? Where are they located? What public information is available?

With this stimulation, Miles two years ago turned to Arthur D. Little, Inc., of Cambridge, Massachusetts, and commissioned an independent study of the available published dietary intake and biochemical studies of nutritional status of the United States population. After an exhaustive search covering the years 1950 through mid-1967, the scientist in charge of the project, Thomas R. A. Davis, M.D., DTM&H, MPH, has now prepared the attached "Summary of Review of Studies on Nutritional Status in the United States". His summary covers pertinent studies from all parts of the country on men, women, and children. We believe that the documentation underlying this summary is a complete compilation of pertinent published studies. Thus the summary may give an indica-

tion of the characteristics and extent of the nutritional situation in the United States.

Senator Mondale, with whom our Company's representatives have on several occasions discussed private sector participation in solving the problems of malnutrition, has suggested that Miles Laboratories make this report available to the Select Committee on Nutrition and Human Needs. Dr. Davis of Arthur D. Little is willing to appear before your committee to present the summary to the committee and to answer any questions the members may have.

If you wish to have Dr. Davis appear before your committee, we will arrange to have him call Mr. William Smith, staff director of the committee, to make whatever arrangements are necessary.

Very truly yours,

WALTER A. COMPTON, M.D.

SUMMARY OF REVIEW OF STUDIES ON NUTRITIONAL STATUS IN THE UNITED STATES

Introduction

Miles Laboratories, Inc., and Arthur D. Little, Inc., have been jointly interested in examining the existing published information on the nutritional status of the United States population. The analysis and organization of the information collected by both Miles Laboratories, Inc., and Arthur D. Little, Inc., was carried out under the direction of Thomas R. A. Davis, M.D., D.T.M. & H., M.P.H, of Arthur D. Little, Inc.[1] The published material reviewed consisted of more than 1500 articles concerned with nutrition, from which approximately 250 studies dealing with human nutrient intake and biochemical determinations on blood and urine in the United States were selected for further review. The results presented here were obtained by combining the data from 50 pertinent intake and biochemical studies published during the period from 1950 to mid-1967 and are in summary form only. A complete report is in preparation for publication at a later date.

Selection of Studies Reviewed

Only studies which presented objective information on the proportion of subjects which met various levels of standards were included. This overall criterion resulted in the selection of (1) nutrient intake studies which presented evidence of the percentage of subjects examined whose intakes were below fractions of the National Research Council Recommended Dietary Allowances (RDA) most commonly used for reporting purposes, i.e., below RDA, below ⅔ RDA, and below ½ RDA, (2) biochemical studies which reported results as percentage of subjects in the various categories of established biochemical standards.[2] The total number of subjects at different fractions and categories of standards are not always equivalent one with the other when results from all studies are combined, because some studies did not uniformly report data on subjects in the various fractions of RDA or the categories of biochemical standards. The above selection criteria excluded studies which presented results in a manner which could not be related quantitatively to the generally accepted standards. However, close examination of these studies indicated that their results were not different from those of studies which met the criteria of selection. A bibliography of the studies reviewed is appended as Appendix B.

Populations Studied

Figure 1 illustrates the geographical distribution of the studies summarized and shows that more population groups in the North Central and Northeastern states (especially New York) were studied as compared with the Western states. Only a few groups in the Southern states were studied.

The studies did not report in a meaningful way the socioeconomic and other salient characteristics of the groups studied. In general the studies were made on populations of small urban communities and their surrounding rural areas. There were few studies made on the population of large cities or city ghetto areas or rural poverty areas.

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[1] See Appendix A for Biography.

[2] Bessey & Lowry, Pearson and Interdepartmental Committee of Nutrition for National Defense (ICNND).

In the nutrient intake studies included in this Summary, a maximum of 14,252 subjects were examined and of these approximately 85% were under 21 years of age, 2% were between 21 and 50 years of age and 13% were over 50 years of age. Of the 11,814 subjects examined in the biochemical studies included here approximately 84% were under 21 years of age and 16% were over this age. Both sexes were in general equally represented except in the 21–50 age group which consisted of women only in the nutrient intake studies.

Results of Nutrient Intake Studies

Table I presents the total number of nutrient intake studies and subjects examined to obtain the percentage of subjects whose intakes fell below indicated levels of RDA for various nutrients. These percentages are shown in figure 2. The percentage of subjects whose intakes were below RDA for the nutrients presented varied between 31 and 57 percent; for below ⅔ RDA the percentage of subjects varied between 8 and 28 percent; and the percentage of subjects whose intakes were below ½ RDA varied between 2 and 12 percent.

Figure 3 illustrates the differences between the percentages of male subjects and female subjects whose intakes were below indicated levels of RDA. A higher percentage of females than males had intakes below all the indicated levels of RDA, except for Vitamin C and to a lesser degree Thiamine. The differences between the sexes were found to be most evident in the 12 to 15 age group for all nutrients except Vitamin C, and were most marked for iron at all age groups above 12 years of age, as can be seen in Table II which presents the data on iron according to age group in males and females.

Results of Biochemical Studies

Table III presents the number of studies and number of subjects examined for each biochemical determination made in the indicated categories of the standards and forms the basis for calculating the percentages of subjects whose biochemical determinations fell within the indicated categories illustrated in figure 4. The percentage of subjects whose biochemical indices were below "acceptable" varied between 24 and 50 percent; in the "low" category the percentage of subjects varied between 13 and 38 percent; and the percentage of subjects in the "deficient" category varied between 3 and 24 percent.

In some contrast to the nutrient intake date, the biochemical differences between sexes are not as marked, at least for the nutrients examined (Vitamin A, Carotene, Vitamin C), except for hemoglobin which may be used as an index of the adequacy of iron intake. In consonance with the nutrient intake data for iron, there is little difference between males and females prior to puberty. Thereafter, the difference in hemoglobin levels between the sexes is marked. In the "low" category for the 15–21 age group there were 14% of males as compared to 36% of females. In this same category for the over 21 age group there were 11% of males as compared to 36% of females.

Salient Findings

1. The results from the nutrient intake studies included in this Summary showed that the percentage of subjects whose intakes of the various nutrients were below the indicated levels of the RDA were as follows:

	Percent
Below RDA	31 to 57
Below ⅔ RDA	8 to 28
Below ½ RDA	2 to 12

2. The results from the biochemical studies included in this summary showed the following percentages of subjects whose various biochemical indices of nutritional status were in the indicated categories:

	Percent
Below acceptable	24 to 50
Low	13 to 38
Deficient	3 to 24

3. Both intake and biochemical studies showed that the greatest differences between the sexes occurred for the nutrient iron. In some age groups there were proportionally as much as 7 times more females than males who did not meet various levels of the standards for iron.

TABLE I.—NUMBER OF STUDIES AND NUMBER OF SUBJECTS EXAMINED TO OBTAIN THE PERCENTAGE OF SUBJECTS WHOSE INTAKES WERE LESS THAN INDICATED LEVELS OF RDA PRESENTED IN FIGURE 2

Nutrient	Below RDA		Below ⅔ RDA		Below ½ RDA	
	Number studies	Number subjects	Number studies	Number subjects	Number studies	Number subjects
Calcium	25	11,267	27	14,252	16	6,721
Iron	24	10,861	26	13,846	16	6,668
Vitamin A	24	10,596	26	13,581	15	6,050
Thiamine	25	11,267	27	14,252	16	6,721
Biboflavin	25	11,267	27	14,252	16	6,524
Niacin	24	10,861	25	13,282	16	6,668
Vitamin C	25	11,267	27	14,252	16	6,719

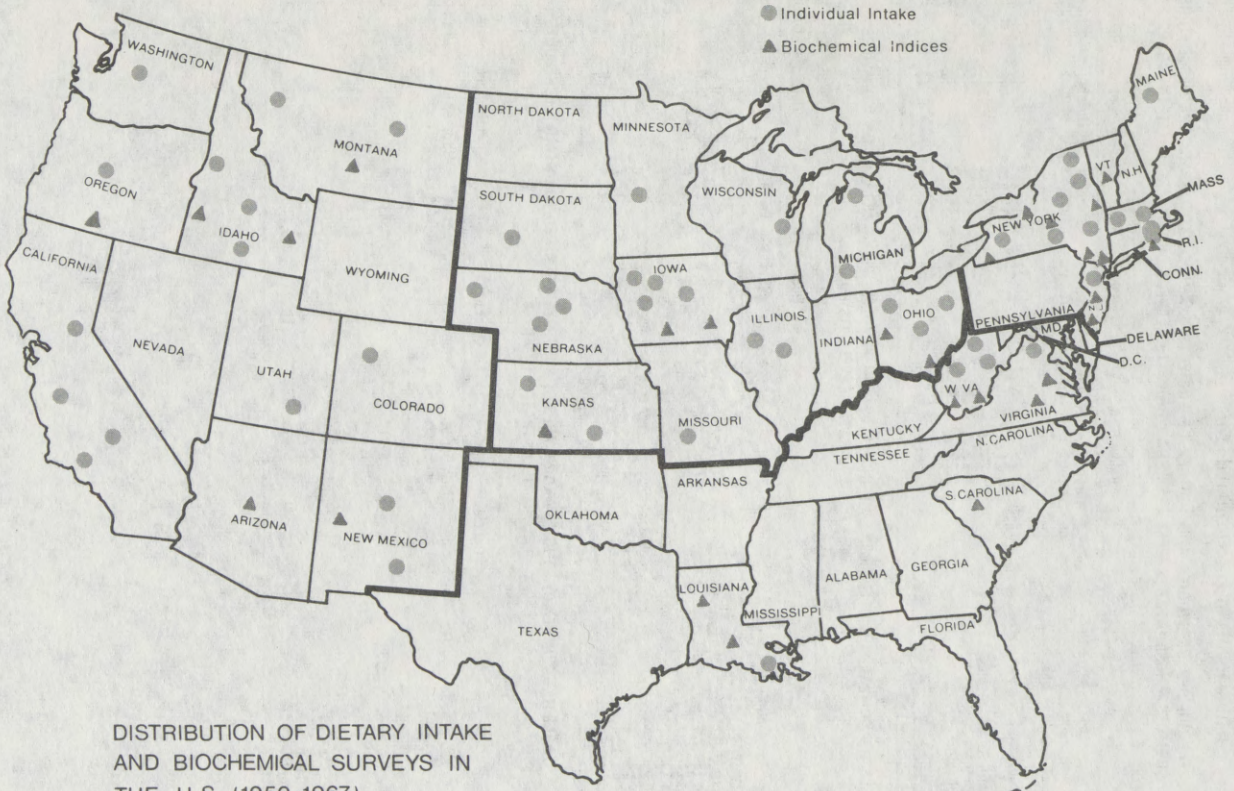
TABLE II.—COMPARISON OF PERCENTAGE OF MALES AND FEMALES WHOSE INTAKES OF IRON WERE BELOW INDICATED LEVELS OF RDA

Age group	Below RDA		Below ⅔ RDA		Below ½ RDA	
	Male	Female	Male	Female	Male	Female
1 to 12	47.3	57.3	5.5	7.7	0	0
12 to 15	47.8	83.7	9.4	31.4	2.0	3.2
15 to 21	38.4	88.5	4.6	34.6	.9	7.0
21 to 35						
35 to 50						
50 to 65	21.6	73.8	2.0	15.0		
Over 65	37.8	84.6	3.0	17.7	0	7.8
Miscellaneous	19.6	85.6	.8	27.4	.8	5.6

TABLE III.—NUMBER OF STUDIES AND NUMBER OF SUBJECTS EXAMINED TO OBTAIN THE RESULTS ILLUSTRATED IN FIG. 4

Nutrient	Deficient		Low		Below acceptable	
	Number of studies	Number of subjects	Number of studies	Number of subjects	Number of studies	Number of subjects
Hemoglobin	15	8,717	14	8,431	16	10,608
Hematocrit	4	1,413	4	1,413	5	1,625
Vitamin A	17	8,320	16	8,205	17	9,035
Carotene	17	8,452	16	8,337	17	9,350
Thiamine	4	1,164	4	1,164	4	1,164
Riboflavin	6	1,664	6	1,664	6	1,664
Vitamin C	20	9,923	19	9,808	22	11,814

FIGURE 1



DISTRIBUTION OF DIETARY INTAKE AND BIOCHEMICAL SURVEYS IN THE U.S. (1950-1967)

FIGURE 2

RESULTS OF STUDIES REPORTING INTAKES OF INDIVIDUALS IN SEVEN NUTRIENTS IN THE UNITED STATES

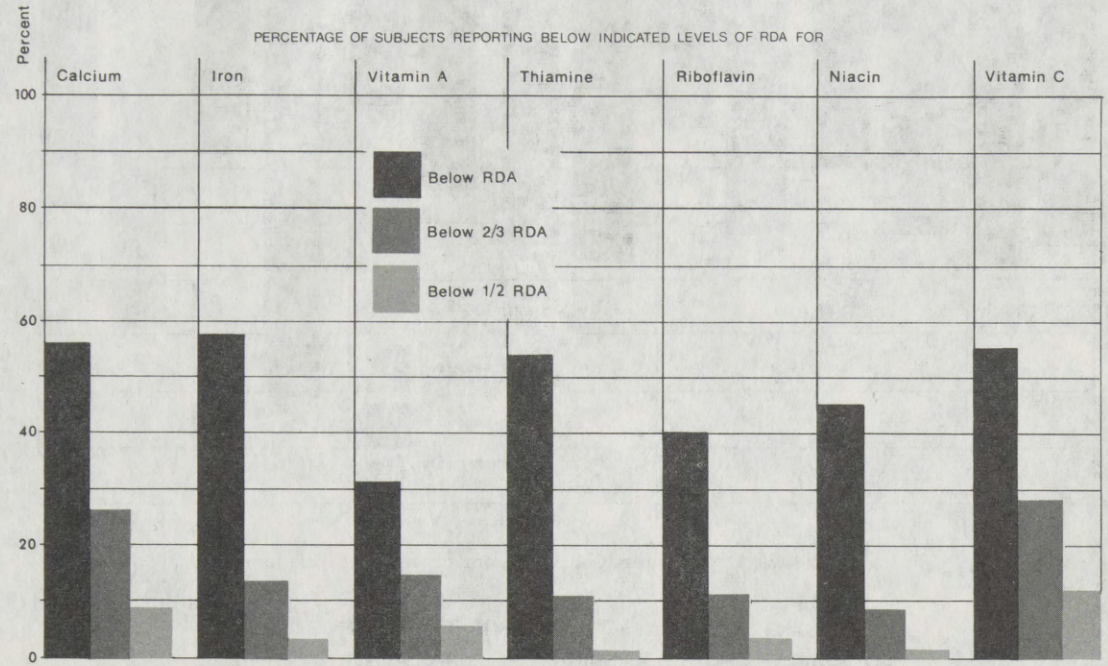


FIGURE 3

COMPARISON OF RESULTS OF STUDIES REPORTING INTAKES OF MALE AND FEMALE SUBJECTS IN SEVEN NUTRIENTS

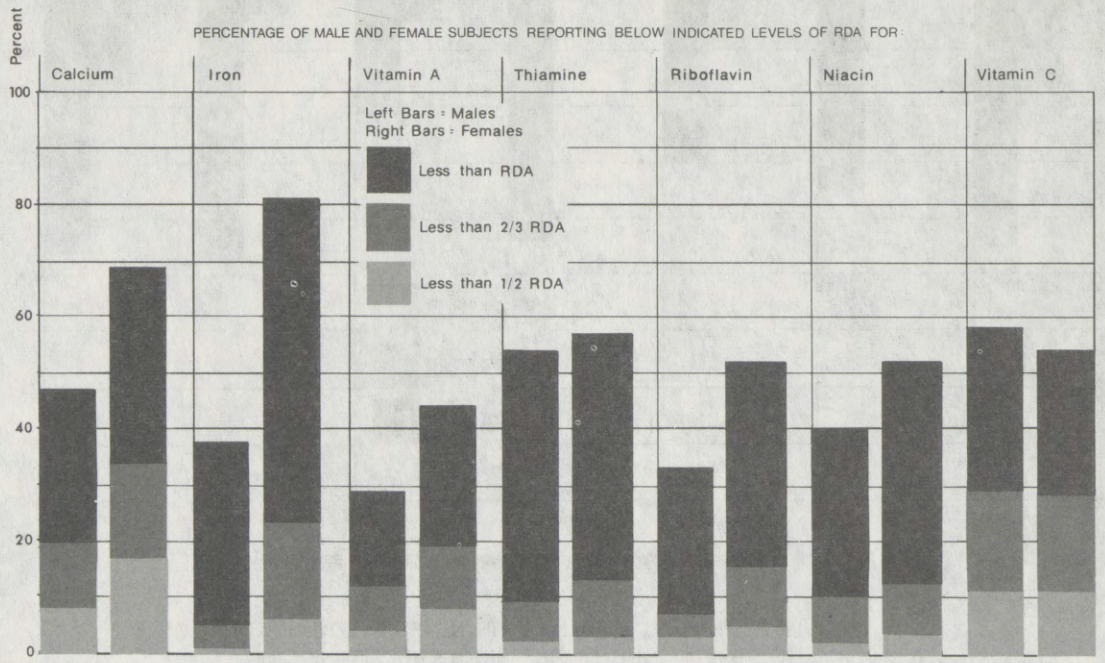
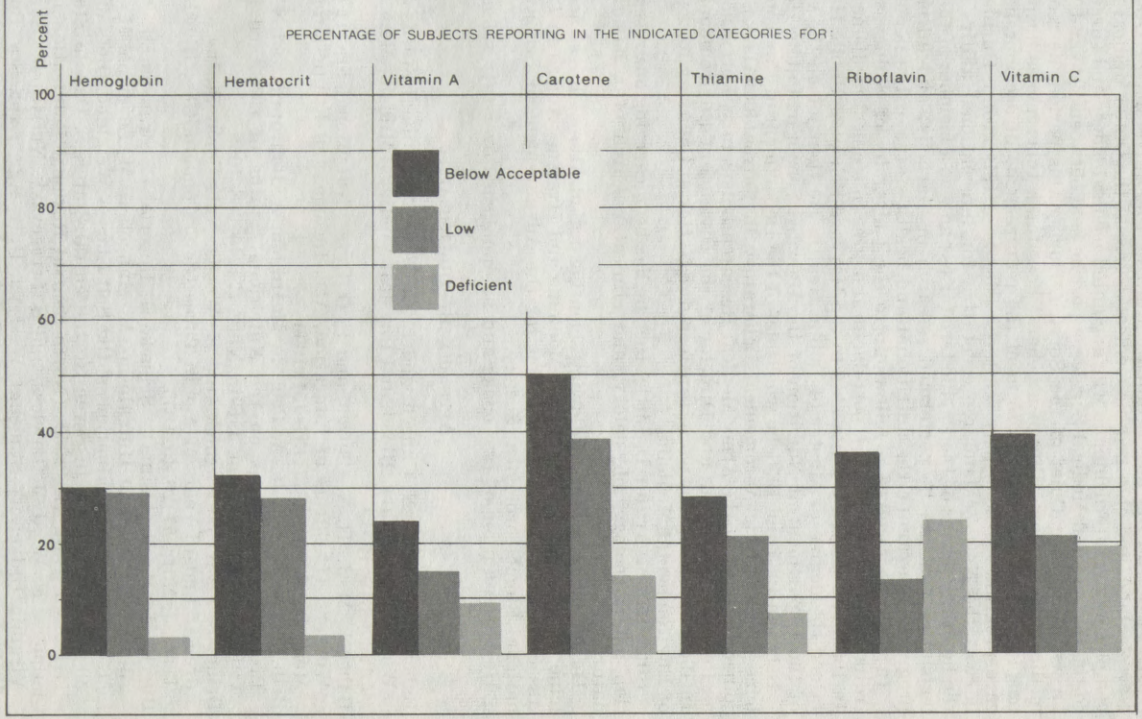


FIGURE 4

RESULTS OF STUDIES REPORTING DETERMINATIONS OF SEVEN BIOCHEMICAL INDICES OF NUTRITIONAL STATUS IN THE UNITED STATES



Appendix A—Biography of Thomas R. A. Davis, M.D., D.T.M. & H., M.P.H.

Dr. Davis did his undergraduate work at the University of Otago, Dunedin, New Zealand, and obtained his medical degree at the Otago Medical School. After completing his internship, he was appointed medical officer and surgeon specialist to the Cook Island Medical Service, a post he held between 1945 and 1948. In 1949, he was appointed Chief of the Service. During this period, he reorganized the medical service consisting of a general hospital, a tuberculosis hospital, satellite hospitals, and dispensaries to meet the requirements of a comprehensive health care program in the widely scattered islands of this group. During this period, he was the New Zealand representative for international affairs dealing with the health problems of the Pacific territories; he was a member of the Cook Island legislative council; he performed research in filariasis; and initiated research programs to examine the nutritional and health status of the population.

In 1948, he received a fellowship to the University of Sydney, Sydney, Australia, where he obtained a post-doctoral degree in tropical medicine and hygiene. In 1952, he received a fellowship to the Harvard School of Public Health and obtained the degree of Master of Public Health. He then joined the research staff of the Department of Nutrition of the Harvard School of Public Health.

Between 1955 and 1956, he was Chief of the Department of Environmental Medicine at the Arctic Aeromedical Laboratory in Fairbanks, Alaska. In 1956, he joined the staff of the Army Medical Research Laboratory, Fort Knox, Kentucky, as Research Physician and Director of the Division of Environmental Medicine. In 1961, his operations were transferred to Natick at the Army Research Institute of Environmental Medicine.

Since joining Arthur D. Little, Inc., he has been carrying out research in nutrition, pharmacology, physiology, and clinical research of a basic and applied nature.

He is a member of the following scientific organizations: Royal Society of Medicine, Royal Society of Tropical Medicine and Hygiene, American Public Health Association, American Association for the Advancement of Science, and International Biometeorological Society.

He is the author of two books and has published over fifty scientific articles.

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Senator MONDALE. I would also suggest that we might consider calling its author, Dr. Davis, to testify perhaps at a future hearing.

Thank you.

The CHAIRMAN. Thank you, Senator Mondale.

Senator Kennedy?

Senator KENNEDY. Doctor, I want to extend a word of welcome to you from this committee and to say I regret not being here at the time of the presentation of your testimony and your earlier responses to some of the questions.

I have a distinct honor of being on the visiting committee of the Harvard School of Public Health and I know very well not only its splendid reputation but I know how highly you are personally regarded there and generally throughout not only Massachusetts and New England, but the entire country.

I know that you have talked a little bit about Boston in response to earlier questions that were directed to you by Senator Ellender from Louisiana and as I understand, and if I am incorrect perhaps you would correct me, Senator Ellender asked you about why there wasn't a school lunch program in Boston.

The reason is very simple and that is because the administration failed to appropriate the adequate matching funds in Boston, and this was a matter which I found deeply distressing and I communi-

cated with our recent Governor up there and actually was very distressed that they still couldn't find the matching funds.

As a result there are tens of thousands of children in Boston who are denied this program which is being taken advantage of in many other cities both in the Commonwealth of Massachusetts and throughout the country.

I understand you did a study in Boston. Was that sponsored by the National Academy of Sciences or by Harvard, the school of public health?

Dr. HEGSTED. This was sponsored just by the school of public health. It wasn't a very complete study. We never succeeded in financing a good study. This was really a preliminary study which we hoped would then lead to a more thorough investigation of the problem.

Senator KENNEDY. Could you tell me a bit about the opportunities which are available to your board to conduct any surveys similar to the study that was conducted by the school of public health? Do you have adequate staff and adequate resources to do this?

Obviously you have a very distinguished board who I think would perhaps be uniquely qualified to really expose this problem and do the kind of research work in this area, and I am wondering if, first of all, there is a disposition to do it or if it is because of a limitation of funds or just what?

Dr. HEGSTED. I find the food and nutrition board like a university department. It has lots of ideas and no money, so if the board is going to become active in any field we have to find methods of supporting it.

I think the board itself should not be responsible for nutrition surveys. Although there have been a few situations where the board has actively promoted research programs.

Ordinarily they have served primarily as an advisory body. A few years ago the board had a substantial grant from the Rockefeller Foundation for studies on protein malnutrition and so they have, on occasion, conducted actual studies but this has been relatively rare.

Senator KENNEDY. Do you find it difficult to advise if you don't have first-hand information?

Dr. HEGSTED. We certainly do. I think most of our reports have to end up with suggestions of the kinds of data that we need in order to arrive at definitive conclusions.

Senator KENNEDY. I know you can speak only as an individual member of the board. Do you think that in fulfilling your own responsibility if funds were made available that you would feel that it was part of your responsibility to conduct these kinds of surveys so that you would be better equipped to advise the food industry in fulfilling your own responsibility on nutrition needs in this country.

Dr. HEGSTED. I think the additional data or additional surveys are a necessity. Whether we could conduct them better than Dr. Schaefer's group I think is not at all certain.

Senator KENNEDY. I suppose suggested in that would be obvious communication in working together in ways that you felt your group was strong in a cooperative kind of an effort.

Dr. HEGSTED. You are talking about the food and nutrition board?

Senator KENNEDY. Yes.

Dr. HEGSTED. Yes. The board has been asked to evaluate the surveys that Dr. Schaefer has made and make recommendations. We think that certainly is an appropriate function of the board.

If the surveys are not adequate, then perhaps the board would like to consider the possibility of doing their own but that requires a major staff in Washington such as we don't have. I would be doubtful whether the board really should get into that operation.

Senator KENNEDY. I suppose one of the things that I am driving at is whether the board itself, with the distinguished membership that it has, can really achieve and fulfill what I think many of us would feel are great expectations for it.

I mean have we got a board that people can sort of say that here is a board that is functioning, that is concerned about these problems, that is really doing something about it, or is this the sort of a board that is operating in a rather limited way?

Dr. HEGSTED. I would say I am confident that if we are intelligent enough we can mobilize the best people in the country. We obviously can't do anything until we have some funds. I find it difficult even to have a committee meeting until I try to find out who is going to pay for the travel to Washington.

Senator KENNEDY. This is a serious limitation, you feel, on really carrying through the efforts.

Dr. HEGSTED. It certainly is because many of the members of the board obviously are very busy people and we have to have some kind of a staff in Washington.

Senator KENNEDY. Have you requested these funds from the Academy of Sciences?

Dr. HEGSTED. We have requested the funds from HEW for this specific purpose.

Senator KENNEDY. What has been their response?

Dr. HEGSTED. Well, we expect to get them but we haven't——

Senator KENNEDY. When was your first application for these funds?

Dr. HEGSTED. The Academy was requested early in December to undertake this and the President of the Academy responded immediately that he would be happy to.

Senator KENNEDY. And from the communications that you have had with the respective HEW officials you are reasonably hopeful that these funds will be made available.

Dr. HEGSTED. We are.

Senator KENNEDY. Can you indicate what the scope of these funds are now approximately?

Dr. HEGSTED. That we would like to have?

Senator KENNEDY. That you requested.

Dr. HEGSTED. We think we could survey this data adequately with approximately $50,000 to $60,000 a year.

Senator KENNEDY. Actually it is a very limited kind of a program.

Dr. HEGSTED. Yes, it is not a major item but it is more than the Board has available to it now.

Senator KENNEDY. I just have one other area. I know that you have been very interested in the international food program. Just in the course of the hearings the other day I requested of some of the distinguished witnesses how we ranked in comparison with some of the industrialized societies and developing situations in Central America and where I do think that they have made some surveys and studies about nutritional deficiency I am wondering if you could make some kind of comments or observation as how you think the United States

compares with perhaps Western European countries as well as any developing nations that you have some experience with or some knowledge of?

Dr. HEGSTED. Well, I would think that data from other countries are not much better than the information we have in the United States as a whole. I would think probably the situation in the United States is probably not as satisfactory as, say, the Scandinavian countries.

Obviously the nutritional situation in the United States is much better than Central and Latin America. The data from the surveys, after all, are taken from lower——

Senator KENNEDY. Excuse me for interrupting. It was unclear with our witnesses this past week in regards to certain deficiencies in diet. That question remained unclear and I didn't know whether this comment that you made now was from your direct study of this problem or not.

Dr. HEGSTED. I think I stated that simply because the survey data that we have available now are from the lower economic groups.

In many respects that group looks like the average data from the Latin American countries and I think this is what you might expect just from traveling through Central America and Latin America, that more or less the average there would correspond to some of our poverty groups.

I feel no hesitation in saying that the nutritional situation in the United States is certainly better on the average than any place south of the border.

Senator KENNEDY. If you have any additional information or comparisons I wish at a later time at your convenience you would submit them as part of the record, any of the studies that you might have done or been a part of any surveys that have been taken.

I understand that you have been a part of some studies.

Dr. HEGSTED. Of course I participated in the ICNND survey, some of those. The only other participation I had in Latin America is now 18 years ago, so it wouldn't be very relevant.

(The following information was subsequently received for the record:)

(Summaries of two papers published in the Journal of the American Dietetic Association, vol. 53, pp. 226–242, 1968, by M. L. Myers, S. C. O'Brien, J. A. Mabel and F. J. Stare, entitled, "A Nutrition Study of School Children in a Depressed Urban District.")

SUMMARY

A nutritional survey of fourth, fifth, and sixth grade students in two elementary schools in an economically deprived section of Boston was conducted in the spring of 1965.

Using appropriate adaptations of ICNND methods, the following procedures were carried out: (a) four-day dietary records, (b) clinical examination, (c) anthropometric measurements, (d) biochemical studies of blood and urine samples, and (e) dental examinations.

A report of the dietary studies is presented in this paper. Ratings for individual meals and for food groups showed:

(a) Usually, the older children had poorer evaluations for meals and food groups than did the younger subjects, with the critical point being between ten and eleven years of age. Two exceptions were observed: evening meal scores improved in the older girls, and the ratings in the meat-cheese-egg group were higher for all older children.

(b) Negro children scored lower in every evaluation than the Caucasian, showing also a sharper deterioration with age.

(c) On the average, boys had poorer ratings for meals and for food groups than the girls, but the girls tended to demonstrate a more pronounced decline in eating habits with age.

(d) Particularly low scores were found for the consumption of several of the "protective" food groups: citrus fruits and juices, green leafy and yellow vegetables, milk to drink, and milk from other sources, such as ice cream, pudding, and cereal milk.

These children presented as poor a food intake picture as has been described in earlier studies. The need for a school feeding program in conjunction with parent-teacher orientation to nutrition is obvious. Recommendations for implementing these programs are made.

* * * * * * *

Summary

As part of a nutritional status survey of 322 children in the spring of 1965 in a deprived section of Boston (Roxbury), some clinical, anthropometric, dental, biochemical, and dietary studies were made. The dietary findings have been presented (12).

Generally, the children presented a "good" to "excellent" appearance. The clinical findings of major proportions were: dental pathology, 93 per cent; gingivitis, 62 per cent; dry, scaling skin, 52 per cent; follicular keratosis, 25 per cent; bow legs and knock knees, 15 and 13 per cent, respectively; and heart murmurs, 10 per cent.

Using the Stuart-Boston Standards, more children were in the lower percentiles both for height and for weight than expected. Fifty-nine per cent of the Caucasian and 42 per cent of the Negro boys were in the 25th and under percentiles, as were 57 per cent of the Caucasian and 30 per cent of the Negro girls. While the prevalence of weights under the 25th percentile was about as expected for the girls of both ethnic groups, 55 per cent of the Caucasian and 40 per cent of the Negro boys were also in this category. The Negro boys were growing faster at all ages for both height and weight than Caucasian boys. This was not demonstrated in the girls; however, the Negro girls were taller and weighed more at all ages.

There were few obese children in the study—8 per cent, of whom proportionately more were Caucasian girls than any other category.

TABLE 9.—AVERAGES BY RACE, SEX, AND AGE OF ESTIMATES BASED ON NITROGEN/CREATININE EXCRETION LEVELS

Group	Number	Nitrogen/creatinine (gm./gm.)	Estimated protein intake [1] (gm./kg. body wt.)
All children	295	8.5	1.2
Negro children	227	8.0	1.5
Caucasian children	68	10.1	1.3
Boys	153	8.5	1.3
Girls	142	8.4	1.6
9 years	18	10.4	1.4
10 years	75	9.4	1.3
11 years	79	8.4	1.2
12 years	76	8.2	1.2
13 plus years	47	7.3	1.3

[1] Creatinine coefficient equals 19.9 used in calculations except as follows: 11 years equals 19.6; 13 plus years equals 21.3 (26).

The overall dental picture was poor. Each child had an average of six decayed, filled, or extracted teeth, and 51 per cent of the children had from one to five decayed/filled/extracted teeth while 44 per cent had five or more. Only 5 per cent had all sound permanent teeth. The Negro children had relatively better teeth than the Caucasian. By actual count they had fewer cavities, fewer fillings, and required less dental attention. These differences were statistically significant.

Hemoglobin and hematocrit determinations indicated that 22 per cent of the children had hemoglobin values under 14 gm. per 100 ml., and significantly more of these were Negro than Caucasian children. Also, there were more girls than

boys in the lower ranges. Thirteen per cent of the children were in the "low" category for hematocrit values.

Ninety-one per cent of the children had serum cholesterol levels under 200 mg. per 100 ml., with a group mean of 161 mg. per 100 ml. Twenty-six values were above 200 mg. per 100 ml.

Group averages for both serum vitamin A and for carotene were 26 mg. per 100 ml. and 57 mg. per 100 ml., respectively. These values are in the lower range of the "acceptable" ICNND categories.

Urinary determinations expressed in relation to creatinine excretion were made for thiamine, riboflavin, N'-methylnicotinamide, and nitrogen. Twenty per cent of the children were in the "low" thiamine excretion range. Riboflavin and N'-methylnicotinamide determinations were all within normal limits. The average nitrogen excretion values for the entire group of children was 9 gm. per gram creatinine. The Caucasian children had significantly more high values than did the Negroes, and the excretion levels decreased with age.

On the basis of this preliminary investigation, children in the so-called poverty areas of the city exhibit some physical and biochemical findings which could be related to poor nutrition.

Senator KENNEDY. I see. Just as a final comment, the Kennedy Foundation has been interested in the problems of mental retardation, and we have spent a considerable amount of time and effort in the causes of retardation and we find a very direct relationship between nutritional deficiencies and retardation, and we have sponsored and financed a number of surveys and this relationship is, I think, without dispute.

I think, as you mentioned, when we talk about how much deficiency, before the mind is affected is obviously a consideration, but I think the record ought to be extremely clear on this question that the nutritional deficiency has a very great effect on the lack of development in children up to 14 years of age, and I think the American people ought to realize this because it is one of the prime causes of mental retardation.

Once again, I think it is something that we are very much interested in. I think this committee is, in how it is related to nutritional deficiency, and I know you are interested in that, but I didn't want to let that comment go by without clarification.

Dr. HEGSTED. I just wanted to say, Senator, the point of argument, I think, is that in the undernourished children they are almost always, at least outside of the United States where we talk mostly about protein calorie malnutrition, these malnourished children are always raised in an environment that doesn't lend maximum mental development either, and I think the only hesitation in this is which contributes the most and what contributes to it.

Senator KENNEDY. That is right, but there is a distinction between mental illness and retardation, and you get on into the question about the lack of environment and the fact that children are mentally ill, but the retarded question is directly related in many instances to the lack of adequate food and nutrition at an early age, and there are obviously other kinds of considerations, but I think it is certainly without dispute as far as some of the surveys are concerned and at an appropriate time I would like, to the extent that they are related to our own study here, to make them available to this committee because we have seen over the period of years that this is one of the important causes for retardation.

I have no further questions.

The CHAIRMAN. Thank you, Senator.

Senator Pell?

Senator PELL. Thank you, Mr. Chairman. It is very nice to be with you as the newest member of the committee, so new I have no name tag I see.

The CHAIRMAN. We are glad to welcome you to the committee, Senator Pell.

Senator PELL. Thank you. I should probably remain silent, but I have more to learn too, and hope I can do so through a few questions.

I would imagine, Doctor, that you are more familiar with the Boston area than any other, close to your university. Would that be correct or not?

Dr. HEGSTED. That is not necessarily true, Senator. Unfortunately, sometimes the university is not very well acquainted with its immediate environment.

Senator PELL. Let me be a little more specific. Would you say without citing a precise percentage, there is a substantial amount of malnutrition in the Boston area or not?

Dr. HEGSTED. We feel certain there is, but we are not able to put any numbers or estimates on it.

Senator PELL. I realize you can't cite numbers, but would you be willing to say it is one out of 20 or one out of 50, something of that sort?

Dr. HEGSTED. As I indicated in my testimony, Senator, I don't think that is really possible.

Senator PELL. I read your testimony. I wasn't here when you gave it and I was struck by the fact that you did not want to be too specific, but it would still help us if you could be a little more pointed.

Dr. HEGSTED. I would rather talk about risk of malnutrition, as I say, these schoolchildren that we examine, we think their dietary habits are atrocious but most of them really are not clinically ill. If I would say they are malnourished, I would be challenged immediately by other nutritionists. I think that is a question that you can't get an answer to.

Senator PELL. The reason I am pressing on this is that my own State of Rhode Island, also very much a metropolitan area, is almost next door to where you are and I would imagine the conditions would be similar and I am curious.

There must be some way of ascertaining without generalities, as in your statement, what the specific percentage or number of children suffering from malnutrition is within an order of maybe 100-percent error. That is all I am suggesting.

Dr. HEGSTED. I think that is possible, but there have been absolutely no surveys in Boston.

Senator KENNEDY. Just in taking this on now, can't you say there are certain areas of Boston where because the children aren't getting adequate nutrients they have a higher rate of cavities in their teeth?

Dr. HEGSTED. Oh, I am sure that is true.

Senator KENNEDY. And haven't they got a poor performance with regard to testing of their eyes?

Dr. HEGSTED. That I can't answer.

Senator KENNEDY. Can't you give us some of the various tests, that they are missing more classes because they are spending less days in school?

Quite frankly, I haven't been here for the earlier part, but we are trying to find out whether we have a problem or not and I know you have standards and tests that you were establishing but we can understand if you just say that they miss more classes, that they are sicker in certain parts, and that their teeth are filled with cavities.

These things have all been found up there in Boston at Columbia Point.

Dr. HEGSTED. I realize that.

Senator KENNEDY. It seems to me you have done a study on it and I can't understand the reluctance.

Dr. HEGSTED. I don't have the specific data from Columbia Point and unfortunately, I didn't bring the reprints of the study we did in the two or three schools in Roxbury. These were children in fifth and sixth grades.

I assume the problems are more interesting and more severe in the younger schoolchildren. Again I am sorry I can't give you a figure, but dental caries is a major problem and I can supply you the data tomorrow on how many there were in that small group we examined.

I can tell you what their hemoglobins were and I can supply evidence if there is a substantial nutritional problem. I regret I don't have a figure with me on these various kinds of nutritional problems.

The CHAIRMAN. I would like to say to the committee that Dr. Charles Lowe who will be testifying next is going to talk about this problem primarily from the standpoint of children as a pediatrician and some of these questions that we are directing now to Dr. Hegsted could perhaps be better directed at the next witness.

Senator PELL. I thank the Chairman and have just two more specific questions to ask.

One, what is the cost per person with no relationship to palatability of a nutritionally adequate diet for human beings? What is the minimum under American standards that somebody could live on and thrive on and be healthy on, using fish protein concentrate or any other dietary substances there are?

Dr. HEGSTED. You mean a mixture of food that would contain enough nutrients?

Senator PELL. I am talking to you as a professor of nutrition at Harvard University with the knowledge that you have what would be the minimum cost of a diet to keep people growing, alive, and well.

I am not talking of palatability.

Dr. HEGSTED. You are not talking about palatability?

Senator PELL. No, I am talking about nutritional content.

Dr. HEGSTED. Well, I never calculated that but I would suppose 20 cents.

Senator PELL. Twenty cents.

Dr. HEGSTED. Or on that order.

Senator PELL. A day a person? It could not be done for even less?

Dr. HEGSTED. Well, it probably could be done for less, but I don't think anyone would eat it. I don't understand the merit of the calculation if it——

Senator PELL. The reason I asked to be put on this committee and why I am honored to be on it and glad to be on it is I am wondering how much of the problem is caused by poverty and how much of it is is caused by poor nutritional habits.

I happen to come from an area of the country that has been interested in food from the sea and aquaculture. If we could change nutritional habits, spending even less money on food, one would I suspect find that malnutrition might be eased. Therefore, my question to you is purely on the basis of the cost in cents a day if you were running—it is a very unpleasant thought—a jail and you had to feed the people and make sure they were in good health. What would be the minimum cost for which you could do it?

You must have an idea on this, professor.

Dr. HEGSTED. Well, I don't think one can calculate a cost for food and not consider acceptability even in a prison.

As I pointed out, the K-ration during World War II was acceptable nutritionally, but nobody would eat it. If I could calculate all the nutrients that were supplied at 10 cents a day I still don't see the merit in that kind of a calculation.

Senator PELL. Well, would it be a correct statement to say that for 10 cents a day you could get the nutrients plus some palatability or not?

Dr. HEGSTED. I couldn't be sure of that at all because, as you are probably aware, there are many companies now that are attempting to develop, say, infant foods, vegetable protein sources, and other foods that will be very cheap, say 5 cents a day for an infant. These have not been successful yet and whether they will be successful, they haven't been successful in terms of putting them on the market. They have not been adequately tested on whether they will be consumed if distributed.

Senator PELL. Thank you. As a new man on the committee I will not burden my colleagues more with these questions but this is a line of thought that interests me and I am not completely happy with the responses.

Dr. HEGSTED. There are other people that know a great deal more about the efforts that have been made in these food mixtures that are being prepared especially for overseas use and, as I pointed out, a very adequate mixture can be made that is very cheap.

I mean a good pig diet would obviously be adequate for a man.

The CHAIRMAN. Senator Dole.

Senator DOLE. Mr. Chairman. There seems to be a thread here that malnutrition, whether it is overnutrition or undernutrition, is directly related to income, and that only poor people suffer from undernutrition.

I don't know what percent of the American people have perfect nutrition but doubt it is very high, regardless of their income. I want to make the record clear that it is not a problem just of the poor, not a problem that just money alone would solve.

Is that your basic principle?

Dr. HEGSTED. I think that is certainly true. The nutritional problems vary with income but, for example, iron deficiency in teenage girls is a problem of the U.S. population not related to income.

Senator DOLE. What percentage of the American people have perfect nutrition?

Dr. HEGSTED. I have no idea.

Senator DOLE. All of our discussion has been on the percentage that are malnourished, overnourished, or undernourished, I don't know what base the experts start from, but I know many people with some

affluence who have difficulty with their childrens' nutrition, dental problems, for example, probably more so than some with lesser income. My point as another new member of this committee, that we certainly have a great responsibility but appropriation of money alone will not solve the problem.

When we compare our country to Latin America where they are talking not about nutrition but about famine then we are a little off base. Knowing a little about the operation of some of the world food programs I believe that we are far ahead of the developing countries whether Latin America or Asian countries.

They are facing possible famine in the 1970's. We are concerned about improving nutrition of the American people.

Did you indicate for the record that Americans are better off than those in Latin American countries?

Dr. HEGSTED. I said I had no doubt about that, that we were much better off than Latin America. Of course it depends a little on what you mean by good nutrition.

I feel that coronary heart disease is the major nutritional problem in the United States and half of us are going to die of that, so that is not associated with poverty obviously.

Senator DOLE. That is probably because of overnutrition, obesity, and things of that type.

Dr. HEGSTED. But it is malnutrition.

Senator DOLE. That is all I have.

The CHAIRMAN. Senator Yarborough.

Senator YARBOROUGH. Mr. Chairman, I want to express my appreciation to Senator Ellender and the senior Senator from Georgia for having sponsored this school lunch program legislation in 1941. I think it is great pioneering legislation for better diets in America.

The problem has been so many school boards and cities will not adopt it. In my own State up until within the past 6 years two of our four largest cities would not use the school lunch program.

I have spoken for it all over the State for years. It hasn't been too popular in places where the school board didn't want to go to the expense but I think it has had a great benefit to the schoolchildren where adopted.

I was in one city in Texas of about 10,000 population that had four grade schools and some of the teachers in the core of the city where the more affluent people lived told me that schoolchildren—these were all white Anglos in this one quarter of the city—fainted from lack of food there because the parents had moved in there wanting to get a better social status and the need was that great.

I was invited in there to make a speech for the express purpose of trying to help create enough sentiment to force the school board to set up a school lunch program. I think the Senator from Louisiana is a great pioneer. I think this program has helped greatly.

From my observation from talking to schoolteachers, it has been of vast benefit where it is used.

I have a question, Doctor. Isn't proper nutrition as valuable to mental development as to physical development?

Dr. HEGSTED. Yes.

Senator YARBOROUGH. Senator Mondale has quoted one authority as saying that 90 percent of the mental development of a person takes place in the first 4 years of his life. Thomas A. Edison is credited with saying that most people fail to use 90 percent of their mental capacity, that most people use only about 10 percent through mental laziness or failure to apply themselves. They don't study and work mentally.

If we take those two figures together, isn't there an indication, not from those two alone but other facts, that a good nutritious diet is valuable at any point in a person's life whatever age they get to.

Dr. HEGSTED. The figure of 90-percent mental development I think, and the coming witness is more qualified than I, depends on the physical size, related to the physical size of the brain, and which does grow largely in the first 4 years of life.

Now, whether that equates with mental development is not entirely clear to me, but I am sure that a good diet is important at all stages of life.

Senator YARBOROUGH. It helps a man's mental activity just at that stage of life if he is receiving a nutritious diet.

Dr. HEGSTED. I certainly would agree with that.

Senator YARBOROUGH. Thank you very much. I have no further questions.

The CHAIRMAN. Senator Percy.

Senator PERCY. I would like to concentrate on just one area. In your statement you indicated that in the area of dental health the survey reveals that this situation can be considered not less than a disgrace and a disaster.

I would like to ask you about the fluoridation of water. You also say that flouridation can reduce cavities by 50 percent. Since the time that this has been public knowledge, how wide have fluoridation programs become?

Dr. HEGSTED. Senator, I can't quote you in terms of percent of the population that now has fluoridation. It is obviously increasing slowly. There are three States now that have mandatory fluoridation of all water supplies over a certain size.

Senator PERCY. Are you as convinced as ever that these programs are effective in reducing decay?

Dr. HEGSTED. I think all the evidence continues to support it and if anything it shows they are better than we thought they were 5 years ago.

Senator PERCY. I had assumed that this is public knowledge, that many cities were moving ahead, and that this was a part of our health program in the country. But, in the Chicago Tribune of this Monday there is a major article saying "City faces shortage of fluoride supply." They go on to say that the engineers that maintain this water purification system for the city, say that it has reached a critical stage. We supply 69 suburbs in Chicago, requiring 46 tons of fluoride a week. Right now the Chicago supply is down to 25 tons. On three previous occasions they have stretched the supply, reduced the amount that they should put in the water, and they are increasingly concerned about the shortage of supplies in the future.

Is this something we ought to look into? Apparently this is a by-product of the fertilization industry and it would seem to me, that if

the city of Chicago, with its buying power, can't buy sufficient supplies, many communities across the country will be in danger.

Dr. HEGSTED. I wasn't aware of that problem. I am surprised.

Senator PERCY. Mr. Chairman, I would like to ask unanimous consent to put this article in the record at this point.

The CHAIRMAN. Without objection, it is so ordered.

(The article referred to follows:)

[From the Chicago Tribune, Jan. 27, 1969]

CITY FACES SHORTAGE IN FLUORIDE SUPPLY

Chicago is in danger of running out of fluoride for its water because there isn't enough of the chemical being manufactured, James C. Vaughan, city water purification engineer, said yesterday.

He said the city's water system, which also supplies 69 suburbs, requires 46 tons a week.

LESS BEING USED

"Right now our supply is about 25 tons. We are using less than the required amount in hopes of stretching our supply," he said.

Fluorides are used to fight tooth decay, mainly in children.

Vaughan said the city purchases 8,000 tons of hydrofluosilicic acid yearly from two chemical dealers—the K. A. Steel Chemicals, Inc., of Des Plaines, and the W. R. Grace company of Baltimore.

The city has had three periods without fluoridated water since August, Vaughan said. They were Aug. 25 thru Sept. 3; Nov. 20–25; and Jan. 10–15.

CUTS AGAIN POSSIBLE

"If this shortage of fluorides continues, we will have more periods without fluoridated water," Vaughan said.

Fluorides are by-products of the chemical fertilizer industry, which bases its demand on planting seasons thruout the world. The United States has been a major supplier of fertilizing chemicals but recently other nations have begun operating their own plants, Vaughan said.

As the foreign demand slowed during the last few years, the American manufacturers tied their fertilizer production closer to the home market, with spring and autumn as peak manufacturing periods, he said.

PRICE HIKE POSSIBLE

"The city buys fluorides at the by-product price of $44 a ton. If manufacturers begin to manufacture fluorides as a separate commodity, I suppose the price will go up to four times as much," he said.

Many major cities and hundreds of smaller communities have fluoridated their water for 20 years or more.

Senator PERCY. Again from what little I know about health needs of the country, and I am learning more as a result of these studies, I am impressed with how much knowledge we lack in some areas. Dental care seems to be one of the major areas.

I was very impressed with a program that the Navy is carrying on now right over here at the Naval Gun Factory. Under Captain Letts and Captain Stohl, Comdr. A. R. Smith, a dentist, over there is personally instructing people in dental care.

It is his belief that about 50 percent of the problem with teeth comes from peridontal diseases to which very little attention is being given, through sheer ignorance of people on how to care for and take care of their teeth. I feel that we could do a great deal as a committee to emphasize the need for more public knowledge.

It is very inexpensive to get knowledge out. I go through OEO neighborhood clinics. I see that when children are brought in for the first time their mouths are in deplorable conditions.

This affects their physical appearance for the rest of their lives. It has a deteriorating effect on the psychological makeup. I know, as an employer, that it has an adverse effect upon a personnel manager when someone comes in as a member, say, of the hard core unemployed and opens his mouth to apply for a job and he can see the neglect and the lack of care. I feel that you have alerted us properly to this field and I appreciate very much the fact that you put your finger on something that I feel is exceedingly important. Our committee can do a great deal to emphasize the need for better public knowledge on how to care for the health of the American citizens.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Dr. Hegsted, for your testimony and your responses to the questions this morning.

(Dr. Hegsted's prepared statement follows:)

PREPARED STATEMENT BY D. M. HEGSTED, PROFESSOR OF NUTRITION, DEPARTMENT OF NUTRITION, HARVARD SCHOOL OF PUBLIC HEALTH, AND CHAIRMAN, FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL

I am very pleased to have this opportunity to appear before this Committee. I am sure that it is understood that although I am the Chairman of the Food and Nutrition Board of the National Academy of Sciences-National Research Council, I cannot speak for the Board except on those matters where the opinion of the Food and Nutrition Board is a matter of record.

You have heard, especially from Dr. Mead, some of the history of the late 1930's and early 40's, shortly before and after the Food and Nutrition Board was formed. A considerable number of things were done at that time to improve nutrition of the United States population, such as the establishment of nutritional standards (The Recommended Dietary Allowances), emphasis upon nutrition education, the fortification of certain foodstuffs with vitamins and minerals, etc., which the Board was either instrumental or helpful. It is perhaps worthwhile to consider some of the circumstances at that time which assisted the general effort.

This country had just emerged or was emerging from the great depression. A great many people could easily understand what it meant to be very poor and have too little food. Pellagra was a well-known scourge of the southern United States, rickets had been very common in many parts of the country, and other clear-cut deficiency diseases were easily visible. The science of nutrition had made great strides and during the 1930's and 40's all of the vitamins were isolated, their chemical structure determined, and commercial synthesis became possible. To many of us at that time, knowing relatively little about human nutrition, it seemed that it should be very simple to determine how much of the various nutrients man needed and assure that these would be provided by the diet. The severity of the depression, the coming of the war, and the prospects of a national and world food shortage provided a willingness in communities and in government to cooperate and institute new programs. Much of the malnutrition and poverty was in the agriculture sector in which organizations of the Department of Agriculture, such as the Home Demonstration Agents, County Agents, 4H Clubs, etc., could be maximally effective.

Much of the severe malnutrition disappeared and pellagra and other well-defined vitamin deficiency diseases became rare. It is of interest that even in Britain, where food shortages were much more severe than in this country, it is generally thought that nutrition improved during the war. It has not been possible to clearly define exactly which programs were most important. In the years following the war, nearly all the groups that might have been vigilant and might have consolidated these gains developed a false sense of security. Most nutritionists became more interested in the biochemical function of the nutrients than in the relatively routine task of surveying the nutritional

status of the population; indeed, it has been difficult to find funds to support nutritional surveys in the United States. The Department of Agriculture became primarily concerned with our food surplus and its disposal and much of the population moved into the cities; the medical profession became more interested in overnutrition, which is still the problem most physicians see; the United States assumed broad international responsibilities and the very critical nutritonal problems in many developing countries attracted much attention; etc. Many things obviously happened. I would, however, like to stress that in my opinion one of the mistakes that nutritionists made was that in their enthusiasm they were often uncritical and often made excessive claims which could not be substantiated upon more critical examination. Excessive claims do backfire and it is important that we do not repeat this error now.

I have had the opportunity to review some of the preliminary findings of the National Nutrition Survey which have been presented to you by Dr. A. E. Schaefer. I believe that any reasonable consideration of these findings will indicate that there are many nutritional problems in the United States today. It would seem wise to have the methodology being used and the results of these surveys evaluated by an independent qualified group. The Under Secretary of the Department of Health, Education and Welfare has asked the President of the National Academy of Sciences to have this function performed by the Food and Nutrition Board and we welcome this opportunity. Unfortunately, the Board has not yet been able to begin this function because of the lack of funds.

I would like to point out that one of the questions members of this Committee have repeatedly asked, and to which you would like a straight answer, will not be answered in the manner you would like. This question is, "How many people in the United States are hungry, ill-fed, or malnourished?" In nutrition we are dealing with some 40 to 50 essential nutrients and good nutrition involves the proper amounts and ratios of all these nutrients in the diet. As a person becomes depleted in any of these nutrients, the tissue levels fall and, at some critical tissue concentrations, clinical disease appears. There is no satisfactory way in which we can equate a relatively low hemoglobin level due to iron deficiency and low level of serum protein or vitamin C. Furthermore, the tissue level which produces disease may vary from one individual to another or may be detected by one technique or one physician and not another. The level of intake required to prevent disease may be assumed to vary from one individual to another. Clearly, for each individual, for each population, and for each nutrient there will always be a zone of uncertainty in which one cannot be certain whether the intake is or is not adequate, whether the health of the individual is or is not compromised. One of the responsibilities of nutritional science is to decrease this area of uncertainty but informed judgment will always be required.

We must, however, develop a better appreciation of the concept of "risk." As the intake of any nutrient falls, or the tissue levels fall and approach the level known to be inadequate, the likelihood or danger is increased. People with poor dietary habits must be considered to be exposed to a greater risk of malnutrition. For example, in a group of Boston school children that we have studied, it is not uncommon for them to go to school without breakfast, to have a soft drink and candy bar for lunch, and to grab anything which may happen to be available in the kitchen when they arrive home from school. They may rarely have a real meal. Even though most of these children escape serious nutritional disease, their nutritional situation cannot be considered satisfactory. They are a relatively high risk population. We cannot afford to wait until nutritional disease appears before action is taken nor can we afford to evaluate nutritional status or the need for nutrition programs on the basis of the amount of nutritional disease in the population. Good programs must prevent disease from occurring. The lack of nutritional disease in a population does not necessarily indicate that a nutrition program is not needed. It may indicate that a good program is operating. The danger is that a good program may not be self-sustaining just because it is successful.

Obviously, the first requirement of a nutritional program is that it assures that the intake of essential nutrients is adequate. The current nutritional surveys are directed primarily toward an assessment of nutrient intake. However, we must not forget that we live in an age of rising expectations. It may be that simple diets such as corn meal, fat-back and greens, or rice and beans and a few vegetables are nutritionally adequate or can be made so by fortification with vitamins and minerals. Indeed, if most of the people in a country consume such diets, this may be considered an adequate nutritional approach to their nutri-

tional problems. However, if your neighbors consume meat and milk and other foods generally considered to be desirable, it is unlikely that simple and monotonous diets can be considered adequate. Nutrition programs must relate to the food habits of the people they serve, and programs suitable in one part of the world are not suitable in another. We could easily put together simple mixes which are nutritionally adequate for man, as we do for poultry and swine, but these will not do the job. The experience with K rations during World War II vividly demonstrated that food is more than a simple carrier of nutrients. People can and do refuse food even when they are hungry and malnourished. We need a great deal more effort to define not only what is absolutely necessary but what is within reasonable expectation and acceptable, and what determines acceptability.

The current nutrition surveys are complicated and relatively expensive. They cover only one point in time and cannot cover the entire population. I feel that that we must find simpler and more efficient methods to evaluate the nutritional state of the population. Similarly, we must have means of evaluating the efficiency and effectiveness of any methods used to control malnutrition. It is clearly not enough to simply count counties where programs exist.

I would say that I am not entirely happy with the way the samples have been drawn for the nutrition surveys. These are supposed to represent a random sample from lower economic groups. Obviously, we need some estimate of the magnitude of the nutrition problem. However, it is not very important to have an accurate figure showing that the number of people suffering from a nutritional deficiency is 5, 7 or 9 per cent of the population when a prevalence of 5 per cent represents an intolerable situation. We may never be able to completely eliminate certain nutritional problems but we can decide that certain situations are simply not acceptable in this country. It is more important to find out where nutritional disease occurs and where the risk of disease is high than to derive broad estimates of the prevalence of the disease in a state or in the country.

I would like to call your attention again to the situation with regard to dental health revealed by the surveys. This can be considered nothing less than a disgrace and a disaster and has long been familiar to people who have been concerned. This situation occurs after many years of experience showing that the fluoridation of public water supplies is simple, cheap, and safe and will decrease the amount of dental caries by at least 50 percent from that found in low fluoride communities. There appears to be no possibility that the dental health problem in this country can be adequately met with typical curative dentistry. National programs should be considered.

A considerable number of people with goiter were found and it would seem clear that the simple iodinization of salt upon a voluntary basis is not doing the job. As expected, substantial evidence of iron deficiency anemia was found. Although certain foods have long been supplemented with iron, it is clear that this program is not effective. These are examples of relatively simple kinds of programs, situations where we have fairly good ideas of what might or ought to be done, but we are not doing them effectively.

There are many other problems where we are uncertain what the most effective approach may be. These require study and experimentation, especially experimentation at the public health and administrative levels. You would agree, I think, that we would know a great deal more about what to do and how to do it if better objective data were available for evaluation of some of the current programs, such as the school lunch and the food stamp programs. It would seem clear that we cannot simply count how many programs there are—we need to know why some work and others do not, why certain activities are acceptable and others are not. I believe it is obvious that the group responsible for a program is rarely, if ever, the best group to monitor that program. Objective, qualified appraisal of programs is needed, independent of those who are responsible for either the success or failures encountered.

Also, I think it should be clear that it is not satisfactory to evaluate programs from anecdotal information. Several reports that this Committee has considered were simply anecdotal. While the usefulness of these is not denied, it is apparent that every program has its failures and successes; every program has its opponents and proponents and many of these can be identified. There is reason to suspect bias in all such reports depending upon who selects the material or the witnesses and for what purpose. We need facts and figures, evaluated by experienced people who are not personally responsible for the programs.

I would add my agreement to the suggestion you have already heard several times, namely, that we need some focus on nutrition in the government that is health oriented. I believe that it is unreasonable to expect the Department of Agriculture to provide these kinds of health-oriented programs when their primary interest and responsibility must be directed toward the welfare of the producer rather than the welfare of the consumer. Indeed, it is true that Agriculture has deliberately avoided the medical assessment of nutritional status, as they should. However, one cannot disassociate food and the effects of food if we are to have adequate nutrition programs. Nutrition does not fit nicely into the classical organization of government agencies and it does not fit nicely into the classical organization of science teaching programs or university departments. Means must be found to integrate the components of satisfactory programs and this will present difficulties.

Although it is somewhat peripheral to the major interest of this Committee which is primarily directed toward undernutrition, I would call attention to the fact that nutritional problems are not limited to poor people or due only to undernutrition or poverty. It seems quite clear that the major killer in the United States, atherosclerotic heart disease, has a strong nutrition component. Some 20 percent of the population are estimated to be obese. Diseases of the gastrointestinal tract, diabetes, renal disease, hypertension, anemias, dental caries, the so-called "inborn errors of metabolism" and many other important maladies involve nutrition in their treatment or prevention. It is generally agreed that nutritional knowledge is poorly utilized in medicine and public health. The advances in food technology and the ingenuity of the food industry are constantly producing new and different foods. In some ways nutrition education becomes more difficult because of the bewildering array of products now available to the consumer. In addition, the total food intake of the American people continues to fall as we become less active physically. An adequate consumption of some nutrients becomes more difficult simply because there is less food to carry them to the mouth. These kinds of problems require thought, research, and in many cases, policy decisions.

The evidence that you have heard indicates that there are many millions of people in the United States with varying degrees of malnutrition, partly associated with poverty. However, I would hope that more meaningful ways can be found to deal with malnutrition in poverty areas than massive extension of welfare and food distribution programs. It seems to me that in the food manufacturing and marketing industries there must be a great deal of experience and know-how that is relevant to these problems. Whatever is done to meet the problems of malnutrition will be important one way or another to many food industries. Although I have no particular qualifications to speak in this area, I feel that more efforts are needed to utilize the expertise that lies in the responsible food industries and to get them actively participating in the development of solutions.

It is apparent, I think, that if the objectives of the Committee on Nutrition and Human Needs, which are stated to be the development of "programs which will assure every United States resident adequate food, medical assistance, and other related necessities of life and health" are to be achieved, we must develop a sustained effort which can be continually improved as we gain experience. It seems to me that eventually it may require some basic philosophical changes in our outlook. I have never really understood our national priorities. This country feels that Freedom from Ignorance is so important that every child must be sent to school and our society is willing to pay the costs. We may not do an adequate job but our intent is clear. On the other hand, relatively little is done to provide freedom from hunger and disease for our children, except in dire circumstances, and many attempts to provide such protection for children are considered an invasion of the rights of the parents.

We confidently expect that many improvements will come from the interests and efforts of this Committee. It is apparent that you start from a rather weak base. Nurition is poorly organized at the Federal level, Departments of Nutrition in the United States are, with very few exceptions, weak and understaffed, there is a shortage of trained personnel and good training programs in the universities are few and their future somewhat uncertain, and nutrition education in medical and public health schools is a relatively minor activity. We have been told so often that we are the best fed nation on earth, which may or may not be true, that most people believe it. Only a very broadly based educational

effort will be effective in developing the political and financial support that is needed. These hearings have already had an impact and continuing Congressional interest will be required to reach these objectives. The Food and Nutrition Board believes that we can be useful in this effort and we look forward to providing assistance wherever this will be appropriate.

The CHAIRMAN. I am going to ask the other two witnesses to come back if they will after lunch. There is a vote on the Senate floor.

So we will adjourn until 2:30 this afternoon and we will then hear testimony from Dr. Charles Lowe and Dr. David Coursin. Dr. Lowe is a specialist in pediatrics, Dr. Coursin in the mental and neurological health in children as it relates to growth development and nutrition.

I may ask these two witnesses to sit together this afternoon. We will cross-examine them as a panel.

The committee will be adjourned.

(Whereupon, at 11:55 a.m., the committee was recessed to reconvene at 2:30 p.m., the same day.)

AFTERNOON SESSION

(The committee reconvened at 2:30 p.m., Senator George S. McGovern, chairman of the committee, persiding.)

The CHAIRMAN. The committee will come to order.

I have asked Dr. Lowe and Dr. Coursin to appear together if they would. We will be happy to take the testimony at this time. We are going to ask you, Dr. Coursin, to come to the table and appear with Dr. Lowe, and we will ask our questions of you jointly.

STATEMENTS OF CHARLES UPTON LOWE, M.D., CHAIRMAN, COMMITTEE ON NUTRITION, AMERICAN ACADEMY OF PEDIATRICS; AND DAVID BAIRD COURSIN, M.D., DIRECTOR OF RESEARCH, RESEARCH INSTITUTE, ST. JOSEPH HOSPITAL, LANCASTER, PA.

Dr. LOWE. Mr. Chairman, I am most pleased by the privilege extended to me to appear before this committee as a spokesman for the Committee on Nutrition of the American Academy of Pediatrics. I and other members of the committee on nutrition have followed with great interest the testimony presented to the Senate Select Committee on Nutrition and Related Human Needs and endorse enthusiastically the efforts and activities of this distinguished group.

My comments will attempt to place infant and child nutrition within the scientific context of our understanding of human growth and development and emphasize the critical relations between nutritional experience in early childhood and ultimate achievement during adult life.

I would like to review briefly the structure and role of the committee on nutrition so that the group I represent may appear in context.

The committee has been in existence for 15 years. It was established to satisfy the need of pediatricians for fresh and authoritative information on nutrition and to meet the desire of the academy for an expert group to deal with issues relating to infant and child nutrition.

It was apparent that the missions could be fulfilled most effectively if the committee membership included not only pediatricians, but in addition, two other groups: representatives of industries involved in

the manufacture of formulas, infant foods, and infant nutritional preparations; and members of Government agencies, and those private foundations with operations relevant to infant nutrition. This tripart organization comprises 27 members.

Industry has found the committee a useful sounding board to review proposed changes in the composition of nutritional products or for review of new products prior to market trials. Government and private foundations have used the committee to examine new schemes or proposals for improving nutrition of American children and, upon occasion, as a reference group to furnish advice and counsel on nutritional standards or regulations.

Finally, physicians and pediatricians have continued to receive nutrition information published as memorandums in professional journals.

As a byproduct of these activities, the committee became convinced early in 1964 that the task of providing advice to Government agencies and to practitioners on nutritional issues relating to American children was, upon occasion, difficult if not impossible because no precise knowledge was available as to the general nutritional status of American children. Accordingly, certain steps were taken.

Dr. Robert Frazier, executive secretary of the American Academy of Pediatrics, wrote on behalf of the committee to Dr. Katherine Ottenger, Chief of the Children's Bureau, on June 12, 1964. In this correspondence, the committee directed the attention of the Children's Bureau to the need for information on the nutritional status of American children. It considered that Public Law 88–156, the Maternal and Child Health and Mental Retardation Planning Amendment of 1963, might provide the vehicle for funding a national nutrition survey of American children.

It was the hope of the committee that the survey would be conducted in a manner similar to that used by the Interdepartmental Committee on Nutrition for National Defense under the leadership of Dr. Arnold Schaefer. It was our hope that the Children's Bureau would undertake a national survey of the nutritional status of American children using techniques developed by Dr. Schaefer and the ICNND.

Finally, the committee applauded this action but felt that it failed to meet the needs of the situation. Therefore, it continued negotiations with various Government groups in an attempt to mount a more comprehensive survey.

When the Stennis bill was introduced, it was our hope that this would pass and we were disappointed when it died in committee. An appropriation was finally made to fund the limited national nutrition survey now being conducted.

Senator MONDALE. Would the witness yield?

The CHAIRMAN. Senator Mondale.

Senator MONDALE. Did the Stennis bill call for that national survey as one of its provisions?

Dr. LOWE. Yes, sir.

The CHAIRMAN. Doctor, as long as we interrupted you there, maybe this is explained later on in your statement, and if so, you need not go into it now, but why was a separate nutritional survey chosen when the Shaefer survey was underway? Wasn't the Shaefer survey designed to evaluate nutritional problems among all age groups?

Dr. LOWE. Yes, sir; but at the time the activities I have described took place, there was no Schaefer survey.

The CHAIRMAN. I see. This antedated that?

Dr. LOWE. Yes, sir.

The CHAIRMAN. Although it really wasn't implemented until about the time the Schaefer survey got underway; is that correct?

Dr. LOWE. That is correct. There was a pause of 3 years.

The CHAIRMAN. Why was that? Was that a funding problem?

Dr. LOWE. I am afraid I am unable to answer that. Public Law 88–156, the Maternal and Child Health and Mental Retardation Planning Act of 1963, in our opinion, would have provided funds for implementation of this survey.

The CHAIRMAN. Are the two surveys in fact repetitious?

Dr. LOWE. Only in the sense that both are nutrition surveys. The sampling procedure is quite different. I propose to touch on that in my testimony if I may come to it, or would you prefer I answer it specifically now?

The CHAIRMAN. Maybe we will have some further questions later on. You might proceed.

Senator ELLENDER. Doctor, I notice your committee has been in existence for 15 years. What have you done in the meantime?

Dr. LOWE. Sir, we published 34 memorandums on nutritional subjects relative to the practice of pediatrics, to Federal regulation of infant food production, and other subjects generally related to the nutrition of infant and children.

Senator ELLENDER. How are you financed?

Dr. LOWE. Through the American Academy of Pediatrics.

Senator ELLENDER. Did you make any special studies?

Dr. LOWE. We are not an action group, sir.

Senator ELLENDER. All right.

Dr. LOWE. The appropriation of funds for Dr. Schaefer's survey appeared as a compromise and in our opinion was not necessarily a reasonable one since it failed to meet what was in our opinion the national need. A comprehensive national nutrition survey is needed. The appropriation, however, did indicate that further funds might be available and we hoped that these would be forthcoming.

The role of the committee in fostering the establishment of these two surveys, one by the Children's Bureau and one through HEW–NIH, would have been sufficient reason for our continuing interest in and support of these activities. Additional reasons, however, have appeared.

We have agreed at the request of Dr. Schaefer to act as a review committee to interpret the results of his survey as data appear. Dr. George Owen, who is currently conducting the survey sponsored by the Children's Bureau, is also a member of the Committee on Nutrition. We have agreed to serve in this same capacity on behalf of his survey and have already begun to do so, having held two meetings to accomplish this purpose.

Within this framework we anticipate that the Committee on Nutrition will, on behalf of both surveys, review all data relating to individuals under 15 years of age and collate these. We expect to interpret for a professional public the implications of the surveys so that every effort can be made to improve the quality of nutrition of American

children and assure that steps will be taken to eradicate malnutrition wherever it exists.

The limited educational mission of the Committee on Nutrition has changed. It has broadened to include a concern with the whole fabric and quality of American life to the extent that these relate to the care and nurture of our children. It is our conviction that nutrition is the key to the normal development of infants and children.

In effect, the quality and quantity of nutrition given during the first formative years of life may have the effect of programing the individual for all the years of his life. Malnutrition during the last trimester of pregnancy and certainly during the first months of life may seriously compromise ultimate intellectual achievement.

Experience in developing countries has indicated that the period of greatest nutritional risk is during the second to fifth year of life. These observations reflect the fact that in most evolving nations breast-feeding is practiced for the first 12 or 14 months of life, and therefore nutrition is sound during this period.

In this country among both impoverished and economically more advanced families breastfeeding is practiced to a decreasing extent. Under these circumstances, when the infant is fed by the bottle very early in life malnutrition and inappropriate feeding becomes possible even during the first month of life.

The earlier malnutrition exists, the more devastatingly it impinges on growth and development.

We have unambiguous evidence from several sources of the following facts:

1. When a fetus receives inadequate nutrition in utero, the infant is born small, the placenta of his mother contains fewer cells than normal to nourish him and his growth will be compromised.

2. When an infant undergoes severe nutritional deprivation during the first months of life, his brain fails to synthesize protein and cells at normal rates and consequently suffers a decrease as great as 20 percent in the cell number.

3. During the last trimester of pregnancy, protein synthesis by the brain is proceeding at a very rapid rate. Immediately upon delivery, this rapid rate decreases, although it still continues at a greater pace than at later times of life. In animals, this sharp decrease in protein synthesis immediately after birth occurs in both full-term and premature animals. The decrease in protein synthesis occurring in premature animals in all probability also occurs in premature human infants. If we can extend animal observations to the human situation, we have a logical explanation for one of the most distressing concomitants of prematurity. When very small at birth, as many as 50 percent of the prematurely born infants grow to maturity with an intellectual competence significantly below that which would be expected when compared with siblings and even with age peers.

4. Severe malnutrition suffered during childhood affects learning ability, body growth, rate of maturation, ultimate size and, if prolonged, productivity throughout life.

These facts clarify our concept of the crucial importance of nutrition at certain critical times during the growth cycle of the brain and body of infants and children. The presence of malnutrition during the first 5 years of life constitutes a danger not only to the individual child

but, also, when this exists among a significant segment of a population, to a nation as a whole.

We cannot afford to let millions of children grow to adult life compromised in intellect because we, in this rich land, have failed to feed them. Our goal must be the total elimination of malnutrition for we can tolerate nothing less.

May I now call your attention to the interrelation between certain economic and medical realities. There are 10.5 million children in this country growing up in families considered to be living in poverty. The presence of poverty implies a family income insufficient to purchase many of the essentials of life. Unfortunately, food is one of the essentials which is unavailable. In families living in poverty there is a far higher rate of infant mortality than in more economically well-to-do families. In fact, a high infant mortality rate may be the hallmark of poverty in the U.S.A.

In addition, the rate of premature births is also far higher, in some cases two and three times higher than it is in more well-to-do families.

Finally, the prevalence of intellectual compromise and even mental deficiency may be from three to five times as frequent in children of families living in poverty. In effect, malnutrition, high infant mortality and prematurity rates and high levels of mental deficiency coexist as a constellation of abnormalities that are most frequent among our families living in poverty.

In addition, poverty appears to have a predilection for families with children and the presence of children within these families tends to perpetuate poverty by limiting the occupational options of the parents and the educational opportunities of the children. One-third of all families in the United States with four or more children live in poverty.

It is not the poverty per se, which must be of concern to this select committee, but rather, the fact that poverty carries with it a variety of social and economic disabilities. We have a sequence of aberrations, each of which feeds upon the others. This morbid chain must be broken. In my opinion the most readily accessible link is also the most critical. Were we to insure that infants, children and pregnant mothers of this country receive adequate nutrition, we could interrupt the cycle and remodel the future. Infant mortality and prematurity rates would decrease. With this there would come to our children improved growth and development, certainly of body and probably of intellect. Educational accomplishment and achievement would improve and, with this, economic status would rise.

I would like to make some generalizations about nutrition in infants and children in this country, in contrast to the situation in less developed countries, an increasingly large proportion of infants and children in America are totally dependent upon manufactured foods, be these formulas or infant products. Under these circumstances there is a responsibility which devolves to the manufacturing industry. Under these circumstances I believe it is important that the Federal regulatory agencies maintain proper surveillance so that no damage can occur to this totally dependent population, American infants and children.

I would like to stress the importance of distinguishing between food supply and nutrition. A food supply is what is manufactured or pro-

duced by industry and farmers. The numbers identify the economic and agriculture posture of a nation. Nutrition is personal and concerns the food an individual actually receives and is able to consume. It is an error to fail to distinguish between these two words and to assume, on the basis of national productivity, that individual nutrition is adequate.

There is a tendency among professional nutritionists to consider that the science of nutrition deals with food requirements of adults. This arises from the fact that nutrition in this country received its greatest support during times of national military emergency; that is, during World War I and World War II. Boards, assembled by Government, were used for advice on the nutritional needs, not only of the Armed Forces, but also of the national labor force.

Under these circumstances, it is natural that nutritionists were drawn either from the ranks of biochemists or internists. They perpetuated the concept that infant nutrition was simply adult nutrition scaled down to take into account the smaller size of the infant or the child.

In fact, this is far from correct. The nutritional needs of the infant are unique and bear only tangential relations to those of the adult. Any national program for meeting the nutritional needs of the American infants and children must recruit the advice and support of those with special expertise and understanding of the nutritional requirements of this segment of our population. It would be, in my opinion, an error to assume that those trained in the science of nutrition as it concerns adults have appropriate competence in dealing with the needs of infants and children.

The determination of nutritional needs and status of groups of people is difficult. To establish needs we must face ethical problems and the use of control groups. No physician can undertake evaluation of a dietary supplement without appreciating at the onset that if the procedure appears to be of distinct benefit to the treated group, the experiment may have to terminate prematurely, since withholding the benefit from the control untreated group would be morally intolerable.

Therefore, we must rely upon certain pragmatic judgments and forgo some of the rigors of the scientific method. In addition, we must recognize that the conduct of nutritional trials and surveys is an invasion of privacy that requires the informed consent of the subject. This may be easy with adults, but complex when minors are involved. There are various technical difficulties.

What follows in my testimony is a list of the methods used to survey nutritional status. With your permission, I would like to skip the reading of these. They are covered in the material.

The CHAIRMAN. We will ask that your entire statement be printed in the record just as though you delivered it all.

Dr. LOWE. Thank you, sir.

I would like to skip now to the implications of these methods.

Senator ELLENDER. Page what?

Dr. LOWE. I am going to page 16, sir.

There are, in all, seven methods listed. What is important is that in the two ongoing nutrition surveys in this country, three of these methods are in use concomitantly: Household consumption, physical examination, biochemical profile. This combined approach is likely

to provide authoritative data on the individuals examined. This does not insure, however, that we will have data from which to generalize about the whole country. The facts may be accurate for the groups examined but, because of sampling problems, go no further. It will be one of the responsibilities of the Committee on Nutrition in the American Academy of Pediatrics to attempt to reconcile the results of both ongoing surveys, after reviewing any implications which are the consequence of the differences in the sampling technique used in each.

One important result of the national nutrition survey being conducted by Dr. Schaefer is of paramount importance to this committee. He has demonstrated that there are striking differences in nutritional adequacy and in the nature of nutritional deficiency among ethnic groups, racial groups, and geographic groups.

The best illustration of the ethnic groups is the problem with vitamin A deficiency. In Texas it was found among the groups surveyed that vitamin A deficiency was common. However, it was virtually absent in the black population survey and severe in the Mexican-American population and in between in the white population.

A review of the diets of these groups indicated the reason. The black population ate greens which provided carotenoid pigments, the Mexican-American population ate none and had virtually no vitamin A or carotenoid in the diet, and the white population was in between.

I emphasize this point to illustrate sampling problems. One would have been totally misled were the statement made that Texas per se needs more vitamin A. Selected groups in Texas need more vitamin A. And it would be very difficult, in my opinion, to make a single survey from which to generalize about the United States as a whole.

The final point concerns the significance of finding any level of malnutrition in groups of infants and children. Nutrition must be considered as a single package containing many individual items.

Survey methods may identify deficiency in one or two components of the diet or an abnormality in one or two elements in a biochemical profile. One cannot assume, however, that because only several indices of malnutrition were found that the more general deficiency in diet does not exist.

On the contrary, when the diet is significantly deficient in one element, it is usually deficient in many elements. It is inappropriate to identify a single deficiency and assume that by supplementing a bad diet with respect to this single nutrient an adequate nutrition will be achieved.

With this background, I would like, with your permission, to conclude my statement by making several recommendations which reflect the consensus of the Committee on Nutrition of the American Academy of Pediatrics.

1. We believe it is essential to maintain a continuing national surveillance on the nutritional status of our people. This is particularly important in relation to infants and children, for attention to their nutritional needs can yield rich national dividends.

2. The responsibility for maintaining a nutritional surveillance should be assigned to a single agency of government. This may be an existing agency or one created specifically for this purpose.

3. The responsibility to maintain surveillance should carry with it an obligation of equal importance, that of identifying cause.

4. Once existence and cause have been identified, this agency must have the responsibility and resources to relieve.

Were these steps to be taken, our national posture, with respect to nutrition of infants and children, would improve immeasurably. Within a reasonable period of time, we could anticipate an impact on our appalling statistics for infant mortality and mental retardation since both are related to nutrition.

Then, a new generation of American children will appear with enhanced capacity for education, relieved of poverty, and marching with the legions of our land to our goal of plenty for all.

The CHAIRMAN. We will print in the record at this point Dr. Lowe's full statement and a paper entitled "Nutrition, Child Care, and Public Policy," dated February 2, 1968.

(Dr. Lowe's complete statement follows:)

PREPARED STATEMENT OF CHARLES UPTON LOWE, M.D., CHAIRMAN, COMMITTEE ON NUTRITION, AMERICAN ACADEMY OF PEDIATRICS

Mr. Chairman, I am most pleased by the privilege extended to me to appear before this Committee as a spokesman for the Committee on Nutrition of the American Academy of Pediatrics. I and other members of the Committee on Nutrition have followed with great interest the testimony presented to the Senate Select Committee on Nutrition and Related Human Needs and endorse enthusiastically the efforts and activities of this distinguished group. My comments will attempt to place infant and child nutrition within the scientific context of our understanding of human growth and development and emphasize the critical relations between nutritional experience in early childhood and ultimate achievement during adult life.

First, let me review briefly the nature of the Committee on Nutrition, and identify its composition and its role. The Committee has been in existence for fifteen years. It was established to satisfy the need of pediatricians for fresh and authoritative information on nutrition and to meet the desire of the Academy for an expert group to deal with issues relating to infant and child nutrition. It was determined that the missions could be fulfilled most effectively if the Committee membership included, not only pediatricians, but in addition, two other groups: representatives of industries involved in the manufacture of formulas, infant foods and infant nutritional preparations; and members of government agencies, and those private foundations with operations relevant to infant nutrition. This tri-part organization comprises twenty-seven members. Industry has found the Committee a useful sounding board to review proposed changes in the composition of nutritional products or for review of new products prior to market trials. Government and private foundations have used the Committee to examine new schemes or proposals for improving nutrition of American children and, upon occasion, as a reference group to furnish advice and counsel on nutritional standard or regulations. Finally, physicians and pediatricians have continued to receive nutrition information published as memoranda in professional journals.

As a by-product of these activities, the Committee became convinced early in 1964 that the task of providing advice to government agencies and to practitioners on nutritional issues relating to American children was, upon occasion, difficult or impossible because no precise knowledge was available on the nutritional status of American children. After considering the issues, the Committee decided that action was needed and took steps accordingly. Dr. Robert Frazier, Executive Secretary of the American Academy of Pediatrics, wrote on behalf of the Committee to Dr. Katherine Ottenger, Chief of the Children's Bureau, on June 12, 1964. In this correspondence, the Committee directed the attention of the Children's Bureau to the need for information on the nutritional status of American children. It considered that Public Law 88–156, the Maternal and Child Health and Mental Retardation Planning Amendment of 1963, might provide the vehicle for funding a National Nutrition Survey of American children. It was the hope of the Committee that the Survey would be conducted in a manner similar to that used by the Interdepartmental Committee on Nutrition for National Defense under the leadership of Dr. Arnold Schaefer. Dr. Schaefer was a member of the

Committee on Nutrition at the time this correspondence was initiated and continues to be so at present. In June 1966, almost 2 years later, the Children's Bureau was able to fund a nutrition survey of selected populations of pre-school children in the United States. Although the Committee applauded this effort, it considered that the approach would fail to develop all relevant and needed information and through correspondence and discussion encouraged other agencies in government to mount a more comprehensive survey. Negotiations, for example, with the Bureau of the Census, were undertaken with the hope of gaining their support for such a national survey. Unfortunately, these negotiations were not successful.

When, in July, 1967, the Stennis Bill was introduced into Congress, the Committee hoped that at last its goal would be achieved and that our nation would commit sufficient resources to support a national nutrition survey, programs to identify causes of malnutrition and methods for relief. The Committee was dismayed and disappointed when the Bill died in Committee.

The appropriation of funds to permit a limited national nutrition survey through the office of Dr. Schaefer developed as a compromise, but in our opinion it was not a reasonable compromise, for the need for a comprehensive survey in all States remained. The appropriation, limited as it was, did, however, indicate a commitment on the part of government to identify and measure the level of nutritional well-being of American children, and the possibility existed that subsequent allocations might extend the program and support a comprehensive national survey. The role of the Committee in fostering the establishment of the two surveys being conducted through the Department of Health, Education and Welfare would of itself have been sufficient reason for continuing interest in and support of these activities. Additional reasons have appeared, however. We have agreed, at the request of Dr. Schaefer, to act as a review Committee to interpret the results of his survey as data appear. Dr. George Owen, who is currently conducting the survey sponsored by the Children's Bureau, is also a member of the Committee on Nutrition. We have agreed to serve in this same capacity on behalf of his survey and have already begun to do so. Within this framework, we anticipate that the Committee on Nutrition will on behalf of both surveys review all data relating to individuals under 15 years of age and correlate and collate these. We expect to interpret for a professional public the implications of the surveys so that every effort can be made to improve the quality of nutrition of American children and ensure that steps will be taken to eradicate malnutrition where it exists.

The limited educational mission of the Committee on Nutrition has changed. It has broadened to include a concern with the whole fabric and quality of American life to the extent that these relate to the care and nurture of our children. It is our conviction that nutrition is the key to the normal development of infants and children. In effect, the quality and quantity of nutrition given during the first two to four years of life may have the effect of programming the individual for all the years of his life. Malnutrition during the last trimester of pregnancy and, certainly during the first months of life, may seriously compromise ultimate intellectual achievement. Experience in developing countries has indicated that the period of greatest nutritional risk is during the second to fifth year of life. These observations reflect the fact that in most evolving nations breast feeding is practiced for the first twelve or fourteen months of life and, therefore, nutrition is sound during this period. It is an error, however, to assume that danger does not exist earlier in life. In this country, among both impoverished and economically more advanced families. breast feeding is practiced to a decreasing extent. Under these circumstances, when the infant is fed by bottle very early in life, malnutrition from inappropriate feeding becomes possible even during the first months of life. The earlier malnutrition exists, the more devastatingly it impinges on growth and development.

We now have unambiguous evidence from several sources of the following facts:

1. When a fetus receives inadequate nutrition in utero, the infant is born small, the placenta of his mother contains fewer cells than normal to nourish him and his growth will be compromised;

2. When an infant undergoes severe nutritional deprivation during the first months of life. his brain fails to synthesize protein and cells at normal rates and consequently suffers a decrease as great as twenty percent in the cell number;

3. During the last trimester of pregnancy, protein synthesis by the brain is proceeding at a very rapid rate. Immediately upon delivery, this rapid rate

decreases, although it still continues at a greater pace than at later times of life. In animals, this sharp decrease in protein synthesis immediately after birth occurs in both full term and premature animals. The decrease in protein synthesis occurring in premature animals in all probability also occurs in premature human infants. If we can extend animal observations to the human situation, we have a logical explanation for one of the most distressing concomitants of prematurity; when very small at birth as many as fifty percent of prematurely born infants grow to maturity with an intellectual competence significantly below that which would be expected when compared with siblings and even with age peers.

4. Severe malnutrition suffered during childhood effects learning ability, body growth, rate of maturation, ultimate size and if prolonged, productivity.

These facts clarify our concept of the crucial importance of nutrition at certain critical times during the growth cycle of the brain and body of infants and children. The presence of malnutrition during the first 5 years of life constitutes a danger not only to the individual child but, also, when this exists among a significant segment of our population, to our nation as a whole. We cannot afford to let millions of children grow to adult life compromised in intellect because we, in this rich land, have failed to feed them. Our goal must be the total elimination of malnutrition for we can tolerate nothing less.

May I now call your attention to the interrelation between certain economic and medical realties. Almost 10.5 million children in this country grow up in families living in poverty. The presence of poverty implies a family income insufficient to purchase many of the essentials of life. Unfortunately, food is one of the essentials which is unavailable. In families living in poverty there is a far higher rate of infant mortality than in more economically well-to-do families. In fact, a high infant mortality rate may be the hallmark of poverty in the U.S.A. In addition, the rate of premature births is also far higher, in some cases two and three times higher than it is in more well-to-do families. Finally, the prevalence of intellectual compromise and even mental deficiency may be from three to five times as frequent in children of families living in poverty. In effect, malnutrition, high infant mortality and prematurity rates and high levels of mental deficiency coexist as a constellation of abnormalities that are most frequent among our families living in poverty. In addition, poverty appears to have a predilection for families with children and the presence of children within these families tends to perpetuate poverty by limiting the occupational options of the parents and educational opportunities of the children. One third of all families in the United States with four or more children live in poverty.

It is not the poverty per se, which must be of concern to this Committee, but rather, the fact that poverty carries with it a variety of social and economic disabilities. We have a sequence of aberrations, each of which feeds upon the others. This morbid chain must be broken. In my opinion the most readily accessible link is also the most critical. Were we to ensure that infants, children and pregnant mothers of this country receive adequate nutrition, we could interrupt the cycle and remodel the future. Infant mortality and prematurity rates would decrease. With this there would come to our children improved growth and development, certainly of body and probably of intellect. Educational accomplishment and achievement would improve and with this, economic status would rise.

I would like to make some further generalizations regarding nutrition in infants and children in this country. In contrast to the situation in less developed countries, an increasingly large proportion of infants and children in America are totally dependent, virtually from birth until well into the second year of life, upon manufactured food products. Manufactured formulas and manufactured infant and baby foods have become the major source of nutrition, even among those living on the verge of poverty. Under these circumstances, a special responsibility devolves to the manufacturers of these products. If significant errors in manufacturing procedure, composition or content of these foods occur, a year's crop of babies may be permanently damaged; if the aberration remains undetected for long, a whole generation may be injured. This special responsibility is well recognized and fulfilled by the relevant industries. But I believe it important that federal regulatory agencies maintain proper surveillance so that no damage can occur to this totally dependent population, America's infants and children.

I would like to stress the importance of distinguishing between food supply and nutrition. A food supply is what is manufactured or produced by industry and farmers. The numbers identify the economic and agriculture posture of a nation. Nutrition is personal and concerns the food an individual actually receives and is able to consume. It is an error to fail to distinguish between these two words and

to assume, on the basis of national productivity, that individual nutrition is adequate. This has particular relevance, for example, to the issues discussed before this Committee concerning the role of the Department of Agriculture in providing nutrition for the needy in America, and underlies the apparent conflict of interest between those activities of the Department of Agriculure which relate to food supply and agricultural production and those which relate to individual nutrition.

There is a tendency among professional nutritionists to consider that the science of nutrition deals with food requirements of adults. This arises from the fact that nutrition, as a science in this country, received its greatest support during times of national military emergency; that is, during World War I and World War II. Boards, assembled by government, were used for advice on the nutritional needs, not only of the armed forces, but also of the national labor force. Under these circumstances, it is natural that nutritionists were drawn either from the ranks of biochemists or internists. They perpetuated the concept that infant nutrition was simply adult nutrition scaled down to take into account the smaller size of the infant of the child. In fact, this is far from correct. The nutritional needs of the infant are unique and bear only tangential relations to those of the adult. Any national program for meeting the nutritional needs of the American infants and children must recruit the advice and support of those with special expertise and understanding of the nutritional requirements of this segment of our population. It would be an error to assume that those trained in the science of nutrition as it concerns adults have appropriate competence. This is not said out of arrogance or with any lack of respect for my peers or associates having competence to deal with nutritional problems in adults, but rather to emphasize the special needs characteristic of the infant and child.

Examples can illustrate my point. The adult has no apparent exogenous need for Vitamin D as a dietary supplement. Were the infant to be reared without such supplement, he would develop rickets in a matter of months. The requirement for Vitamin C by the adult may be as low as 10 mgs. per day. If the young infant were given amounts of Vitamin C this low, he would undoubtedly develop an aberration in protein metabolism known as tyrosyluria and, in addition, might go on to develop scurvy. Because of his very rapid growth, the infant's requirement for iron is approximatly equal to that of a full grown woman and approximately twice that of a full grown man. These illustrations identify the danger of simply scaling down adult nutritional requirements to establish those of the infant.

The determination of nutritional needs and status of groups of people is difficult. To establish needs we must face ethical problems and the use of control groups. No physician can undertake evaluation of a dietary supplement without appreciating at the onset that if the procedure appears to be of distinct benefit to the treated group, the experiment may have to terminate prematurely, since withholding the benefit from the control untreated group would be morally intolerable. Therefore, we must rely upon certain pragmatic judgments and forego some of the rigors of the scientific method. In addition, we must recognize that the conduct of nutritional trials and surveys is an invasion of privacy that requires the informed consent of the subject. This may be easy with adults, but complex when minors are involved.

In addition to moral and ethical problems, assessment of the nutritional status of population groups is surrounded by various technical difficulties. I would like to review, briefly, the methods used to obtain these data and the problems in interpretation characteristic of each: (1) *Agricultural Production Figures:* The WHO/FAO annually publish data on national production of food crops by various nations in the world. If these data are divided by the number of people dependent upon this food supply, one gets a crude estimate of nutritional level in a given economic unit. It is obvious that this estimate is far from accurate since it does not measure what reaches individual consumers; (2) *The Technique of Sequential Inventories:* Assessment of disappearance of food from the market has been used to identify food consumption in various population groups. This has the same inherent difficulties as the first procedure; (3) *The Market Basket Approach:* Within this method, contents of a typical market basket is determined, and after making proper adjustment for average family size, deductions are projected for individual consumption. Here again we know little about individual consumption. (4) *Household Consumption:* This method determines household food purchases, retrospectively over periods of 2–3 days. (5) *Individual*

Consumption Figures. It is possible to enter the home and, for a period of one or two days, actually identify what is cooked and what is consumed by individual members of the family group. This is clearly the most accurate method of determining individual intake for it eliminates from calculations waste and food served but not eaten. Unfortunately, this approach is unacceptable in our culture. The method has, however, been used by the ICNND overseas with considerable success and demonstrable effectiveness. (6) *Physical Examination:* Physicians can identify stigmata of significant malnutrition. This method when applied to adults leaves much to be desired, since it will only identify flagrant malnutrition; the physical sign of nutritional disability appears late in the course of a nutritional illness. In contrast, since infants and children are growing, any marked deviation from anthropometric norms may, with reasonable confidence, be used to evaluate nutrition. (7) *Biochemical Profile:* Indices of nutritional deficiency can be developed by examining biological material (urine, blood etc.) in the laboratory. This chemical profile can be very accurate or misleading, depending upon the skill with which it is applied and the results interpreted. Another limit of the method is that we have reliable standards to apply neither to all age groups nor for all nutrients.

In the two outgoing nutrition surveys in this country, three of these methods are in use concomitantly: Household Consumption, Physical Examination, Biochemical Profile. This combined approach is likely to provide authoritative data on the individuals examined. This does not ensure, however, that we will have data from which to generalize about the whole country. The facts may be accurate for the groups examined but, because of sampling problems, go no further. It will be one of the responsibilities of the Committee on Nutrition in the American Academy of Pediatrics to attempt to reconcile the results of both ongoing surveys, after reviewing any implications which are the consequence of the differences in the sampling technique used in each.

One result of the National Nutrition Survey being conducted by Dr. Schaefer is of paramount importance to this Committee. He has demonstrated that there are striking differences in nutritional adequacy and in the nature of nutritional deficiency among ethnic groups, racial groups, and geographic groups. For example, in Texas it was found that Vitamin A deficiency was significant in the sample as a whole. If one examines, however, where the Vitamin A deficiency was distributed, the following observations were made: Among the Mexican-American groups, Vitamin A deficiency was severe. Among the black population surveyed, Vitamin A deficiency was mild or non-existent. Among the white population, Vitamin A deficiency was at an intermediate level. A ready explanation of these findings came from information on dietary intake. The tendency of the black population to eat green vegetables saved them from severe Vitamin A deficiency. The absence of carotenoids from the diet of the Mexican-Americans explained the high prevalence of Vitamin A deficiency among this population. The prevalence of endemic goiter differs among geographic groups. In Louisiana, the prevalence was high, whereas close by in Texas none was found. These findings could only indicate that two population groups living close to each other had markedly different intakes of iodine. In Louisiana, salt is iodized; in Texas, it is not.

A final point concerns the significance of finding any level of malnutrition in groups of infants and children. Nutrition must be considered as a single package containing many individual items. Survey methods may identify a deficiency in one or two components of the diet, or an abnormality in one or two elements in a biochemical profile. One cannot assume, however, that because only several indices of malnutrition were found, that a more general deficiency in diet does not exist. On the contrary, when the diet is significantly deficient in one element, it is usually deficient in many elements. For example, deficiency in proteins and in B vitamins tend to go together, just as deficiency of milk and meat in the diet tends to be accompanied by a deficiency in fat soluble vitamins. In effect, one must look at nutrition as a galaxy of variables, all of which must be available to the individual at the same time. It is inappropriate to identify a single deficiency and assume, that by supplementing a bad diet with respect to this single nutrient, that adequate nutrition will be achieved.

With this background, I would like, with your permission, to conclude my statement by making several recommendations which reflect the consensus of the Committee on Nutrition of the American Academy of Pediatrics:

1. We believe that it is essential to maintain a continuing national surveillance on the nutritional status of our people. This is particularly important in relation to infants and children, for attention to their nutritional needs can yield rich national dividends.

2. The responsibility for maintaining a nutritional surveillance should be assigned to a single agency of government. This may be an existing agency or one created specifically for this purpose.

3. The responsibility to maintain surveillance should carry with it an obligation of equal importance, that of identifying cause.

4. Once existence and cause have been identified, this agency must have the responsibility and resources to relieve.

Were these steps to be taken, our national posture, with respect to nutrition of infants and children, would improve immeasurably. Within a reasonable period of time, we could anticipate an impact on our appalling statistics for infant mortality and mental retardation since both are related to nutrition.

Then, a new generation of American children will appear with enhanced capacity for education, relieved of poverty, and marching with the legions of our land to our goal of plenty for all.

NUTRITION, CHILD CARE AND PUBLIC POLICY—PRESENTED TO FOOD INDUSTRIES ADVISORY COMMITTEE, THE NUTRITION FOUNDATION, INC., NAPLES, FLA., FEBRUARY 2, 1968

(By Charles U. Lowe, M.D.)

In this age of superlatives we have become inured to descriptions of affluence and privation, opulence and poverty. It becomes difficult to winnow the hard statistic from the superficial impression. Under these circumstances, the establishment of realistic goals for political or personal action becomes hazardous.

From several sources we learn that significant malnutrition exists in our land, but many of us have not examined the issue seriously because of the origin of the reports. Too often these reports appear to be self serving. They arise as newspaper headlines or press releases emanating from those with a political investment in the subject. In addition, we find it hard to believe that privation so degrading and enervating can exist in this land of wealth and power. Yet we have a responsibility to examine this national issue critically. To the extent that each of us operates within the public or private sector, our action and opinion impinge upon the formation of public policy.

Let us examine the interrelations between nutrition, child care, and public policy and the evidence that these are related. We must inquire whether or not all the children of our land are adequately fed, and whether they receive sufficient medical care. We must also examine the interrelations between these two aspects of child health and the extent to which existing programs meet identified needs. The answers arising from analysis of these questions become relevant to the economic future of this country. We must review certain aspects of current economic theory and relate these to the nurture of our children. Child health must be scrutinized within the context of poverty, and the implications of poverty. The impact of poverty on the future of our children must be evaluated.

We must start by examining certain elements in our economic structure and determine the relation between these elements and the care we give our children. In a period of less than 35 years we have advanced through three phases of capitalism. The first we might designate as classical or market place economics, the second is Keynesian, and the third, the "new economics". All operated within the system for exchanging goods and services we have chosen to call capitalistic as opposed to feudal or Marxian, but our understanding of the operation of this system and the techniques we have used to maintain it have changed. Of the classical, we need say little. It evolved virtually spontaneously over a period of five centuries, flourished despite our failure to understand its operation, and ground to a screeching halt during the great depression of the thirties. We were rescued by John Mayhard Keynes whose fresh and exciting theories were published even before an autopsy could be performed on the inert corpse of world capitalism. Keynes developed concepts of the operation of the capitalist system which provided not only predictive techniques but more importantly permitted development of remedies for its diseases.

Basic to this concept was the role of government in maintaining the value of money and in stimulating or repressing the economy. If the key to a healthy economy lay in the interplay between productive capacity and public demand, the keystone was aggregate demand. Keynes visualized that the actions taken by government to alter tax rates and national indebtedness were specific in controlling aggregate demand and thereby in regulating the labor market. And he set full employment as the goal of national economic policy. What he failed to anticipate was the appearance of revolutionry manufacturing techniques which could increase production and fully utilize industrial capacity in the presence of significant unemployment.

The Keynesian calculus has limited usefulness under these circumstances and economic theorists have been compelled to reevaluate the methods used to regulate our economy. The emergency of the "new economics" has required development of theory to predict the relations between tax-fiscal policy and unemployment in the presence of high aggregate demand and high industrial productivity and thereby control national economic posture. Impinging upon these relations has been an unanticipated coalescence of multinational trade groups, the reemergence of gold as a currency basis, and finally, the continuing outflow of dollars through our military and nonmilitary commitments overseas. These issues are beyond the scope of our discussion, but serve to illustrate the complexity of the problem. Suffice it to say that a statement on the "new economics" enjoying consensus endorsement has yet to appear. (1)

Keynes proposed that either direct payment by government to the unemployed, or involvement of the unemployed in public works projects, would increase aggregate demand and thereby reactivate unused productive capacity. That this approach can work under appropriate circumstances was demonstrated during the economic experiments of the New Deal era. But what happens when the unemployed receive direct support at a time when production facilities are operating at full capacity? Idle machines cannot be started; there are none. Augmented demand leads only to inflation and untimately to an economic decline. It is clear that we must reevaluate the available options for dealing with unemployment. If the unemployed are used for public works projects, for example road building, school construction, their efforts will result in inflation. If they receive a direct dole, the results will be the same. Only if they are committed to creating new productive capacity will their employment not threaten our economic structure.

But can they be so employed? The answer appears to be "no." The basic characteristic of our unemployed is that they are untrained, unskilled, and suited mainly for manual labor or menial tasks. Industry no longer employs them since they lack the requisite skills for the production line. Attempts to retrain and develop the talents needed by our modern automated industry have been discouraging. In his recent message to Congress on Hard Core unemployment, the President said: "500,000 men and women who have never had jobs are living in the slums of our fifty largest cities." Another half million of these people live in the rural slums of our land. He identified our most disadvantaged citizens as those who "have given up the search for work because of inadequate training, discrimination, discouragement, and despair."(2)

In a scholarly article with the title "People and Jobs—Why U.S. Manpower is in short supply while three million are unemployed," John Tebbel presents the following challenge: "America is facing a manpower crisis of awesome and dangerous proportions. What is done, or not done, about it in the next few years will affect the quality of life in this country for generations. Nor is it any exaggeration to say that if the correct solutions for the problem are not conceived and carried out, the United States will be confronted with potential disaster." In talking about the unemployed, he excluded the one million of hard core unemployed and said the rest . . . "are chiefly those who are in various ways unskilled." (3)

Thus, the "new economics" concerns the regulation of the economy when significant unemployment or underemployment coexist with fully committed productive capacity and when the unemployed cannot enter the labor force. How do we support the unproductive elements in the labor force without fostering inflation and currency devaluation? How do we prevent the entry into the legions of the unemployed those generations yet unborn?

The question we must ask ourselves is whether the children of our country now being reared in poverty and deprived of an adequate diet will mature

and become employable or unemployable. It takes no great jump in reasoning to conclude that the three million unemployed to which both President Johnson and John Tebbel referred came from the ranks of those who as children had been reared in disadvantaged environments.

To examine this problem we must explore the economic status of the families in which our children are reared, the evidence available that they get enough to eat, the hazards of malnutrition, and the implications that derive from these data.

First, let us examine the nature and scope of poverty. A recent publication of the OEO defines this group.

TABLE I.—THE POOR IN MILLIONS

	White	Nonwhite	Total
All ages			34.3
Children:			
Under 6 years	3.5	2.3	5.8
6 to 15 years	5.0	3.1	8.1
Total	8.5	5.4	13.9

Note: 40 percent of our poor are children.

Source: (4) "Dimensions of Poverty 1964," a publication from the Office of Economic Opportunity, October 1965.

"In March 1965, about 12 million households comprising thirty-four million persons were living on cash incomes insufficient to buy goods and services vital to health. Measured by the reports of 1964 cash incomes to the Census Bureau, these—based on a sliding scale of cash incomes allowing for family size and the ages of family members—are *The Poor*, averaging, on these incomes, at most, seventy cents a day per person for food, and choosing, among hard alternatives, which needs may be endured and which must be satisfied.

"Almost seventy percent of the poor were white; eighty-seven percent did not live on farms; forty-seven percent (over half of those not on farms) lived inside the metropolitan boundaries of areas containing cities of 50,000 population or more. As nearly as can be determined, cities, large and small, contain about fifty-five percent of all these poor. The rest spreads thinly like a retreating nerve network over the hamlet traces of past and dying industry, mining, lumbering, transportation, and farming, with rural nonfarm poverty outnumbering farm poverty two to one." (4)

Of the fifty-eight million children in our country under fifteen years of age, 13.9 million, or 24%, live in poverty, the majority in 6.8 million family groups. The households of the poor account for only 11% of those still in high school and 32% of high school dropouts. (5) Excluding those over 65 from the calculation, 48% of the population of the poverty group comprises those under fifteen years of age, and 40% of all families living in poverty have children under six years of age. In contrast, only 30% of the national population is under fifteen years of age. Poverty has a predeliction for families with children and the presence of children within these families tends to perpetuate poverty by limiting the occupational options of the parents. One-third of all families with four or more children live in poverty.

TABLE II.—U.S. FOOD CONSUMPTION

	United States 1965	Great Britain 1962	Netherlands 1960
Pounds per person per year	1,280	1,395	1,289
Kcal per day	[1] (3,000)	3,190	2,975
Kcal per pound of food	855	845	845

[1] Estimated.

Sources: (6) The New Information Please Almanac Atlas and Year Book 1966; (22) Bourne, G. H., World Review and Dietetics.

The average person in the United States consumes 1280 pounds of food per year and spends $435 to purchase it. (6) According to the OEO, the person living in poverty spends less than $255 per year on food, or a bit more than one-half of the national average (4). If we equate dollars to calories, we can calculate that $255 provides purchasing power for only 1680 calories per day per person. This is at best an approximation and its implications must be weighted to allow for the age distribution of those living in poverty and for the fact that many living in rural poverty grow some of their own food. The contribution of this portion of their diet to a national summation cannot be measured. Neither does this estimate include the direct contribution of food by government at all levels. The poor, in contrast to the rest of the population, spend a larger percent of their available income on food, more than thirty percent in contrast to less than twenty-five percent, buy within a restricted market and the food they purchase costs more than it does when bought by the affluent.

We must remember, however, that poverty is much more than a lack of cash. It is a way of life, all pervading, crushing, immobilizing, and destructive. It is self-perpetuating, and infectious, spreading through regions like an infectious illness. And it is cruel, enervating, and dehumanizing.

Performance of individuals has a way of falling between the lattice and chinks of statistics, and we must seek more direct evidence that poverty in this country is associated with a significant incidence of malnutrition. A national survey currently in progress will provide hard facts.* Until these are available, we are left with only indirect evidence. First we have the anecdotal evidence. Kwashiorkor (Profound protein-calorie malnutrition of childhood) has been identified in isolated instances in two hospitals in New York, one in Cleveland, Rochester, and Seattle. We have no means to establish prevalence in these communities or in others.

Next we have the newspaper evidence. Much of this is flamboyant and hysterical but probably all has some basis in fact. An investigative committee of the Citizens Crusade Against Poverty reported that malnutrition was not uncommon in certain counties of South Carolina. (7) A physician gave testimony that he had seen "large numbers" of preschool children with some degree of Kwashiorkor, and a lay person told the committee that she had seen cases where children starved to death. South Carolina is the only state in the Southeast that does not participate in the Federal Government's direct Commodity Distribution Program.

The publicity given the non-governmental survey of malnutrition in Mississippi served to alert the country to this problem, though the reliability of the report has been questioned. Nevertheless, after the Senate passed the Stennis Bill which was to provide for Food and Medical Services on an emergency basis and support a nutrition survey, the New York Times, commented editorially: "The poor, underdeveloped countries aren't the only ones with a hunger problem. Most Americans were surprised and shocked to learn during a Senate subcommittee's hearings . . . . that thousands in poverty areas of this country suffer from serious malnutrition and lack of medical care." (8)

What direct evidence do we have of malnutrition? A recently reported nutrition survey, conducted in Columbus, Ohio, gives some incidence data (9). The preschool children living in three groups of families were studied; two were in the lowest economic quartile with mean incomes of $775 and $1,050/year, and one was in the second quartile with a mean annual family income of $1,525. Thirteen, or eleven percent of the 146 children examined had daily intakes during the period of study of less than 80 Kcal/kilo, a value probably well below the ideal. If this can be translated to encompass all the disadvantaged in our land, 1.5 million children are similarly deprived.

Assessment of anthropometric information from this small study tends to suggest a highly significant skewing of the growth data. While one cannot be certain that the standard curves used to evaluate growth apply to the specific population under study, certain findings are important. For weight, 11 percent of the children were more than one standard deviation above the mean whereas 28 percent, more than 2½ times as many, were more than one standard deviation below. For height, 6.5 percent were more than one standard deviation above the mean; in contrast, 18 percent, or almost three times as many, were more than one standard

*Public Health Service Act Amendments for 1967.

deviation below. These data are consistent with the presence of malnutrition among this group of infants and preschool children living in poverty.

TABLE III.—MEAN FAMILY INCOME $775 TO $1,525, COLUMBUS, OHIO

	Average anthropometric data, children 1 to 6 years of age	
	Boys (77) [1]	Girls (70) [1]
Height:		
>1 SD	6	4
>1 SD below	13	14
Weight:		
>1 SD above	8	9
>1 SD below	21	20

[1] Figures in parentheses indicate number of children.

Source: (9) Owen, G. M., et al.: "The United States Today—Is It Free of Public Health Nutrition Programs?"

An indirect index of nutritional adequacy can be gained from examination of statistics on neonatal death rate and on the incidence of premature births. Both can be related directly to adequacy of prepartum care and indirectly to the adequacy of nutrition. In 1967, almost 20 percent of all births in America occurred among those living in poverty. (10) Three years earlier it had been estimated that only 7 percent of mothers living in poverty had adequate prenatal care. (11) In 1967, about 25 percent of poverty women at risk were receiving prenatal care in the various programs sponsored by the Children's Bureau (1, 10). The vast majority of the 8½ million women in their reproductive years living in poverty have no medical care whatsoever during interpartum periods. (12)

Almost 20 percent of infant mortality is directly related to prematurity or immaturity at birth. In the last year about 7 percent of all births were premature, almost 280,000 infants. In a recent publication by the National Center for Health Statistics, it was stated that: "The causes of infant deaths in the United States are largely concentrated in five groups which account for three-fourths of all infant deaths—yet among these categories there are hidden associations which are not evident from the statistics. The thread of prematurity and/or immaturity runs through a number of these causes." (13) Eleanor Hunt summarized the problem as follows: "Much newborn mortality could be prevented if measures to sustain pregnancy 36 weeks could be applied successfully." (14)

There seems to be no question, therefore, among those who have studied the statistics, that within the confines of the problems of premature birth and its prevention lies one solution to the major national disgrace found in our infant mortality figures. The question we must ask is whether this relates in any definable way to nutrition. The answer appears to be "yes". For example, in a national conference on Infant Mortality, E. W. Page, Chairman of the Department of Obstetrics and Gynecology at the University of California at San Francisco, after reviewing 12,000 premature births, listed means to prevent prematurity. Of the seven listed, two deal with public health measures. The most important of these was: "improve maternal nutrition—early in pregnancy and preferably before conception." (15)

A further element compounding the problem, and bearing directly on our argument, is the observation that the ultimate intellectual achievement of low birth weight infants is subnormal. This is a handicap our nation can ill afford.

TABLE IV

National rank and State	Per capita income, 1956	Infant mortality rate, 1963		Percent nonwhite births, 1960
		White	Nonwhite	
1 Connecticut	$3,678	21.0	41.0	5.4
2 Delaware	3,563	20.9	38.7	17.9
3 Illinois	3,511	20.3	41.2	15.4
50 Mississippi	1,751	22.9	57.6	54.9
49 South Carolina	2,027	22.4	48.1	43.0
45 Kentucky	2,205	26.3	44.4	8.7
44 North Carolina	2,235	22.2	50.8	32.6

Sources: (23) National Statistical Abstract, U.S.A.; (16) Infant, Fetal and Maternal Mortality, National Center for Health Statics, series 20, No. 3, 1966.

TABLE V

State	Decile—Mortality rates by counties										Percent of counties 50 percent more than U.S. white average 23.3
	1	2	3	4	5	6	7	8	9	10	
Rich:											
Connecticut	1	1	5	1							0
Delaware				2				1			0
Illinois	16	18	14	13	20	11	2	4	2	2	4
Poor:											
Mississippi				1	1	2	8	14	22	34	68
South Carolina					2	4	8	9	14	9	50
Kentucky	5	5	6	11	15	10	14	27	19	8	22
North Carolina	1	4		5	10	6	19	15	24	16	40

Source: (16) "Infant and Perinatal Mortality Rates by Age and Color," Children's Bureau 1967.

Geographic areas with the lowest per capita income and the highest incidence of poverty have the highest infant mortality rates. In general, states with the highest per capita incomes have the lowest infant mortality and those at the bottom of the economic ladder the highest. Since these statewide data average affluent counties and poverty counties, they give only part of the picture of disparity between the rich and the poor. The impact of poverty can be best appreciated by examining the performance, county by county. The distribution of mortality rates by deciles isolates these data with unambiguous clarity. The percentage of counties with infant mortality rates 50 percent higher than the national average for white births is shockingly high among the impoverished and negligible among the rich states. Though clearly the impact of births in the nonwhite population is to raise the mortality figures, a state like Kentucky with a very low level of Negro births still has poverty counties with rates significantly higher than those found in affluent, predominantly white counties. Some of the rates found among our Negro citizens are worse than those existing in Africa, South America, and Asia. What is disheartening is that the gap between the white and the nonwhite groups is widening.

TABLE VI.—SELECTED INFANT MORTALITY STATISTICS

County	Infant mortality, 1960		Annual births	Percent nonwhite births
	White	Nonwhite		
Hickman, Ky	13.3	116.9	604	25.5
Bell, Ky	35.8	81.1	4,282	3.5
Brantly, Ga	22.9	77.6	640	18.1
Emanuel, Ga	21.1	69.4	2,156	42.8
Cameron, La	22.7	106.4	844	11.1
Evangeline, La	29.5	80.3	4,136	37.6
Baylor, Tex	39.6	105.3	568	6.7
Bosque, Tex	17.4	250.0	780	4.1

Source: (16) Infant and perinatal mortality rates by age and color, Children's Bureau, 1967.

"The gap between death rates for white and nonwhite infants has increased from 66 percent (excess in rate for nonwhite over white) in 1950 to 90 percent in 1964. The latter excess represents a lag of over two decades in the reduction of infant losses in the nonwhite group. The 1964 mortality rate of 41.1 for nonwhite infants has not been recorded for white infants since 1941." (16)

We have established a correlation between nutrition and income and related infant mortality and prematurity with poverty. These data suggest that an attack on inadequate nutrition among those living in poverty might yield high rewards in national wellbeing. Improved nutrition will not of itself ameliorate poverty, but coupled with improved health care, family planning and better education it may so alter the substrate upon which poverty lives, that ultimately this national disease may be eradicated.

The cold statistics confirm that the existence of poverty has an adverse effect upon our national economic posture: Those living in poverty represent a continuing economic drain; the dole is inflationary; those reared in poverty cannot enter the employment market; and poverty is self-perpetuating. In regions of Appala-

chia and sections of our urban slums, a third generation of Americans is being reared in poverty. This is stated most strikingly in the following quotation from a report by Peter Schrag in which he reappraised Appalachia in 1968:

"Appalachia, now growing its third welfare generation, has counties where more than a third of the population is unemployed, where the government check-social security, welfare, aid to dependent children—is the prime source of income, and where some men are so far from their last job that it cannot properly be said that they have a trade at all. Here the average adult has a sixth-grade education, three-fourths of the children who start school drop out before they complete the 12th grade, and the statistics of human pathology—tuberculosis, silicosis, infant mortality—are so high that they do not belong in the Western world at all." (17)

We can safely assume that if malnutrition exists, it will be found in the impoverished rather than among the affluent. The presumption is strong that children reared in poverty and suffering malnutrition will neither compete in a modern labor force nor accommodate to the modern industrial complex. Instead they will languish in poverty, dependent upon a dole, and perpetuate this status in their offspring. They will jar the gears of the post-Keynesian economy in two ways. They will be unable to alleviate the pressures of aggregate demand since they will be unsuited for modern industrial operation and they will, by requiring subsistence support, contribute to the fires of inflation. Clearly we cannot permit these conditions to exist least we jeopardize the very fabric of our capitalist economy. For those already imprisoned as adults we can only improvise solutions and temporize, but for their young, we must do more. We must insure that as adults they escape this way of life.

What can nutrition do? Phrased another way, what happens to those who grow up chronically malnourished? Though we have little data in our own land for reference, we have ample evidence from other countries. Alan Berg, Chief of Food Resources and Regional Development, AID, in New Delhi, has reviewed this issue on a global basis. He cites not only the general consequences of malnutrition, but specific examples of changes in productivity when nutritional improvements occurred. Among the benefits he identifies are increased life expectancy and a fivefold increase in life time earnings among Brazilian workers when malnutrition was relieved. A threefold daily increase in work accomplishment among manual laborers occurred in another South American country when the contractor provided ample food. Hospitalization was reduced almost fourfold with better feeding. An example he cites is immediately applicable to infants: In Newfoundland, compulsory enrichment of flour is credited with a striking 40 percent decline in infant mortality. (18)

The most important correlate, however, derives from the increasing evidence of a relation between adequate nutrition during infancy and childhood, and ultimate intellectual achievement. The data may be inconclusive, the experiments incomplete, and the conclusions tentative, but we cannot risk inactivity or complacency in the face of the implications. If poverty appears to be self-perpetuating, and even acknowledging that its origins are multifactorial, adequate nutrition during the formative years may unlock the gate and facilitate escape.

We are concerned that the children of poverty may never function in the labor market of our country. Can we equip them with the skills they will ultimately need by assuring adequate nutrition at a time when key educational experiences are offered? The best study available, that of Craviota, De Licardie and Birch (19), indicates that language acquisition and development of skill in symbol manipulation are the neurointegrative functions which suffer most when malnutrition exists during early life. These are the very skills that prepare a child for an effective role in our complex, verbal, industrial culture. Adequate food will not convert the child of Appalachia into a Nobel Laureate but without the achievement of certain basic language skills, he will be destined only for manual labor, and today the opportunities for gainful employment as a manual laborer are shrinking rapidly.

Now we must examine what we are doing and we must yet do to assure adequate nutrition for our children. Our federal government is making food available to some of our most impoverished citizens. The Commodity Distribution Program helped 3 million persons in 1967; in that same year the Food Stamp Program helped 1.8 million people. (20) Thus, a total of 4.8 million citizens received help through one or the other program, but because of the wording of the Acts, the two programs may not operate simultaneously except during emergency situations. Unfortunately, as yet the presence of malnutrition has not been considered an "emergency situation." The magnitude of the programs must be considered in relation to the need. The poverty group, according to OEO statistics,

number 34.4 million with another 4 million economically marginal. (4) In effect the two distributive programs reach about 12 percent of those who need it, and only one-half of the national jurisdictions offer either program.

What about programs designed especically to meet the nutritional needs of infants, preschool children, and school children? Here, the picture is somewhat better, in part because of the existence of sound enabling legislation, in part because of administration by creative, well-informed, and devoted public servants operating at the federal level, and finally, because no small part of the legislative and public support for these programs comes from those anxious to create a dependable market to consume American agricultural surplus.

The School Lunch Program today feeds 18.5 million children and has a net worth in excess of $1.6 billion. The School Milk Program adds almost $100 million to this total and the School Breakfast Program a mere $4 million. But unfortunately, acceptance of these programs depends upon local option and individual payment by children, and this contribution fails to reach over 6.2 million of the almost 40 million children in public schools. Of the children who attend schools without a lunch program, over 87 percent are in elementary grades, and this program fails to reach any of the 5.8 million preschool children living in poverty.

TABLE VII.—NATIONAL SCHOOL LUNCH PROGRAM, 1967 FISCAL YEAR

[Dollar amounts in millions]

	Number	Value
Schools	72,944	
Children	18,500,000	
Federal contribution:		
Cash		$150
Value of food		188
State and local contributions		401
Children's payments		925
Food purchased by schools in local markets		874
Total program costs (Federal, State, and local) for food, labor, and other		1,664

Source: Personal communication, Mr. Herbert Rorex, Dec. 15, 1967.

The Children's Bureau in day care center or foster home programs operating under Title V of the Social Security Amendment of 1967 can assist in the purchase of food. In 1967, only 4582 children received assistance in this fashion. The Office of Education, using authority in Title I of the Elementary and Secondary School Act of 1965, and the 1966 and 1967 Amendments, can subsidize children too poor to pay their share of the school lunch program. It is estimated that about 8.3 million children living in families with incomes below $3000/year receive assistance in this fashion; the dollar value of this federal contribution comes to $21 million. Finally, the OEO through the Head Start Programs is funding a lunch program for upward of 200,000 preschool children annually.

The picture is obviously neither all good nor all bad. None of the programs with the exception of Head Start is focused on the group in greatest need and even these programs may miss many of the needy. Obviously large segments of the population of needy children, perhaps upward of 50 percent, get no benefit from any of these federal-state programs. In addition, infants, many preschool children, and large percent of needy school children get no aid.

The feeding of our children is a pressing national emergency and all our current efforts hardly measure up to the challenge. What can be done to meet the need?

Ours is a rich nation. We are blessed with a vigorous, literate population, a vast fertile, well-watered alluvial plain, incredible mineral resources, a sophisticated, massive industrial complex, and a distributive network, the capillaries of which profuse the smallest hamlet and the most remote villages. These operate within a political system responsive to its people and molded by the will of the majority.

Six percent of our people engaged in farming produce enough food to feed our 200 million people, and in addition another 160 million people in the rest of the world, while leaving untilled 50 million acres, almost one-half of our total agricultural resources. (20a) Production figures stagger the imagination and the numbers involved are difficult to conceive. Fifteen boxcars, each filled with 40 tons of produce, leave American farms day and night every minute of the year to provide the staggering annual total of 324 billion tons of food or forage.

Retail food sales amounted to $120 billion in 1965 accounting for about 20 percent of our Gross National Product. It has been said that with maximum utilization of our crop acreage we could feed one-third of the world (one billion people) while continuing to maintain the American diet at its present level.

The combination of fertile land, conservation of acreage, wise use of mechanical and chemical aids, inventiveness, and energy provide this land with agricultural capacity so far beyond that of any nation in the world, that comparisons become meaningless. Orville Freeman has said: "If we were as far ahead of the Russians in the space race as we are in agriculture, we would now be running a shuttle service to the moon." (1)

This picture of American agriculture, while correct, exists amidst a number of problems such as declining farm income and certain inequities in the distribution of goods and services between the farmer and the urban citizen. The fact to be stressed is not that all is well on the farm but rather that we can feed the nation abundantly without really half trying.

TABLE VIII.—ARITHMETIC OF FOOD, UNITED STATES

Annual per capita food consumption, pounds	1,280
Daily per capita consumption, Kcal	[1] (3,000)
Per capita cost per day	$1.20
Cost per pound	$0.40
Cost per 1,000 Kcal	$0.47

[1] Estimated.

Sources: (6) The New Information Please Almanac Atlas and Year Book 1966; (23) National Statistical Abstract, U.S.A. 1966.

TABLE IX.—COST OF ALLEVIATING MALNUTRITION IN CHILDREN

Cost of 500 Kcal (in dollars)	0.235
Children in poverty (in millions)	13.9
Cost per year, 500 Kcal per day (in billion dollars)	1.91
GNP 1968 estimate (in billion dollars)	807
Cost of 500 Kcal, percent of GNP	.147
Food cost United States per year (in billion dollars)	85.4
Cost of 500 Kcal, percent of food cost United States	2.24

Sources: (6) The New Information Please Almanac Atlas and Year Book 1966; (23) National Statistical Abstract, USA 1966; (24) "U.S. Output at 800-Billion Rate, but Inflation Trims Gain to 2.5 Percent," the New York Times, 1968.

Let us next examine the arithmetic of food in the USA and then the potential cost of improving the caloric intake of those children living in poverty. In comparison with our vast national wealth and our agricultural capacity, the expense is negligible. If we set as our goal the provision of an increment of 500 calories a day and assume that by accomplishing this aim we can eradicate malnutrition among children, we can do so at a cost of one-tenth of one percent of our estimated Gross National Product. Though in dollars the price is large, in relation to our wealth, it is trifling.

But we cannot alleviate malnutrition by merely budgeting dollars. The problems are far more complex. There are social and educational issues, personal preferences, and habit patterns. We must bypass what Margaret Mead has called the "irrational rigidity" of inadequate diets. Education becomes the hand maiden of any feeding program. Unfortunately we cannot even presuppose that appropriate federal enabling legislation will be available. Scrutiny of the hearings on the Stennis Bill before the House Committee on Agriculture suggests a callous attitude on the part of legislators reminiscent of that era of political organization when human values were disregarded. (10) Government dollars alone are no answer. But even if the federal programs were enacted, to succeed each will require the assistance of many disciplines.

To quote again from Alan Berg who said in discussing overseas feeding programs, "The relief of malnutrition is an interdisciplinary problem, but each discipline—nutrition, food technology, health education, marketing—tends to be a bit over-disciplined in prescribing its own solution. There is a kind of unrealistic parochialism that prevents a clear view of the aggregate problem." He goes on to say: "Another impediment is the gap frequently existing between the scientific community and the food industry—or stated another way, between the laboratory and the child's stomach." (18)

In contrast to conditions known to exist in developing countries, our situation is unique. We have a superabundance of food but fail to get it to those in need. The solution lies not in enactment of new and more comprehensive federal legislation, though some may be needed, but rather in a novel organization of public,

private, and philanthropic groups. The issue must be met along several lines, involving primarily education and distribution, and secondarily, methods to guarantee availability and cost control.

The food industries of the United States should take the initiative, enter into a unique partnership with government, at the federal, state, and local levels, and in conjunction with a philanthropic foundation, undertake responsible action to insure solution. Model nutrition programs can and must be established in well-circumscribed geographic areas where poverty is known to exist and the presence of malnutrition substantiated. All the resources of industry for supply, education, and distribution must be marshalled and an attempt made to lift the nutritional level of the area. Follow the guide lines established in overseas programs: reorient eating habits by nutrition education at all levels, encourage local participation and implementation and help to establish the necessary local agencies to perpetuate the programs once external sponsorship retires. The food industry can make programs work. It has the financial resources. In 1965 it was the second largest manufacturing group in the country, with a value of manufactured products in excess of $23 billion and a net income before taxes of over $14 billion. It has the technical knowledge of food production and distribution and its member concerns are masters at the art of salesmanship. As evidence we can cite their success in establishing products for nutrient supplementation in developing countries: "Vitasay" in Hong Kong, "Pronutro" in South America, and "Incapurina" in Latin America. The illustrations concern only food supplements, but the lesson learned can be applied to nutrition as a whole, and they indicate the critical role that the food industry can play in determining the success of such programs.

Utilize the local food store or supermarket not only as a distributive agency, but also as an educational arena; assure that within the selected geographic area the basic federal support programs are operative, particularly the Food Stamp and Commodities Distribution programs. Involve the schools, the churches, the civic organizations, and community action programs; educate, distribute, improvise, and feed. Demonstrate to the world that we have not only the food but the imagination to insure that none go hungry, and can do so not by demanding only more federal dollars, but rather by recruiting an imaginative and creative program spurred by private industry working with a foundation and government. To fail is to court disaster. Not to try is cowardly. To succeed is to open new vistas of national productivity.

The obligations of the private sector become clear in the following quotation: "Economic policy in the United States economy, which now enjoys a productive power and wealth outdistancing the most fanciful expectations of a decade ago, is ultimately a moral problem. The traditional economic problems have become secondary not because they are no longer of prime importance, but rather because they are relatively solved. We have learned conclusively how to avoid great depressions, and we have made significant progress toward reducing the frequency and scope of even minor recessions. But we are not facing up adequately to the ultimate moral question that underlies all economic endeavors: What portions of our total annual product should be devoted to the ultimate purposes of serving pressing social needs, lest wealth accumulate and men decay?" (21)

The future of our country depends upon those with imagination, compassion, energy, and determination. They can, through exercise of these talents, lift our children from poverty by assuring that none will live in want of food.

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The CHAIRMAN. Thank you very much for an excellent statement, Dr. Lowe. I think before we address any questions to you, I would like to have Dr. Coursin summarize his statement if he would do so at this time.

STATEMENT OF DR. DAVID BAIRD COURSIN

Dr. COURSIN. Mr. Chairman, members of the Senate select committee, I, too, greatly appreciate the opportunity of appearing before this committee, and participating in the hearings on the problems of nutrition and related human needs.

At the outset, I have identified my background and the results stemming from our original findings of the relationship of nutrition to brain function.

The CHAIRMAN. We will ask that your entire statement be printed in the record, Dr. Coursin.

Dr. COURSIN. If I may move through it rapidly, then, Senator McGovern, my personal concern here is as an informed private citizen as well as a member of the various committees that I have listed. I have been interested in the development of an orderly study such as the national nutrition survey has represented. This survey has provided the information that has already been extensively discussed, and I will not dwell on that to any degree.

I would like to point up the fact that we are not looking at a singular situation wherein nutrition is the all or none of the problem, or that education is the all or none of the problem, or that better distribution of foods would answer all problems; that we have a complex sociological, psychological, educational mix intertwined with medical situations as well as the overall nutritional substructure.

The terminology used in the last few days has been discussed at length, relating to the problems of hunger, starvation, and nutritional disease. I would stress, as my colleagues have, that we are looking at problems that do not evidence themselves readily as far as clinical appearance is concerned. In reality, we are seeing the results of adaptation of the human to the complexities of his environment, and as such, we are drawing from his potential capacity for his future well-being, with detrimental effects to his physical structure as well as his mental one.

Our early work in the late 1940's and early 1950's, demonstrated that a single nutrient, vitamin B_6, having just borderline deficiency within a given formula in an infant population could produce a change in the neurochemistry of the brain causing neurophysiological alterations of function with consequences in clinical ability and performance. These were indicated by hyperirritability, by convulsive seizures, and by behavioral changes and mental retardation.

The CHAIRMAN. You were the doctor who made that discovery, were you not?

Dr. COURSIN. That is right, sir. I was the person who identified for the first time that this chain of events that we are addressing ourselves to in these last several weeks could take place with a single nutrient. This was not under experimental circumstances, but under normal dietary conditions where the borderline for normal was 100 micrograms for a quart of breast milk compared to the 60 micrograms per quart in the formula in question.

One can readily see in this situation that the single nutrient diminished by that small amount produced detrimental effects. Furthermore, under special circumstances of the inborn error of metabolism of vitamin B_6, irreversible brain damage can be produced.

I would move on from that to note that as Senator Kennedy mentioned, the whole gamut of inborn metabolism in which PKU, galactosemia, and perhaps 80 others are single nutrient defficiency problems that affect the brain. If we lose you with the large names we use for these disorders and the enzymes we refer to, you will find that each identifies a single nutrient that if abnormally handled by the metabolism of the body or brain, results in a detrimental effect.

In the past 5 years, there has been a tremendous amount of interest in nutrition and brain function with studies throughout the world. I have served either as an adviser or consultant to most of these studies, and have firsthand knowledge of those in Mexico, Guatemala, Chile, South Africa, Kenya, Egypt, India, and Japan. The findings are that as a result of moderate to severe undernutrition, you do have effects on brain function that can amount to a diminution of 10 to 15 percent below what we might have expected the individual's potential to be.

I am not identifying this as severe mental retardation under these circumstances but I am talking about 10 to 15 percent off the top, which I think you will all agree would immediately clear this room of all participants and Senators, if we should have such detrimental circumstances abroad here.

With reference to other aspects of the problem, let me emphasize as I have already indicated that this is the result of an environment of malnutrition. The complex that I have alluded to, places this beyond the range of a simple approach of improving a single factor and resolving the situation.

Dr. Lowe has commented on the problems that are inherent in the utilization of the ordinary nutrition survey. Let me point out that the real consequences with which we are concerned far transcend the survey we have at hand at this point in time. It is confined to documenting the size of individuals, identifying their chemical profiles, and proving that they have a poor dietary intake. What we are really after is the problem of the individual's capabilities and actual performance. This is the direction to which we must look in the future, the avenue we must pursue immediately.

At the present time there are several such studies in the world, one in Guatemala, at the INCAP group (Canosa et al.), and one in Mexico City at the Hospital Infantil (Cravioto et al.). I have in hand the new manual of operations for the Guatemalan study, that brings into perspective the complexities of undertaking studies of this comprehensive nature.

With respect to the future, it would obviously be presumptive of me to suggest how we might solve all of these problems. However, some points are of particular importance:

1. The national nutritional surveys must be continued, since these have just begun to provide us with information that has been so sorely needed over these years.

Historically, we have had far better data on some 33 foreign countries. It is noteworthy that we are finally in a position to have even the briefest preliminary data, which is in reality what Dr. Schaefer's presentation contained, to have something to mount a Senate meeting about.

I would strongly recommend that these studies be continued. As to how many States, I think this is something to be resolved later. Certainly the sample size, with only several States partly done, several more touched on, 10 to be done, must necessarily be completed.

2. I have already indicated that solutions to the problems are different in different parts of the country, and therefore one cannot extrapolate from the meager data presently at hand, or from just a few more studies.

3. Whatever solutions are designed, must be monitored in the future, so that we can identify whether or not there has been real success in utilization. If we cannot do this, we are simply kidding ourselves with respect to their real effectiveness.

4. The classical type of survey such as we have necessarily been dependent upon, must give way to surveys which will evaluate physical and mental ability and performance, so that the true consequences of malnutrition can be quantitated and treatment evaluated by these techniques.

I have already identified, and Dr. Lowe has elaborated upon, the problem of structural changes of the brain that result from malnutrition during the first years of life. There are also differences in performance that occur with ongoing poor nutrition. These do not relate specifically to structural alterations in the brain, but are caused by reduced energy available for brain function.

5. Finally, an overall view of the problem suggests that our present framework of operation has been inadequate.

It would be invaluable to establish a single agency of responsibility within the Federal Government that would identify the needs, would correlate the facilities that are at hand, and, hopefully, be more productive in providing solutions for the future. This should also include nonprofit organizations, the universities, and private industry.

With this mechanism, one could hopefully bring together the forces that we already have at hand, modifying them as necessary, and expanding them to meet the needs of the future.

Thank you very much, Senator.

The CHAIRMAN. Thank you, Dr. Coursin.

(Dr. Coursin's prepared statement follows:)

PREPARED STATEMENT BY DAVID BAIRD COURSIN, M.D.

Mr. Chairman, Members of the Senate Select Committee, I greatly appreciate the opportunity of appearing before this Committee and participating in the hearings on the problems of nutrition and related human needs.

My name is David Baird Coursin, M.D. I am the Director of Research at the Research Institute, St. Joseph Hospital, and the Lancaster Cleft Palate Clinic in Lancaster, Pennsylvania. My curriculum vita accompanies this material and provides pertinent background information that may be of interest. For purposes of our discussion today, it may be helpful to identify my position as a member of the Subcommittee on Maternal Nutrition and the Subcommittee on Vitamin B_6 of the Food and Nutrition Board, National Research Council; member of the Malnutrition Panel of the U.S.-Japan Cooperative Research Group for the Far East; the ad hoc group for interpretation of the National Nutrition Survey; recent past member of the Committee on Nutrition, American Academy of Pediatrics; and Consultant to HEW, AID, NIH.

In these various capacities, I have been deeply interested in the problems of malnutrition in the developing infant and child with particular concern for its effects on physical and mental growth and development. Until the past two years, the major work in these areas had been carried out in foreign countries under the guidance of ICCND, NIH, AID, OIR and various private foundations. As an informed private citizen and a member of a number of expert Committees during the past 10 years, I have repeatedly called attention to the problems of malnutrition existing in the United States and have strongly recommended that an orderly survey be undertaken to properly evaluate the scope and content of this problem. With adequate information, it would then be possible to develop a satisfactory means of modifying and expanding our already considerable efforts in meeting these needs as well as providing for long-term monitoring of the effectiveness of the procedures that would be utilized. It is indeed incredible that until the past several years we have had far more information on 33 foreign countries than we have had for the entire United States.

Recently several studies have been undertaken by various agencies, including the National Nutrition Survey. In addition, a number of smaller projects have been mounted in various parts of the country. While each of these has made some contribution, the National Nutrition Survey has been designed to explore the broadest prospective of the problem. Dr. Arnold Schaefer, Dr. William McGanity, Dr. Patrick Morgan and their colleagues have very competently presented a preliminary analysis of data that is now available from Louisiana and Texas. In order to avoid reduplication, I will simply indicate that I have participated in the ongoing review of this material and concur with their observations. If there are specific areas to which I may contribute further, I will be happy to do so later in this session.

I shall therefore confine my discussion to a consideration of the broad significance and consequences of the findings of malnutrition in the National Nutrition Survey. For this purpose, I would like to establish some guidelines in accord with those already presented—reaffirming and extending them.

1. That it is the inherent right of each individual to develop to their fullest physical and mental growth potential within their genetic capacity.

2. That this development may be affected by any of a variety of factors (sociological, psychological, educational, economic, traumatic, infectious, parasitic, nutritional, etc.). All of these depend to a large extent on how early in life they exert their influences, how extensive they may be and how long they persist. Furthermore, it should be noted that these diverse background factors have nutrition as the focal point of effect. Therefore, in analyzing this complex situation, it is evident that little real improvement can be expected with upgrading of these various influences unless their progress is reflected in better nutritional status in time to prevent irreversible physical and mental changes.

3. The question of terminology is always a difficult one—particularly when words such as hunger, starvation and nutritional disease have been so widely used to exemplify the problem of malnutrition. Actually these designations are of little value in describing the situation, since they are applicable to only a small percentage of the vast numbers with whom we are concerned. These populations have been experiencing poor nutrition over prolonged periods of time—often their entire lives. They may not be hungry or starved, but their malnutrition may have produced changes in biochemical metabolism of their body cells, thereby producing limitations in their growth and development. It should be further noted that despite extensive malnutrition, most individuals will not show skin sores, blindness, bleeding gums, bowlegs, etc., as obvious symptoms of their deficiencies. More often they will show decreases in their overall growth and development as well as alterations in their biochemical composition as evidence of the tremendous adaptability of the human body that permits it to adjust to malnutrition without serious external symptoms. However, in making these adjustments, the body cells must sacrifice many important aspects of their functional capacity, resulting in changes in physical and mental growth and development. The individual's physical size is generally decreased as may be their potential mental ability and performance that can be reduced by some 10 to 15 percent below expected normal. These figures may not appear to be large but I am certain that you will agree that they are of sufficient order of magnitude to impair the individual's capacity for education as well as future productivity As such, he becomes less of an asset to himself, his family, his community and his country.

These concepts are valuable in interpreting the National Nutrition Survey that has provided us for the first time with meaningful data from dietary surveys, anthropometric and biochemical measurements and other parameters made in well-selected samples of the population. I will not review the actual figures that already have been presented but will emphasize the importance of the terms acceptable and unacceptable as criteria for analysis. Furthermore, one should realize that the unacceptable figures for a given measurement not only identify deficiencies in that specific area but may be interpreted as indicating a more general state of undernutrition with other accompanying deficiencies.

As my colleagues have stated, the survey's findings are indicative of the presence of a significant incidence of malnutrition within the United States. However, important as these figures may be in documenting the dietary, anthropometric and biochemical aspects of the problem, they do not convey the real consequences of the potential effects of malnutrition in these populations. The major concern is with the possible impairment of physical and mental ability and performance.

One of our main areas of research during the past 20 years has been the relationship of malnutrition to brain function. In this concept, the nutrients in the diet supply the chemical constituents and energy for the brain, affecting its growth and development, its physiological function and the individual's resultant clinical ability and performance. You may recall that by four years of age some 90% of brain growth has occurred with coincidental tremendous increases in numbers, size and complexity of brain cells. It is during this critical period of rapid growth that the brain is most vulnerable to nutritional deficiencies with the likelihood of irreversible changes being produced that remain throughout life. These effects of undernutrition have been found to be dependent on the early onset of deficiency, its severity and duration. It should be further noted that while the completely formed brain of adult size is much more capable of withstanding the effects of undernutrition, it too may function abnormally if the individual suffers deficits of sufficient duration to alter the normal molecular mechanisms of intelligence, learning, memory and behavior.

Research studies reported in the early 1950's by the Research Institute, St. Joseph Hospital, demonstrated that the borderline deficiency of a single nutrient such as vitamin B_6 could produce this sequential effect in the brain of the developing infant causing hyperirritability, behavioral disorders, convulsive seizures and mental retardation.

Other well recognized examples of the nutrient-brain function relationship are the inborn errors of metabolism or genetic abnormalities that cause the metabolic mishandling of single nutrients by the body resulting in damage to the brain producing mental retardation. PKU or phenylketonuria is one of the most widely known of this group of which an increasing number of new forms are being identified.

During the past 5 years, there has been a rising tide of interest in the effect of moderate and severe general undernutrition on brain function that has led to a number of studies in developing countries. The severe forms of multiple deficiency malnutrition, known as kwashiorkor, marasmus and protein-calorie malnutrition (PCM) that begin early in life are severe in degree and persistent. Reports from Mexico, Guatemala, Chile, South Africa, Kenya, Egypt, India, Japan and other countries all indicate that youngsters who have experienced these forms of malnutrition have deficits of 10% to 25% or more in what would have been expected as their normal potential for ability and performance. Let me point out that I am not equating these children with limited performance to what is commonly thought of as severe mental retardation with deficits of 70% to 80%.

However, there is no doubt that even a very modest 10% to 15% decrease in mental capabilities is enough to have a significant impact on the individual's existence. When one realizes that authoritative estimates categorize more than 300 million infants and children as being at nutritional risk that may cause varying degrees of changes in brain function, the importance of this problem becomes overwhemingly apparent. We are no longer simply saying that diet is poor, that growth is stunted, and biochemical composition is unacceptable; but are translating this into consequences that will limit capacity for education, productivity, and contribution to self, family, community and nation.

Obviously, malnutrition and brain function, per se, are the result of the dynamic interaction of many forces— some genetic but for the most part environmental including economic, sociological, psychological, and educational influences as well as availability of food, dietary habits, etc. This complex of forces is variably altered by poverty, producing the problems with which we are all concerned. In quantitating any of the aspects of the situation, we find that techniques of measurement are not as sensitive as they should be, so that we may well be underestimating some of the influences and effects within the total picture. The magnitude of the problem and the world-wide interest in it has stimulated a great deal of new research in development of more sophisticated techniques for measurement by competent scientists in the various disciplines involved.

At this point in time, several well-designed longitudinal research projects are in progress in Guatemala by Canosa et al., at INCAP; and in Mexico City by Cravioto et al., at the Hospital Infantil, evaluating the effect of undernutrition on brain function. These are multidisciplinary programs with design and instrumentation to explore the various factors that have just been discussed. In addition, existing techniques are being improved and new ones developed to meet the needs for greater sophistication in analysis. One such procedure that has been of particular interest to us is the use of electrophysiological measure-

ments to provide the necessary third dimension for interrelating the already documented parameters of nutritional status and psychological test performance. With further progress in methodology and its application in appropriate studies, we look forward to an increased understanding of the effects of malnutrition on brain function and the effectiveness of programs designed for its treatment.

It would be presumptuous of me to undertake a discourse on the factors that may have contributed to the existence of malnutrition in the United States, or to make singular recommendations for their improvement. Certainly, Government agencies, as well as the private sector of the country, have endeavored to meet the nation's needs. Unfortunately, these efforts have not been sufficient, nor as effective in many instances as might have been expected. The problems are complex with political overtones, economic circumstances, education inadequacies, difficulties in logistics, in management, etc., etc. Suffice to say that there is a deep concern for the existing situation and a general desire to improve it. With these goals in mind, a number of important considerations should be emphasized.

1. The National Nutrition Survey has just begun to identify the scope and content of the national problem. It will be absolutely necessary that the surveys continue with adequate funding for personnel, facilities, equipment and ongoing operation, so that a realistic view of the total problem can be documented and analyzed.

2. Satisfactory solutions based on the survey's observations will vary in different parts of the country since there is no single panacea that will be universally applicable.

3. Solutions that may be proposed and instituted must be monitored in the future with well-designed criteria for measurement of their success and establish means for implementing modifications that may be necessary to gain further improvement.

4. The classical type of survey such as we are necessarily dependent upon at this time must be further improved in the future to include means of measuring physical and mental ability and performance so that the true consequences of malnutrition can be quantitated and treatment evaluated by these techniques.

5. The broad scope of the entire problem is clearly beyond the sphere of responsibility of any single agency now functioning within the Federal Government. While each interested division is operating productively within its circumscribed domain, the multifaceted nature of the problem is such that there must be active collaboration among the responsible agencies so that each may profit by the expertise contributed individually and collectively. Such an arrangement would bring to bear the necessary forces in a cooperative structure that would share the total problem and most effectively combat it with the conjoined efforts of the separate divisions providing the necessary parts of the whole. In carefully examining the overall situation, it is apparent that it is primarily one of health, education and welfare, with the obvious equally important inputs from agriculture and economics. In addition, a number of non-Government agencies such as the Food and Nutrition Board of the National Research Council; the American Academy of Pediatrics; the American Medical Association; Universities and Private Foundations; and Industry all have important contributions to make. As a matter of fact, the successful partnership activities of the Federal Government and private industry are the key to implementing the programs that are devised to meet the needs of malnutrition.

It is therefore imperative that a working organization be structured that includes representatives from these various important groups so that it may provide the mechanism for integration of expertise, effort and effectiveness that is so sorely needed. The categorical designations of Federal Government, Advisory and Liaison membership in such a group may serve to accommodate the various participating members. In any event, the organization must be established at a level in the Federal Government that will assure the necessary authority and funding required to cope with the mechanics of interdepartmental and intradepartmental responsibilities and cooperation.

Dr. Cohen, in his testimony of January the 10th, outlined the broad scope of National Nutrition Administration. Dr. Schaefer, in his testimony of January the 22nd, expanded on the subject with the objectives of the National Nutrition Center—specifically itemizing its responsibilities, both in the U.S. and abroad. Incidentally, since undernutrition is universal, there are many opportunities in other countries for studies of specific projects, developing solutions for them, and facilitating cooperative international relationships.

I would, therefore, recommend to the Committee that the concept of establishing an organization with the responsibilities and capabilities of coordinating an overall program in Nutrition be considered by them as one of the major requirements for success in the future. Without this means, we will undoubtedly continue to fall far short of our goals, despite increases in expenditures of time, effort and money within our existing framework of operation.

In closing, may I express my appreciation to the Committee for this opportunity to participate in these hearings. It is most encouraging to have your competence focused on the problems of Nutrition with your recognition of their complexity, magnitude and importance to the United States and to the world.

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Professional associations

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American Association of Cleft Palate Rehabilitation.
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Member of the Visiting Staff—Philadelphia Children's Hospital.
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Vitamin B_6 Metabolism and Nutrition.
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The CHAIRMAN. Dr. Lowe, if I could just ask two or three questions of you, to begin with, on page 6 and the next couple of pages, you talk about the importance of nutrition in what you call the normal development of infants and children.

I presume you mean the overall development of the child, physical and mental development.

Is it your view, or do I read correctly, that nutrition is the most important factor of those things that enter into the development of the youngster?

Dr. LOWE. Within the context of the coexistent aberrations that I identified. I include fetal wastage or infant mortality, prematurity, mental retardation, and malnutrition.

This is the constellation of aberrations which go together.

I don't mean to imply, sir, that a child can be reared in a home with no intellectual stimulation. I don't mean to imply that. This is obviously critical, but I think the key to changing our national health picture with respect to infants and children is nutrition, and I believe I can document that.

The CHAIRMAN. I think it was Dr. Margaret Mead who appeared before our committee and said that, while it was difficult to single out any one cause of the cycle of poverty and underdevelopment, we are not going to win that overall battle unless we first win the battle of hunger and malnutrition.

Is that in effect what you are saying here, that that is the first factor that has to be solved, if we are to break the cycle of poverty in this country?

Dr. LOWE. That would be my opinion, not only the first, but the most readily approachable.

The CHAIRMAN. You refer on page 10 of your statement to manufactured formulas which you identify as the chief source of nutrition for infants. Are there cases of food of that kind having been put on the market in condition that was unsafe for children?

Dr. LOWE. Yes, sir.

The CHAIRMAN. Is that a common practice? Are there considerable numbers of those manufactured foods that you would not feel were adequate for infant feeding?

Dr. LOWE. The answer must be divided into two parts.

First of all, there have appeared on the market proprietary, formula preparations which no nutritionist could accept.

Unfortunately, the Food and Drug Administration, although it seized the product eventually, lost its case in court, because it did not have the authority to act in this instance. This is one type of product.

Now, the other problem with inappropriate formulations has to do with the microelements, rather than the macroelements. One of them would be vitamin B_6, to which Dr. Coursin referred.

What has happened in the past, and I believe I can cite four instances, is that a manufacturer has a product which appears to be a fine product, supports infant growth. Then he makes a minor change in manufacturing procedure. Now a whole series of calamitous events occur. Microelements in the formula suddenly become inadequate, inappropriate, or destroyed, and what has been accepted by the public as a sound product is now obviously not sound.

This is quite different from the first instance, where a clearly inappropriate product is on the market.

The CHAIRMAN. How do you as a nutritionist evaluate, though, the present level, the present value of the better products that are available on the market for infant feeding?

Dr. LOWE. My opinion is that they are excellent.

The CHAIRMAN. They are?

Dr. LOWE. Yes, sir.

The CHAIRMAN. Could more be done by the fortification of those products, if the industry turned itself to that problem as a high priority?

Dr. LOWE. I think the only element of fortification to which we must look at the moment is iron. There appears to be a real need for readily available sources of iron for American infants.

Change the iron. Other fortification is adequate.

The first part of your question was, are formulas generally sound, and I think they are of high quality.

The CHAIRMAN. This question could be answered by either you or Dr. Coursin.

I think one of the problems we are up against, or will be up against if this committee makes recommendations for either changing or modifying or expanding our present program, is that we are going to have to justify the cost estimates to the Congress.

In your view, having dealt with this problem over a long period of time, how would you compare the cost to our society of permitting the present level of malnutrition to continue, as over against what it would cost us in effort and dollar outlays to correct that problem?

I know you cannot do this in absolute terms, but can you give us some idea of what you see as the cost to this country of permitting large numbers of our children to be malnourished?

Dr. LOWE. Well, I can give some estimates. These are gross, rough, but I believe defensible.

If one assumes that the caloric deficit of children in this country amounts to about 500 calories a day, and that these are balanced calories, that is, protein, carbohydrate, and that the cost of these 500 calories is about 25 cents, you can multiply that by the number of children living in poverty and you have a dollar figure.

When I calculated these values, it was estimated that there are approximately 14 million children living in poverty. This was two and a half years ago. It is now clear that the number is lower. If it is half this number, then the annual cost per year to supply these calories would be of the order of $500 or $600 million.

This is clearly a negligible amount.

The CHAIRMAN. Of what age brackets are you talking?

Dr. LOWE. Children 15 and under.

This is clearly a very small amount.

The CHAIRMAN. Just a rough estimate, a half billion dollars would close that nutritional gap for children in this country in poor families, 15 years of age and under?

Dr. LOWE. It would be my estimate that this would, in fact, accomplish that purpose.

The CHAIRMAN. There probably is no estimate, is there, of what it costs not to do that, in terms of the loss of contribution to society?

There is really no way to estimate that, is there, for youngsters who will go through life producing at somewhere below par, both intellectually and in terms of their productivity, and other factors that we use to measure the contribution of the individual?

Is there any way we can measure that cost to society?

Dr. LOWE. I think you can estimate the difference between mean lifetime earnings of a middle class wage earner and the mean lifetime earnings of an individual who is born, reared, lives, and dies in poverty.

If you multiply this by the numbers that you assign to poverty, you achieve some estimate of the loss to the economy.

In my opinion, this would be billions and billions of dollars that are lost in terms of productivity.

There are firm figures available through the Public Health Service on what earning capacity is lost through illness per year by disease by age group.

Unfortunately, I don't have these figures in my head, but they would be available.

Malnutrition, unfortunately, is not one of the diseases included in this category.

The CHAIRMAN. If you run across any estimates of this kind, and of course, we know they have to be tentative and cannot be any more than that, I would appreciate it if they could be made available to the committee.

I don't know whether anyone has ever attempted to really set down the rough estimates of what it costs this country in terms of lost productivity because of the malnutrition that exists, but if there are such studies, I would like to see them.

Dr. LOWE. I would be pleased to try to get them for you.

(Information will be printed in a later volume.)

The CHAIRMAN. Dr. Coursin, do you have anything to add on any of these points I have raised?

Dr. COURSIN. No.

The CHAIRMAN. Senator Ellender.

Senator ELLENDER. This is becoming more complicated. I thought we would be able to find some ways and means of getting action quickly, but according to your testimony, I presume that it will require a lot of time to make more studies. I would like to ask you this, Dr. Lowe.

In answer to a question by Senator McGovern, you suggested the breaking of the cycle of poverty. How would you do that, if you were a legislator?

Suppose you were Senator in my place. What would you do? I mean to get quick action.

I can well understand the losses sustained because of malnutrition. I can well remember when I fostered the first Public Housing Act, when I came to the Senate in 1937.

By men sleeping in a good bed at night, where there are no mosquitos or bedbugs or anything to bother them, they figured that their capability of giving 8 hours work would be increased by maybe double or triple.

We made estimates that helped us out in getting Congress to act. Now we are confronted with malnutrition, and we must do something about it now, not tomorrow, but now, as I see it, according to many of our colleagues in the Senate.

But everything I have heard since yesterday has been that we need more and more hearings, more studies of different kinds.

This idea of yours of finding a way to break the cycle of poverty interests me, and I would again like to ask you the question: How would you do it? If you were a Member of Congress, as I am, what would you do?

Dr. LOWE. First, let me say, sir, you must realize that I have neither your wisdom nor experience in legislation.

Senator ELLENDER. God pity you.

Dr. LOWE. In the legislative process.

Senator ELLENDER. We are trying to get wisdom from you. That is why we have you here today.

We are legislators, and you are telling us that the first thing you would do would be to break the cycle of poverty.

That is a nice sentence to repeat on a stand, or give to intelligent people. I wonder how would you do it.

Dr. LOWE. May I make some suggestions for positive action?

Senator ELLENDER. Just imagine that you have my wisdom and yours combined.

Dr. LOWE. A marriage of the two of us?

Senator ELLENDER. Right.

Dr. LOWE. First of all, I wanted to say I do not propose delay. I am sympathetic with your statement this morning, that steps should be taken when and where malnutrition is identified. It is morally reprehensible to say we must wait until a national survey is completed, and I believe I emphasized in my testimony that where particular pockets of malnutrition exist for reasons which may or may not be related to poverty, we have a national obligation to relieve it, I am not proposing delay.

But I would say there are a number of steps which could be taken for the long-range relief of poverty.

First, let me be critical of two steps that have been taken.

I believe the commodity distribution program has failed, and has failed for at least one important reason. For example, housewives are not used to receiving flour to make bread. They don't know how to make bread and many poor have no ovens. They are used to buying bread. They are not used to receiving lard to be cooked into something.

Therefore, although the calories are good, and the protein is good, the ordinary recipient of these products frequently finds herself——

Senator ELLENDER. Now, I happen to be chairman of the Committee on Agriculture and Forestry, and do you know how that program started?

Dr. LOWE. I have read the legislation, sir.

Senator ELLENDER. It was to get rid of our surpluses. We did not have in mind the number of calories that we would give to one family or the other family.

As I said yesterday, and I think this morning, I know of some families that got four or five times more butter than they could consume in 30 days. Some of them got butter who never used it before.

I admit to you that there is no doubt that the bulk commodity program has somewhat failed, if you consider it from the standpoint of giving a balanced diet. That is why we are trying to substitute the bulk program with the food stamp, so that a person can use the money that he has on hand to buy what he needs, and then we will supplement that budget by giving him free stamps.

In other words, with $25, or with $3, he can buy $48 worth, if he is so poor that $3 is all he has. But if he has $60 to spend, he might be able to get $100 worth of stamps for that $60.

The idea was to give him a chance to obtain a balanced diet.

That, in my opinion, has not worked too well, either.

It is my belief that, if we can have a food stamp program, and then have the fathers and mothers of the children we are speaking about now educated somewhere as to how best to use what they can buy, that would be a good start.

The knowledge that we could obtain could be disseminated by the same agency that has disseminated the knowledge to the farmers through the Extension Service.

If we start now creating new bureaus and getting in new people, it is going to be a big job.

I would like to use what we have on hand now, so that we can go ahead with that work tomorrow, instead of the year after next.

Dr. LOWE. Sir, my comments suggested polarizing effort, and I intentionally left to the wisdom of this committee the decision of whether a new agency or an existing agency should have this responsibility.

I believe it is in error today to have responsibility for nutrition surveillance, distribution, research, and so forth, distributed among many agencies of Government. This is a unique responsibility and, as I hope my testimony indicated, a critical one for this country.

Would you like me to continue to answer your question?

Senator ELLENDER. I would like you to answer my question of a while ago.

Dr. LOWE. I started with criticism of the commodity program.

I believe the food stamp program also suffers because the food stamps are not free.

Senator ELLENDER. They are not what?

Dr. LOWE. They are not free.

If your goal is not to relieve malnutrition, but to try to provide a moral lesson in living to the recipients of food stamps, perhaps it is important to charge for it.

I am distressed at the shibboleth that continues to circulate in the country, that a large number of able-bodied males are the recipients of welfare, and upon occasion the recipients of commodity distribution programs and food stamp programs.

The last estimate I read is that of the 9 million humans on welfare, about 50,000 are able-bodied males, so that welfare, the food distribution program, and the food stamp program basically serve mothers and children. It becomes our responsibility to see that they get food, and if the $3 or $5 or $6 charged for food stamps interferes with their ability to get nutrition, then it would be my proposal that the food stamps be distributed free, keeping in mind our goal of getting food to them.

Now, what other steps should we take?

I am sympathetic with your ideas about education. Clearly, there is an educational element, but one cannot educate a person to buy proper food if he does not have any money to buy the food.

It appears to me that here is the place where the private sector of our economy can operate. Nutrition education today, for better or for worse, is conducted by private industry. They teach us to eat what they want us to eat; thus their products are sold.

If I were sitting in your chair, I would try to bring private industry in and use their merchandising techniques to educate the American public on what a sound diet is.

Now, I would agree with you that some malnutrition in this country reflects ignorance, and there is a perfectly good reason for it.

Our families today, our young families, 20-year-old, 18-year-old girls, and husbands of the same age, leave an area where traditional wisdom can support them. They no longer live with their parents or grandparents, and so they strike out on their own, and have very

limited knowledge of nutrition. When their infant is born, the child suffers.

So the first step I would take is to try to bring private industry in to use their merchandising techniques, not to sell their product, but to sell sound nutrition. I think they could help us, and at very little cost to them.

Senator ELLENDER. Those who sell the goods, the knowledge, would be the people I spoke of a while ago, that is, people who are now employed as county agents and the extension workers.

You see, we have food experts. I remember we had them in my parish 35, 40 years ago. You had home economics taught. You had the lady there to teach you how to brew coffee and make milk drinks, and how to take care of children. That lady used the knowledge that was then at hand.

Now we have improved all of this, and I am wondering why we can't get that same lady, with improved knowledge that she gathers, to do the same thing now as she did 40 years ago.

Dr. LOWE. Well, I read Secretary Freeman's testimony which related to this proposal. I am skeptical that the county agent is the person to provide nutrition information.

Senator ELLENDER. Why not? What is your objection?

Dr. LOWE. Partly, sir, because much of the malnutrition in this country is not rural.

I find it difficult to visualize the county agent operating in the Bronx.

Senator ELLENDER. Under the law, you can have the Extension Service in the city, if the authorities there will cooperate with the Government.

Dr. LOWE. I realize that.

Senator ELLENDER. What I am trying to do, and have done in the past, is try to make this a cooperative effort between the Federal Government, the counties, and cities, as well as the States.

If you throw that all in the lap of Uncle Sam, I am just afraid Uncle Sam will not be able to carry the load, and that is one of our troubles, here. It has to be done on a cooperative basis. Some of the cities will not cooperate.

As I pointed out this morning, big cities like Boston and New York had the same opportunity to get into the food stamp program or the school lunch program as the smallest city in the State of Louisiana. We have it all over our State. It has done fairly well.

In many areas like New York, Massachusetts, I don't know why, but the people there will not cooperate to get any of these programs going in their own area, because it costs a little money. They did not like to work with the Federal Government, some way or another.

That is why in many areas these programs, although considered good, did not spread so readily in the States of the Northeast.

Dr. LOWE. They are also local option, are they not, Senator? They are local option programs and require contribution from the community that receives them, and I would suspect that in many instances this militates against acceptance.

I am not proposing that all good flow from the Federal till, but I am trying to explain why I believe some of these programs have failed to meet acceptability in individual communities.

Senator ELLENDER. Well, except for the statement about the bulk food program, we realize that that was not too good, because we had so few surplus commodities to distribute.

Dr. LOWE. This is now improved.

Senator ELLENDER. Exactly, and the way we got Congress to do it was to simply say, "Here is the food now. We will just distribute it among the States that will cooperate with us to divide it up among the people in a certain area."

Then came the food stamp program. I consider that a good program. It can be made into a good program, if only there would be full cooperation between the local people and the Federal Government.

When I say local people, I mean not only the people who consume this food, but the counties in which they live, the cities in which they live, as well as the States.

If you had full cooperation, there is no doubt that you could make these programs work very well.

Dr. LOWE. I am not sure.

Should I continue?

Senator ELLENDER. Yes, sir.

Dr. LOWE. You asked for other steps which might be taken.

I would suggest rapid implementation of day care centers. My impression is that legislation passed in the last Congress provided authority for the HEW to support and enlarge day care centers.

I think this will provide a unique opportunity for starting nutrition in the very young.

Senator ELLENDER. Would you have that in every State?

Dr. LOWE. I would have it every place you could build it, every place there are infants.

Senator ELLENDER. I know they have a good system like this in Russia. I recently returned from there. I spent 53 days in Russia.

I went to Stanislav, which is on the border of the dry land area, where in a city of about 200,000 people they had more than 100 day centers, kindergartens, where the children in kindergartens were taught, where they were fed, and they took care of children from 3 months on up, while papa and mama worked in the factories.

They had doctors there, nurses, and it was done at a small cost to the fathers and mothers. Depending on the salaries they got, a child could be taken care of for a ruble a month. If the father and mother had an income a little greater than the average, they might pay up to 8 rubles, if they could pay it, per month.

It is a mighty nice thing, but it is very expensive.

I just wonder what the cost would be in this country if you would try to take care of all of the children, as you suggest.

Dr. LOWE. Of course, in practice, there would be a limit to the families that would accept or utilize day care centers. My proposal is to make it available.

I think if you did a cost-benefit analysis, you would find that the mothers who were as a result of day care centers for their children now free to enter the labor market would contribute to the gross national product much more than it cost a government, be it Federal or local, to support the day care centers, and in the long run the importance is that sound nutrition could be established in the infants under care from very early in life.

Senator ELLENDER. Why could you not do that in your schools?

Dr. LOWE. This is the fourth suggestion I have.

The third suggestion is that we must to the extent possible register pregnant women, so that they would receive proper nutrition supplements all during pregnancy.

This is a system that has been used in the more advanced European countries with remarkable success.

It costs relatively little to provide the pregnant women with either vitamin or nutritional supplements, so that if you start the infant with sound nutrition, the hope is that the pregnancy will be successful.

Here is where you can break the fetal wastage—early mortality cycle.

It has been observed in many developing countries that once infant mortality falls, the need of the family to reproduce at the rate of six, eight or 10 children declines, and so you have a built-in social type of family planning. The family decides that they have two or three children, and the children are going to live, so there is a tendency to control family size.

Now, I would see that these mothers got what they needed free of charge, and at the end you are going to be supplementing perhaps half a million mothers, not 4 million, only the ones who cannot afford a good diet.

Senator ELLENDER. When you say free of charge, who would pay for that? The Federal Government?

Dr. LOWE. I cannot define who will pay, but the cost will be negligible, compared to the cost-benefit in the years ahead.

The next thing I would like to propose is that we consider the school as the focus for health care of infants and children and pregnant women.

This is the logical place. Modern health care which deals with prophylaxis really has no place in the hospital or clinic. The school is the place where you educate, where you provide nutrient supplements, where you can see children in a setting which is more natural, and it would be my suggestion that if I sat in your chair, that a bill that I would like to see developed is one which fosters the development of community and family care programs within the public school system.

These are the steps that I would take some immediate action on. Some would take time to develop, but all I believe would in effect break the poverty cycle, which would be your goal and my goal.

Senator ELLENDER. Well, I don't want to ask any more questions, but in order to do that, I presume you would have a welfare state sooner or later?

Dr. LOWE. I would deny that, sir.

Senator ELLENDER. If you would have the Government do it.

Dr. LOWE. I would deny that. You would increase the productivity and the capitalist instinct in this country to a degree which neither you nor I could imagine.

Senator ELLENDER. You are very optimistic. I have been here 33 years, now. This is my 33d year, and when you start a program, there is no end to it. They always want to add something to it.

The program you are conceiving now is that every mother who is pregnant will be taken care of until the child is born, and after that

child is born, you will take care of it in some way until it gets to be about a year old, and then get a kindergarten for it.

All of that means that you have to take care of that child until it is ready to go to school, and then from school, if you cannot take care of it, it goes to college, and then you take care of it at college.

If that is not building a welfare state, I don't know what it is.

Dr. LOWE. Sir, with our social progress and the commitment of the Federal Government to the welfare or our people, the gross national product has mounted far more rapidly than the Federal expense.

Senator ELLENDER. How about your debts? Do you know how much we owe now?

Dr. LOWE. Yes, sir.

Senator ELLENDER. How much?

Dr. LOWE. $385 billion.

Senator ELLENDER. How much does it cost to carry that?

Dr. LOWE. $15½ billion.

Senator ELLENDER. $16½ billion per year.

Dr. LOWE. I am not here as an economist. I am sure you are getting me off base.

Senator ELLENDER. You are pretty well up on it.

If your scheme were put through, I don't know what would happen.

The CHAIRMAN. I think the record ought to show that very little of that $300 billion debt went to nutrition.

Senator Cook——

Senator ELLENDER. I agree.

Senator COOK. Doctor, on page 4, you say, "* * * for a comprehensive survey in all States was necessary."

Why do you feel that it is necessary in every State of the Union? Why do you feel that if you take a socio-economic level in general areas that you may not come up with the same thing that you might suggest is necessary in a survey of all 50 States?

Dr. LOWE. Well, may I illustrate the point by defining the methods used by the current ongoing surveys? There are two separate methods in use.

Senator COOK. Suppose they used the same method in every State?

Dr. LOWE. I have to illustrate the dangers.

Senator COOK. Go ahead.

Dr. LOWE. One approach attempts to look at a profile of the U.S. population. There are so many whites, so many blacks, so many Chinese, so many Mexican-Americans, so many urban, so many rural, so many Southern and so many Northern, and so forth, and you get a composite profile of the country. Having done this, you then select a sample which fulfills this profile, and if the profile has 100 elements, you multiply this by another hundred, or 1,000, or 10,000, to get your sample.

This is one approach at getting a national profile, and I would support this approach a priori.

However, the results of Dr. Schaefer's program in Texas, and the illustration I gave on vitamin A points to the danger in using this approach.

One would have made a profile statement that in Texas vitamin A deficiency existed, but if you started giving vitamin A-containing

food or vitamin A to the black population, you would have been wasting your money.

This is the danger of the cross-sectional approach.

The other approach is to take a totally random sample, not trying to match any profile.

I believe this, too, will fail to identify special problems which exist in our urban areas as opposed to certain rural areas, Southern areas as opposed to, say, Appalachia.

It is my belief that we must actually do it State by State, and use a great deal of thought and imagination within each State, so that we do in fact identify the poverty or the malnutrition areas.

Senator COOK. I think that the fallacy in your argument, to me, is that States are just legal lines.

I am not sure that you are going to make a distinction, for instance, if you evaluate Louisiana and then evaluate Mississippi.

This is the point I am trying to make. I am wondering if you cannot take general geographic areas and come up with the same result that you seem to attach a great deal of significance to rather than a State-by-State survey.

I don't believe there is a great deal of difference in the people from New York and those in Massachusetts, so why would it be necessary to take a survey in Massachusetts and another in New York.

This is the point I was trying to make. I would hope you would agree with me, because I think it is necessary to survey all of the total geographic areas, but I am not sure that we have to do it State by State.

Dr. LOWE. Sir, I am afraid I missed your point, and I agree with you.

What we want to do is cover the United States, but there seems no necessity for dividing the survey according to legislative lines.

I think that Dr. Schaefer's survey has, however, used the State-by-State approach, because of the enabling legislation, but I would agree with you that this may not be necessary.

Senator COOK. Now, let me try to point out some of the holes in your recommendations.

I am one of these people who feels basically that even though the surplus food program was started to distribute surplus, it was later supplemented by the food stamp program in the hope of providing a more proper diet. When we added the food stamp program, we were, in effect, admitting that we were not only interested in surplus distribution but in improving diet. And, if this is now our goal, we are failing miserably.

Now, I happen to be one of these people who feels that the time to evaluate this is with those States that are now on surplus food, rather than with those States that are on food stamps, because I feel that once you move into food stamps, although we have them in a great many counties in the Commonwealth of Kentucky, that we get further away from the possibility of impressing on a mother the proper dietary requirements for her family. We could take the 22 items that we now have in surplus commodities and analyze them as to their proteins, calories, vitamin A, vitamin B, niacin, and all the rest of it. And we could, it seems to me educate the recipients through the distribution program to the proper diet.

I have a fear that the educational process will become more difficult as we have moved into the stamp program, because under it the people can go to the grocery store and buy anything. They can buy all the bread they want to, and fill up on potato chips and candy bars, all of which certainly does not provide a proper diet.

This is really what bothers me.

I am pleased that you have emphasized the day care center. I do however, question the fact that you listed it, in order of priority, before care for the pregnant mother. I would imagine that training the pregnant mother as to just what proper nutritional requirements must be met for the health and welfare of the child should come first.

Dr. LOWE. Senator Cook, I did not mean to list these in the order that I would implement them.

I agree with you completely that there are certain steps which must be taken concomitantly, and one must deal with the pregnant mother and her offspring virtually at the same time.

This is why I think that the school becomes the logical locus. It can become the day care center, the nutrition center for the schoolchildren, the health center for the children, and the pregnancy health center for the woman, but these must come together.

Let me deal with the first issue that you discussed, and again I agree with you. I don't think we would be in disagreement.

But I think the reason we fail with the food stamp-commodity mixture is our inability to use these in the same jurisdiction. I would hope that this simple change could be undertaken immediately.

I think if one could balance the commodity program with the food stamp program in the same jurisdiction, coupled with sound education, and a relief from the cost of food stamps, where necessary, we would make tremendous strides within a year.

I am not talking about 10 years, now.

Senator COOK. Doctor, I fear the food stamp program just isn't working at the present time. And I am just not sure how it could be improved upon even if we did balance the two programs in the same jurisdiction.

I like your suggestion that the mass media which sells food, should also be used to help inform people just what foods should be bought to provide the proper nourishment.

Although we are talking of breaking the cycle of poverty, we will still always have the problem of refusal to eat properly even if the right food is available. I fear we will never be able to totally cope with the problem of bad eating habits regardless of what is available. I do not mean to imply however, that we should not try.

I guess we will have to live with the fact that many of these problems will not be corrected.

Dr. LOWE. Many of the results of our failure to deal with them is what we have to live with.

Senator COOK. Doctor, are the obstetricians in this country failing in their responsibility to give proper dietary advice to pregnant mothers?

Dr. LOWE. Let me dodge just a minute.

Senator COOK. Please don't.

Dr. LOWE. I will not deny answering, but our problems in infant mortality and prematurity are basically problems among women who

have no obstetrician. The major national issue of our infant mortality question is not among middle-class women who have an obstetrician. These are the women who arrive at the hospital in labor, have not been seen by a physician for years before their pregnancy, or during pregnancy.

So rather than point a finger at the obstetrician, though he may be at fault, I don't look at him as a vehicle for dealing with these problems as a public health problem.

Senator COOK. I look at him as dealing with the problem as far as mental retardation and many of the other defects which are not exclusively a problem to the low income and poverty group.

I look at this as not a matter of public health, but a matter of his responsibility to his patient.

Dr. LOWE. I hate to do it, but I would have to say I am not willing today to undertake a criticism of the operation of the obstetricians of this country.

Senator COOK. Please, if you are going to be critical of us, find somebody in your own profession to be critical of sometimes.

Dr. LOWE. I will be critical of pediatricians. I will tell you something that they don't do, and should do.

Senator COOK. What are some of those criticisms?

Dr. LOWE. Their services are not widely distributed. We have to take care of many more children than we do. We have to bring into our practice ancillary personnel so that one pediatrician, instead of taking care of 1,000 or 1,500 children in a year, can take care of 5,000.

It is hard to do this, but if we multiply the effectiveness of pediatricians, he could care for many, many more children.

Senator COOK. Thank you.

The CHAIRMAN. Senator Mondale.

Senator MONDALE. Thank you, Mr. Chairman.

We have had many fine witnesses before this committee, Dr. Lowe, but I want to express my personal judgment that I think you have contributed more to the understanding of this committee than any other witness.

I am most grateful to you and to your colleague for making this contribution, including a pretty good estimate of the gross national product. That is better than I can do.

Dr. LOWE. Thank you very much.

Senator MONDALE. You mentioned earlier that the services of an obstetrician tend to be limited to persons in the middle and upper income brackets.

What about the availability of prepared baby foods? You indicated that while some had been dangerous, and I assume some are non-nutritious, that generally speaking the quality of prepared baby foods is excellent.

Do the children of the poor generally have such prepared food available to them? Can they afford it?

Could it be said that, like the unavailability of the obstetricians' services, the quality prepared baby foods are unavailable as well?

Dr. LOWE. I am not sure, sir, that I can come up with the sort of figures that you would like. I am not sure that anyone has informa-

tion on distribution of, let's say, proprietary formulas in relation to economic groups.

I think we can say that by the end of the third month of life, approximately 75 percent of all infants have been on a proprietary formula.

Of the 25 percent, approximately 10 percent have been breast fed. Approximately 10 percent have been on an evaporated milk formula.

What happens to the others, I don't know.

Senator MONDALE. That 25 percent figure can be related to the poverty line, because that is approximately the poverty figure.

Dr. LOWE. It could be, but what complicates my numbers is that in certain jurisdictions, welfare organizations, maternal and child health perhaps have been purchasing proper dietary formulas for distribution to the recipients of their program, and so the figure 25 might not contain all of the poverty group.

In other words, some of the youngsters living in poverty are in fact getting prepared formulas through distributive programs rather than through maternal option.

Senator MONDALE. Yes, but would it be your judgment that the cost of prepared baby foods of quality is beyond the reach of many impoverished families?

Dr. LOWE. I think this would be a fair statement.

Senator MONDALE. And when that is the case, what is the likelihood that those infants will in fact have a nutritious diet?

Dr. LOWE. Well, when you can't buy food, you are limited.

Senator MONDALE. I am talking about the prepared baby food. What would that child receive, in all likelihood?

Dr. LOWE. He would receive an evaporated milk formula, but what frequently happens is if the mother has no guidance, she makes a formula which is too dilute or simply feeds the child milk when she has it, and sugar water when she does not.

An evaporated milk formula is a sound, nutritional product, and does not really fit into the classification of proprietary formula products.

Senator MONDALE. If the Federal Government food assistance programs were limited arbitrarily to a 5.9-year period of aid, and of course that would be a cruel and immoral judgment as your testimony implies, which 5.9 years in the average life span would you select as the most critical?

Dr. LOWE. Without any question, I would take the first. I would take the last trimester of pregnancy, so it would be 5.6 years of life.

In other words, though I would not like to propose it, if I had the option of dropping the school lunch program and insuring sound nutrition for pregnant women and preschool children, I would choose that.

The CHAIRMAN. You would choose the latter, the preschool and the pregnant mother?

Dr. LOWE. Absolutely right.

Senator MONDALE. I have asked this question repeatedly, because that has been my impression, that it seems to me that this is almost precisely where the present food programs are least adequate.

Our school lunch programs and the limited pilot breakfast programs, the Headstart programs with food components, all pick up at

about age 5, at best, which is at the far end of your 5.6-year highest priority period.

The direct commodity and food stamp programs, where they exist, and where they are adequate, and where the impoverished can afford to buy the stamps, or where they can find transportation to pick up the goods, are inadequate to meet this very problem.

The direct commodity distribution program does not distribute baby foods at all. The food stamp program first of all is not distributed except in a small proportion of the counties of the country.

Secondly, it is very difficult to make that once-a-month down payment, and, thirdly, where the family can afford the food stamps, the program assumes that they know what sorts of things to buy to best contribute to the health of their infants. I suspect that where the husband is working and the mother is working, they might take a little larger share of the food than they should, in light of the high priority that should be placed upon the needs of the infant.

As I recall Senator McGovern's book, that is one of the biggest problems in food deficient nations, that the worker in the family eats all the food and stunts the child, the infant, so that he is crippled in body and mind, and probably unable to assume his full potential.

Thus, it seems to me that if you are correct, and I believe you are, that while we must help nutritional problems across the board, we must first identify the 5.6 years as the most critical, the period when failure to provide proper nutrition can lead to permanent and irreparable injury to body and mind, to infant mortality, to premature births, to seriously restricted educational and work levels, and all the rest; therefore, we must fashion a new method or new methods for targeting our efforts.

I listened to your alternative suggestions in this field, because I have not heard any in the past. One was the child day care center.

On the day care centers, this requirement was incorporated in the Social Security Act to try to get AFDC mothers out working.

As Americans, I think we hate to see anybody, even mothers, sitting around, so we had to provide some sort of answer to care for the children. Thus, the day care centers.

We only have a few of them. Many of them are inadequate. Many are too distant from the mother. I have talked to mothers that spend all day trying to get their children to the day care center.

It may be that this is another strong reason to really put pressure behind the establishment of day care centers throughout this country, and include not just custody of the infant, but also an effort to deal with the infants' nutritional problems.

I think that is an area that we ought to explore.

Do you have any other suggestions along this line, as to how we might better bring assistance and education and nutritional health to the infant, to the mother during pregnancy, and to help the preschool children?

Dr. LOWE. Senator, you are asking me to deal with issues about which I have no expertise and limited knowledge.

Senator MONDALE. As the Senator said, just go right ahead. That is part of the fine tradition of this body.

Dr. LOWE. I suspect serious consideration must be given at some time by this Government to subsidizing families with children.

Senator MONDALE. Family allowance?

Dr. LOWE. Family allowance, child allowance. I am not prepared to deal with the numbers or the mode of distribution, but children are far too valuable to our country to compromise development through malnutrition.

As I say, I am not prepared to deal with it substantively, but I think this should be considered.

Senator MONDALE. Dr. Coursin, will you take a crack at that one?

Dr. COURSIN. Being a member of the pediatricians' committee of which Dr. Lowe is chairman, he is speaking for the committee, and for me, as well.

I think that you have all covered the gamut beautifully with respect to what we have in hand to think about at this moment.

It also points up part of our inadequacies with respect to the interdigitation of resources within the Government.

Each of those who has addressed himself to this problem in the last several weeks has underlined that with all the wisdom and the expertise at hand, and we are still lacking major moves. I would say we are not going to get farther than that until we do have these resources in a conjoined effort to resolve this problem. To continue as we have in the past, with larger expenditures, and major efforts along the same lines, will be just as unprofitable if reviewed at a later date.

Senator MONDALE. Now one of you suggested the hope that the private sector could be depended upon, or could be asked to broaden the traditional nature of their advertising, namely, "Buy my product," to a general public education program to be sure and have a nutritious meal.

I must confess some uncertainty about that, and I am a private sector man; but as I commented earlier, every significant effort that the private sector has made in housing, employment, and so on, has usually been accompanied by some sort of financial assistance, because before a profit corporation decides what they might do on a pilot basis for public relations, they must go back to their board of directors and essentially explain how they have enlarged their profits, and how they have reduced their costs. If you expect them to undertake voluntarily an awful lot of spending to educate millions of persons who are underinformed in nutrition, I wonder if that isn't placing faith where it should not be placed.

Senator COOK. Would you yield for a minute.

Senator MONDALE. I will be glad to yield.

Senator COOK. Dr. Coursin, on page 9, I think you have hit it right on the head in relation to what the Senator is talking about: "We are no longer simply saying that diet is poor, that growth is stunted, and biochemical composition is unacceptable; but are translating this into consequences that will limit capacity for education, productivity, and contribution to self, family, community, and Nation."

I think one of the prime goals of this committee should be to help convince the country and in particular the private sector of our economy that malnutrition is affecting us greatly in terms of man-hours lost. There has been earlier testimony that an inestimable

number of man-hours are lost to the country through lost-time sickness, either directly or indirectly related to malnutrition.

Dr. COURSIN. I appreciate your identifying that particular statement. It happens that it is also yellow lined on my page, to emphasize it.

I would agree with what has been indicated by Senator Mondale, as well as you, Senator Cook.

I can speak from my personal experience with the private sector, which happens to be considerable, that they are interested and eager, that as they look to their social conscience, they are concerned as to where the expertise is going to come from for their own corporations. They are far more aware than even you gentlemen of those available for employment, and they recognize fully that this is an area in which they are going to have to expend their energies. They look to Government to get priming resources, and are universally against having a welfare state, as I am sure Dr. Lowe and I are.

I have also been through Russia, and through the same experiences that Senator Ellender has referred to. I am aware that if he cared to, he could elaborate on the other aspects of the use of this system, for indoctrination of the people.

I would point out that experimental work in learning in these same centers is one of the key factors that our friends behind the Iron Curtain have been exploring for many years. They are well aware of the intricacies of this problem, and feel as we do in our own research, that the whole future lies in what we are able to learn and do about the molecular basis of intelligence, memory, and behavior. At this point in time we are addressing ourselves to improving the capabilities of those who are a nutritional risk. However, we can already foresee that the key to the Nation's success in the future is going to lie in the application of these same concepts to improving the ability and performance of the general population—raising it to new levels that will enable us to meet the challenges that are coming.

Senator COOK. Are you also saying that the independence of the Nation makes the problem harder to solve?

Dr. COURSIN. I don't know about that. This is perhaps inherent in that, but I will have to examine it a little more.

Senator MONDALE. One last question, if I might.

Dr. LOWE. May I comment on your asking about the private sector?

Dr. Coursin covered it in part, but let me give you an example of how I think the Federal Government could invoke the assistance of the private sector at virtually no cost.

Regulations governing educational items on television is under the control of the Federal Communications Commission. Now, if the Federal Government were to say, "That time must be used for nutrition education," it would not cost anything to use that time, and I think television is probably the best medium we have today for education. I think industry would step in and recognize this as a real opportunity.

Now, I can see an issue, who is to decide whether the material that goes on that free time is sound or not? This is a problem.

I wanted to illustrate the point that we can do this at very little cost.

Industry's advertising bill mainly is the purchase of media, whether newspapers, magazines, or television, and only a small part of this is the preparation of the material.

Senator MONDALE. We have seen a good deal of creative private industry involvement in nutritional methods in foreign feeding, because we have paid them to develop the foods that are low cost, and they have done some rather remarkable things. There have been some AID-funded feeding programs of other kinds to which some of the private food industry in Minnesota contributed to. I think there is a great need there.

One of the things that bothers me is that I don't think there is any costless, magic way out of malnutrition in this country. I don't think we can wave the private sector wand or the poor person's 2-cent pill wand to get out of this problem.

I think we have to look at it fully and realize that it requires substance and some cost.

Dr. COURSIN. If I may add to that—I would feel strongly that the private sector stands ready to cooperate in efforts involving the Federal Government; that you are not looking at a clique that is saying, "We won't do anything."

My experience is both in this country and as a member of the United States-Japan cooperative program for the Far East. I have recently returned from Japan, Thailand, Taiwan, India, and the Middle East—visiting a number of the AID programs that you mentioned, and believe me, industry is strongly behind them. They have furnished research resources to these programs, and are eagerly interested in what they can do to further them.

I was proposing that the university sector be brought in, the industry sector, and all related Government agencies.

Senator MONDALE. The problem of the statistical treatment of hunger is one that is reflected in virtually every human field in this country. We are very input oriented.

They can tell us how many schools there are, but cannot tell us whether anybody is being educated. They can tell us in this case how much food is being produced, but not how many children are receiving decent nutrition.

In all the human fields—education, employment, skills, and so on—the output side of national statistics is just almost totally inadequate.

Some of us have proposed creation of a Council of Social Advisers, to try to introduce at the highest level a body of sort of Walter Heller-type social scientists, and among their responsibilities would be to develop social indicators to try to get to this output problem affecting human beings in this country, including nutrition.

Would you be prepared to comment on that objective?

Dr. LOWE. I would be prepared to comment, and in addition, if I may, make a suggestion.

You pushed me pretty hard on suggestions to implement nutrition programs.

Well, it seems to me that one of the ways that input might be developed is through an ad hoc group that could do far better than I.

I have not come prepared to deal with the issues that you have questioned me on, but there are people with expertise and knowledge and even wisdom on how these things could be accomplished.

If it is along these lines that this committee would also like to develop information, I think you would find a group of physicians in this country prepared to support you in developing concepts.

I think this is consistent, then, with the general question that you asked about having a group of people that asks questions, not about the cold numbers, but the warm numbers, if I can use this analogy. The cold numbers are the structures. The warm numbers are what happens within them.

We are just beginning, and I think Dr. Coursin made this point, that we are just beginning to get ideas about what is happening in nutrition. We know all about food supply, but virtually nothing about nutrition in this country, and it is to develop these types of information that I suppose we are endorsing the perpetuation of nutrition surveillance in this country.

Senator MONDALE. Mr. Chairman, I am through.

The CHAIRMAN. Dr. Coursin.

Dr. COURSIN. To complete what Dr. Lowe has indicated, may I point out the tremendous problem in measuring the very types of phenomena that Senator Mondale referred to. Along with the concepts of ability and performance, this study of the whole interaction of environmental structures is where we must go in coping with this entire problem in the future.

Senator COOK. Are you not saying that cold numbers are problems, and warm numbers are solutions, in essence?

Dr. LOWE. Getting cold numbers is easy. Getting warm numbers is difficult.

Senator COOK. Recognizing the problem is easy. To find a solution is difficult.

Dr. LOWE. That is right.

The CHAIRMAN. Dr. Lowe and Dr. Coursin, you have been so helpful to us this afternoon that I cannot tell you how much we appreciate your testimony.

I do regret that we had to put you on so late in the day that I am afraid a good many of our press people have left us, but this testimony is going to be invaluable to us.

It may be as we move along we will take the liberty of inviting you to come back and help us, when we get to the recommendation stage of this committee's work.

I did want to ask just one final question.

As we have moved along here the last couple of weeks, certain factors have begun to emerge in my mind that explain the existence of rather widespread malnutrition in this country, but I am wondering if you would be willing, either one of you or both of you, to just outline as you see it the one, two, three, or four factors, and perhaps try to rank them in importance that have been responsible for malnutrition in the United States, perhaps try to list them in order of significance.

Dr. LOWE. I would put poverty No. 1.

The CHAIRMAN. Poverty, No. 1.

Dr. LOWE. This would be my opinion.

No. 2, a switch from rural living to urban living. I think probably our worst poverty numerically is in urban living.

The CHAIRMAN. That is associated with giving up the little garden or the production the family has of foods in rural life?

Dr. LOWE. It might be part that, Senator, but I think it is also the fact that it takes a certain amount of training to live in the city. It is nothing that you do de novo.

The CHAIRMAN. In a sense, that is a byproduct, or is related to the poverty factor that you mentioned, is it not?

Dr. LOWE. This lack of preparation for urban living? Not directly. I think when people move into cities and are unprepared for the jobs, for example, that are offered them, they then drift into poverty. In that sense, it is related.

I think that the third item might be the one I touched on, the severing of families from traditional wisdom. We are breaking up families all the time, and there is nobody to fall back on for nutrition knowledge.

I think there have been major dislocations in a free culture in this country which have impinged upon rural well-being.

The fifth item would be changes in our energy sources, so that coal, for example, is no longer a critical energy source, the way it was 25 years ago, and this might explain what we are seeing in Appalachia.

The sixth cause I would say was education. We have not done a good job in educating the public on sound nutrition, and I am not quite sure right now how to do it, except maybe to use industry.

Seven, I think we have built up a sense of complacency in the country that we are doing something about nutrition, because we have the commodity distribution program, because we have the food stamp program, and it really took some shocking movies or television programs to make us realize that malnutrition existed.

I think I have to stop there.

The CHAIRMAN. Dr. Coursin, would you generally accept what he said?

Dr. COURSIN. I have nothing to add. I think this is quite comprehensive.

The major factor is the move from rural to urban living. It is in developing countries, as well as in the United States. In the developing countries the whole spectrum of undernutrition shifts with changes in the form of severe malnutrition, from the kwashiorkor type that appears, by 18 months to 2 years, to the marasmic, which appears earlier in life, because breast feeding is simply cutoff.

This relates to the whole structure of survival in an environment of poverty where the mother has changed from doing menial tasks in an industrial society to try to keep from household responsibilities to doing menial tasks in an industrial society in an effort to keep things going in a whole new world that she lacks the capacity to cope with.

The CHAIRMAN. Senator Pell.

Senator PELL. No, I just want to read the statements.

The CHAIRMAN. We do want to thank both of you for your great contribution.

Dr. COURSIN. Thank you, Senator.

Dr. LOWE. Thank you very much, Senator.

The CHAIRMAN. We will print in the record at this point, additional materials submitted by Dr. Coursin.

(The materials referred to follow:)

EFFECTS OF UNDERNUTRITION ON CENTRAL NERVOUS SYSTEM FUNCTION

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While the general physical debilitation of undernutrition has long been clinically obvious, it is only recently that reports from world-wide programs for its evaluation and treatment have led to a growing awareness of its related subtle effects on central nervous system function (M. Geber and R. F. A. Dean, Africa; B. Robles and J. Cravioto, Central America; G. G. Graham, Peru; A. Schaefer, Interdepartmental Committee on Nutrition for National Defense). Various studies have shown that these alterations in brain activity occur primarily in undernourished preschool children, particularly those under four years of age, whose deficient dietary intake, high incidence of parasitic infestation, and disease synergistically limit the availability of nutrients (N. S. Scrimshaw, C. E. Taylor, and J. E. Gordon, *Am. J. Med. Sci.* **237,** *367* (*1959*)) and produce abnormalities in molecular structure and chemical energetics within the nerve cell. Furthermore, even though they may demonstrate "catch up" in physical size through the new cell growth that occurs with adequate nutritional therapy (Scrimshaw and M. Béhar, *Science* **133,** *2039* (*1961*)), the established aberrations in nerve cell activity in some of these youngsters are not readily corrected and, if of months of prolonged duration, may be irreversible (R. Ramos-Galván, J. L. P. Navarrete, and J. C. Muñoz, *Bol. Méd. Hosp. Infantil* (*Mex.*) **17,** *455* (*1960*)).

The timing of limitation of nutrient intake during these early years correlates well with the rapid increase in nerve cell mass and cellular differentiation that normally produces some 90 per cent of normal brain structure by four years of age (J. A. Harris *et al., The Measurements of Man. Minneapolis, University of Minnesota Press, 1930*; J. L. Conel, *The Postnatal Development of the Human Cerebral Cortex. Harvard University Press, Cambridge, Massachusetts, 1939*; W. A. Himwich, *International Rev. Neurobiol.* **4,** *117* (*1962*)). It also coincides with the specific "critical periods" of sequential maturation and myelinization of the brain as it integrates into functional units in the development of mental abilities (J. P. Scott, *Soc. Res. Child Dev.* **28,** *1* (*1963*)).

Experience has shown that despite submarginal dietary intake, if a woman's nutritional status is adequate to allow for fertilization and gestation, her intrauterine active transport and concentrating mechanisms for nutrients will probably be capable of sustaining the normal development of embryo and fetus (C. A. Smith, *J. Pediat.* **30,** *229* (*1947*); *Am. J. Obstet. Gynec.* **53,** *599* (*1947*)). As far as can be determined, the newborn child will be normal except for diminution in size resulting from restrictions of fat and water deposition during the last months of pregnancy. The measurable central nervous system abilities of normal newborns is in general within a similar range of performance regardless of their geographical or racial origin.

Interestingly, reports of evaluation of newborn children in some of the developing countries have shown them to have normal performance on a standard scale of 100 with many of them capable of superior neuromuscular performance (score 140 or more) at birth; comparable to that expected in European newborns at four to six weeks of age (Geber, *Courrier* **6,** *17* (*1956*); Geber and Dean, *Lancet* **1,** *1216* (*1957*)). Longitudinal studies suggest that if these infants

are provided with adequate nutrition, good medical care and environment, they will make excellent progress (120 to 140 on standard psychometric testing) with gradual gradation of abilities to within the usual normal range of 100 to 110 by three to four years of age (Geber and Dean, *Pediatrics* **20,** *1055 (1957)*).

In contrast, infants of similar initial abilities but who received a deficient diet and lived under poor health and environmental conditions during these early years, showed not only retardation of physical growth and development but tested at a level that was approximately 25 per cent below normal standards (score 75) of central nervous system capacity by three to four years of age (Cravioto, *Bol. Méd. Hosp. Infantil (Mex.)* **15,** *805 (1958)*); Robles, Ramos-Galván, and Gravioto, *Bol. Méd. Hosp. Infantil (Mex.)* **16,** *317 (1959)*; Robles and Cravioto, *Proc. Ninth Meeting Mex. Soc. Pediat. Res., Guernavaca, Mexico, 1959*).

In studies of undernourished children, those who exhibit the marked clinical changes of kwashiorkor and marasmus are the ones who most frequently come under study. Their treatment with long term adequate dietary measures usually produces a satisfactory remission of the general clinical symptomatology but in many instances there is evident lack of improvement in the functional capacities of the brain (Cravioto, *Am. J. Pub. Health* **53,** *1803 (1963)*; M. B. Stoch and P. M. Smythe, *Arch. Dis. Child.* **38,** *546 (1963)*). Apparently, the duration and extent of nutritional deficiencies in these children has impaired the normal critical cellular maturational processes of brain structure. Their intellectual, psychological and neuromuscular capacities are found to be some 10 to 25 per cent below those of normal controls. Although this does not represent a marked degree of mental retardation, it is enough to limit the individual's ability to realize his inherent potential and minimizes his possible contribution to his own well-being as well as his asset value to his nation. Inasmuch as an estimated 70 per cent of the preschool children in developing countries are classed as undernourished, this realization of the far reaching effects of these mental as well as the physical factors in growth and development has led to an increased emphasis on nutritional problems throughout the world (P. György, *Am. J. Clin. Nutrition* **14,** *65 (1964)*).

The utilization of newer techniques of biochemistry and biophysics in the study of subcellular structures, reactions and functions is greatly enhancing our understanding of some of the complex factors that underlie the effects of nutrients on cellular metabolism. Although the general metabolism of the body preferentially protects the brain cell from deficiencies, its formative process of singular completion lacks the benefit of possible future replacement or regeneration and hence is particularly subject to persistent derangement of its metabolic environment. This is exemplified in the extreme by conditions of severe specific nutrient deficiency, *i.e.* vitamin B_6 (D. B. Coursin, *Vitamins and Hormones* **22,** *755 (1964)*), and so on, and in inborn errors of metabolism, *i.e.* phenylketonuria (H. Harris, *Human Biochemical Genetics. Cambridge University Press, London, 1959*) and the like. In these instances, particularly the latter, mental ability may be reduced to 50 per cent to 75 per cent or more below normal with the deleterious biochemical abnormalities causing irreversible structural and functional brain changes within the first several years of life. Conditions such as these represent the far end of the spectrum of the severity of effects of altered nutrient metabolism on the brain compared to those seen in undernutrition which while of a lesser degree, may nevertheless result from

malfunction of similar and related biochemical systems.

Among the various important systems and interrelationships, attention has most recently been focused on the effects of protein-calorie undernutrition with a full realization of the inseparable importance of all of the other necessary components of an adequate diet (J. C. Waterlow, Cravioto, and J. M. L. Stephen, *Advances Protein Chem.* **15,** *131* (*1960*); *see also Mammalian Protein Metabolism, H. N. Munro and J. B. Allison, Editors. Academic Press, New York, 1964*).

Depending on the degree and duration of deficiencies of these two factors, there may be a progressive decrease in available nitrogen (L. E. Holt *et al., Lancet* **2,** *1343* (*1963*)), variability in concentrations of essential and nonessential amino acids (G. Arroyave, D. Wilson, C. de Fune, and Béhar, *Am. J. Clin. Nutrition* **11,** *517* (*1962*); R. G. Whitehead and Dean, *Ibid.* **14,** *313* (*1964*)) and reduction in energy for metabolic activity (H. A. Krebs and J. M. Lowenstein, in *Metabolic Pathways, D. M. Greenberg, Editor, vol. 1, p. 129. Academic Press, New York, 1960*). Although the body may adapt to a lower level of nitrogen balance, there is an associated decrease in protein biosynthesis with changes in structural elements of the cell per se as well as in the formation of enzymes for normal cellular metabolism (G. Maggioni, *Mod. Probl. Paediat.* **2,** *161* (*1957*); Cravioto, *Am. J. Clin. Nutrition* **6,** *495* (*1958*)). Availability of amino acids that are already deficient in the diet may be further limited by their general catabolism for energy production and by the continued utilization of specific ones as precursors in the formation of metabolites such as catécholamines and hormones (T. L. Sourkes, *Ibid.* **12,** *321* (*1963*)). These conditions may aggravate the already limited state of protein biosynthesis with resultant abnormalities of enzyme activities in the normal metabolic pathways of important amino acids such as histidine to urocanic acid to formimino glutamic acid; phenylalanine to tyrosine; p-hydroxyphenylpyruvic acid to homogentisic acid; tryptophan to serotonin; and others (R. G. Westall *et al., Arch Dis. Child.* **33,** *499* (*1958*); Dean and Whitehead, *Lancet* **1,** *188* (*1963*)).

The abnormal concentrations of the various amino acids may further affect the active transport of important cellular elements across the nerve cell membrane, changing the intracellular concentrations of necessary substrates and enzyme precursors for its normal operation (S. Udenfriend, *Am. J. Clin. Nutrition* **12,** *287* (*1963*)). These changes may to some degree produce coincidental alterations in other components of brain cells such as cerebrosides and unesterified cholesterol molecular configurations that are seen in faulty myelinization in phenylketonurics (L. Crome, V. Tymms, and L. I. Woolf, *J. Neurol., Neurosurg., Psychiat.* **25,** *143* (*1962*)).

Finally, it appears that the functional integrity of DNA and RNA formation may be altered by protein-calorie deficiencies per se (Waterlow, *W. Ind. Med. J.* **5,** *167* (*1956*); Waterlow and C. B. Mendes, *Nature* **180,** *1361* (*1957*)); or in association with other factors such as vitamin B_6 deficiency (A. C. Trakatellis, *Fed. Proc.* **23,** *137* (*1964*)). These observations are representative of the great strides that have been made during the last decade in studies of the normal metabolic mechanisms of the brain as well as the effects of nutrient deficiencies on them. At the present time, the enormous significance of this field justifies extensive research in three broad areas: (1) the exploration of the molecular components operant in the brain cell as they relate to mentation; (2) the development of more meaningful procedures for measuring brain function on a conceptual basis with consideration of family background, environmental circumstances, and cultural

factors; and (3) devising better techniques for measuring the neurophysiological mechanisms that integrate them both into the total functioning complex of the individual.

These studies are of immense practical and theoretical importance in helping to solve man's present problems of the relationship of nutrition to central nervous system activity as well as those that will arise in the future with the further evolution of his increasingly complex brain structure.

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Undernutrition and Brain Function

By David Baird Coursin, M.D.

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ABOUT THE AUTHOR

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After completing his secondary schooling in the public schools of McKeesport, Pa. in 1936, Dr. Coursin entered Haverford College and received the B.S. degree in 1940. Then in 1943 he received his M.D. degree from the School of Medicine, University of Pennsylvania in Philadelphia.

Dr. Coursin served as resident physician in the Cincinnati Children's Hospital and Research Foundation from 1944 through 1946 and in the Philadelphia Children's Hospital during 1948.

In addition to his appointments in Lancaster Hospital, Dr. Coursin serves as Director of Research in the Lancaster Cleft Palate Clinic, as a consultant to the National Institutes of Health, Education and Welfare, as a consultant to the Pennsylvania State Crippled Children's Hospital in Elizabethtown, as a visiting staff member in the Philadelphia Children's Hospital, and as a consultant to the International Committee on Nutrition for National Defense-Agency for International Development. Dr. Coursin also serves as a lecturer in the Graduate School, School of Medicine, University of Pennsylvania.

In recognition of his outstanding medical research achievements, Dr. Coursin has been appointed to numerous committees. Among these are the Committee of Nutrition of the American Academy of Pediatrics, the ad hoc Committee for Vitamin B_6 *sponsored by the Food and Nutrition Board of the National Academy of Sciences, and the ad hoc joint committee of the American Society of Dentistry for Children, American Academy of Pedodontics and American Academy of Pediatrics.*

Dr. Coursin also serves as a member of the editorial board of CLINICAL PEDIATRICS.

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Dr. Coursin has made many contributions to scientific knowledge. He is the author or coauthor of more than twenty publications.

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INTRODUCTION

Undernutrition is the major problem affecting the well-being of mankind in the developing countries of the world today.[45] It has been estimated that an average of 70% of all preschool children in these nations are undernourished while some surveys have shown the incidence in both children and adults to be as high as 100%.[23] The importance of nutritional deficiency, parasitic infestation and disease to the peoples in these areas is evident from their mortality statistics which are many times those of people of European origin,[62] as shown in Table I.

Table I

Comparative maternal, infant and child mortality statistics for the United Kingdom and some developing countries

Country	Deathrate (per 1000 pop.)	Birthrate (per 1000 pop.)	Maternal mortality (per 1000 births)	Infant mortality (per 1000 live births)	Mortality per 1000 of same age	
					1-4 yr.	5-9 yr.
United Kingdom, 1962	9	16	0.4	21	0.8	0.5
Jamaica, 1950	13	31	6	86	13	1.0
Egypt, 1947	22	38	20	205	49	4.3
W. Nigeria:						
Imesi, 1957	—	—	—	295	69.7	—
Imesi, 1962	—	—	—	77	31	—

These data reflect the prevalence of fundamental health problems that have an impact on all members of a population. In addition, those persons who do survive usually have some sequelae and may experience further difficulties. Table II presents figures for the distribution of manpower by age (50% under 14 years) and potential period of productivity (20 years) under these conditions and summarizes the situation with regard to the individual's limited opportunity to advance self and nation.[63]

The evident physical changes resulting from undernutrition are well recognized and have been extensively studied. Since World War II, surveys have been undertaken in many parts of the world with the increasing use of improved biochemical tests in addition to the long established anthropologic measurements.[41]

Table II

Contrasts of manpower distribution and productivity potential between developed and developing countries

	Developed Nations	Developing Nations
Life Expectancy	70 years	35 years
Productive Years	50 years	20 years
Per cent under 14 years	20	50
Per cent deaths under 5	5	50

These studies have helped to define some of the many biochemical changes occurring with undernutrition. They also have provided diagnostic measures for early identification of these disorders, greatly facilitating the detection of their true incidence in a given population.

Within the past decade, a number of observers have begun to emphasize the effects of undernutrition on central nervous system activity — neuromuscular function, behavior, and intelligence — in the preschool child. Previously, neurological findings were viewed as symptoms of the more obvious physical disorders and were improved with adequate dietary therapy. However, there is now an increasing body of evidence suggesting that the abnormalities of the central nervous system activity arise from changes in the developing brain *per se* and that they may be irreversible with persistence of function at a subnormal level. These youngsters, therefore, would never fully realize their inherent potentials of brain capacity and as such would be limited in their abilities to advance themselves and their society.

Admittedly, this is a difficult area in which to obtain meaningful data. There are many factors to be considered in the evaluation of mental ability: genetic background; family, environmental and cultural circumstances; time of onset of undernutrition, degree of its severity and duration; adequacy of treatment; subsequent environment; controls etc. The available techniques for definitive measurement in this field are limited and often lack the fine precision for identification of specific deficits and accurate quantification of deviations of the magnitude of 10% to 25% below normal. Nevertheless, information at hand supports the thesis of severe undernutrition affecting central nervous system activity. It justifies a full scale program of research in order to advance our methodology for its measurement and to devise new concepts for its treatment.

NORMAL DEVELOPMENT OF THE BRAIN

The embryological development of the brain is one of the most rapid and extensive processes occurring during gestation. This rapid rate of growth of the

brain persists after birth, well in advance of that of the rest of the body. By the time a child is 4 years of age some 90% of the final mass of adult brain has been formed.[25] Coincidental with the increase in size there is a continuously complex evolution of the anatomy, biochemistry, and physiology of the brain.[6] This maturational process involves myelinization and elaboration of a number of enzymes as well as increases in the concentration of substances necessary for the normal operation of nerve cells.[26]

The performance of the newborn is primarily reflex. This stage is followed with a gradual orderly appearance of new capacities for neuromuscular activity, socialization, behavior and mentation. The infant's abilities to respond coincide well with the maturational process and provide clinical evidence of his normal central nervous system development. During the early formative years, the brain sequentially acquires each new specific function and integrates the process into its total pattern of performance and experience. Experimental evidence suggests that the timing of this over-all procedure is of utmost importance. The reason: each new function makes its appearance chronologically at a "critical period" in the total ongoing pattern and is apparently maximally operant at that time.[46, 4] Therefore, any disruption of this normal sequence may result in limitation of the capacity of a specific ability that should have been formulated in a predetermined relationship within the continuum of the brain matrix. This may be clinically evident immediately, but more often it does not become demonstrable as a deficit until a later age.

There are a variety of testing procedures that measure neuromuscular activity, behavioral and intelligence performance, and neurophysiological function. A complete neurological examination of the infant such as that outlined by André Thomas has proved satisfactory in the careful delineation of neuromuscular parameters. It also provides acceptable data that allows comparisons among infants of different races and geographical origins.

Psychological and intelligence testing are inseparable from cultural ramifications and intellectual stimuli. Thus, tests such as the Gesell, Bender-Gestalt, Weschler-Bellvue, Stanford-Binet, Goodenough, are valid primarily in populations for which standards have been established. They have some diagnostic value in developing countries, but there is need for their further modification and for the compilation of normative data from these areas. Scoring by these techniques requires further mathematical modification by reference to weighted scales to allow comparisons among groups from different parts of the world.

Measurement of neurophysiological activity of the brain can be done with some success using the electroencephalogram. This machine is capable of identifying maturational progress in brain wave patterns and will, in many instances, reveal deviations from normal that are indicative of cerebral pathophysiology.

The norms for evaluation of neuromuscular, psychological, and intellectual ability have been established primarily for infants and children in European countries and in the United States, with the standardization of scales based on a normal score of 100. The application of these procedures to the study of young-

sters of comparable age groups in developing countries suggests that while numerous interrelated factors may formulate the abilities of normal newborns, their inherent functional capacities and general potential abilities are fairly similar regardless of racial origin or geographical location.

Geber has demonstrated the remarkable reflex and neuromuscular abilities of newborn infants in Africa.[19, 20] Utilizing the Thomas technique, she found these newborns to perform (score 140 +) to a degree that would not normally be attained by European infants until four to eight weeks of age. Similar findings have been reported by Robles and Cravioto in Central America.[11] Under the circumstances of adequate nutrition, good health and environment, these infants continued to perform very well. Table III summarizes the findings of Geber and Dean which indicate the high level of intellectual capacity (score 120 — 140) demonstrated by African youngsters.[21] By three to four years of age, their findings coincided with the normal levels of European studies (score 100).

Table III

Performance scores for African infants and children receiving adequate nutrition and living under good health and environmental circumstances

	Scores				
Performance	1-6 mo.	7-12 mo.	1-2 yr.	2-3 yr.	7 years
Motor Activity	140	135	110	120	100
Manual Ability	130	125	110	110	100
Adaptivity	120	125	105	100	90
Language	120	120	100	90	90
Personal-social	120	120	110	110	100
Average	130	120	110	105	100

THE SPECTRUM OF MENTAL RETARDATION

In considering abnormalities of brain function, it is important to clearly define "mental retardation." General usage and interpretation of the term routinely brings to mind the extreme examples of an imbecile, idiot or feeble-minded child. In reality, its connotation also includes those individuals whose performance may be borderline subnormal with psychological testing scores ranging some 10% to 25% below the normal level. It is in this broad sense that "mental retardation" is used in this presentation. It encompasses the complete spectrum of mental abilities from those with minimal changes to those with completely incapacitating mental shortcomings.

Examples of extreme retardation are noted in Table IV where some of the inborn errors of metabolism are outlined.[24] These disorders directly affect the central nervous system and may produce serious defects in the brain with attendant performance scores of a very low order. Each one causes a different biochemical anomaly, but all are similar in that they begin to produce their deleterious effects at birth, producing excesses of specific nutrients as well as changes in their intermediary metabolites. If untreated, these changes in the biochemical environment of the developing nerve cells will result in irreversible brain damage.

Table IV

Inborn errors of metabolism that derange nerve cell nutrient metabolism causing mental retardation

Phenylketonuria	Fructosemia
Maple Syrup Disease	Histidine
Dissacharides	Pyridoxine Dependency
Leucine Sensitivity	Lipodosis
Galactosemia	

A second group of central nervous system disorders has been caused by a wide variety of specific vitamin deficiencies. Table V lists these substances that act in many specific roles as cofactors in the release of energy for central nervous system function as well as in the synthesis of important subcellular elements.[40] Studies of patients with these deficiencies have demonstrated both the neurological reactions to lack of a given vitamin *per se* and their complex interrelationship to each other in the total pattern of nutritional requirements for nerve cell function. Most of the cases in this category have been described as responding to

Table V

Specific vitamin deficiencies that can produce abnormalities of nerve cell metabolism and function

Thiamine	Pyridoxine
Riboflavin	Cyanocobalamine
Niacin	Ascorbic Acid
Pantothenic Acid	

therapy. However, rarely have they been subjected to long-term complete central nervous system evaluation. Thus, while the original obvious symptomatology may have been corrected, the possibilities of sequelae have not been eliminated.

The third category is made up of individuals who have been subject to varied periods of undernutrition for prolonged periods of time during their infancy and childhood. These children may exhibit moderately severe mental retardation which may improve with therapy, but can have persistence of minimal deficiencies of performance with scoring in the range of 75 to 90. It is this last group with which we are particularly concerned. Their problem may be representative of deficits in functional capacities of vast numbers of children in developing countries.

CLINICAL SYMPTOMATOLOGY OF SEVERE UNDERNUTRITION

Maternal nutritional status is a significant factor in fertility as well as in the survival of the embryo and fetus. It appears that even though a mother's diet may be submarginal, if her nutrition is adequate for conception and maintenance of pregnancy, her intrauterine active transport and concentrating mechanisms will supply the necessary nutrients for relatively normal development of her unborn child.[50, 51] Deprivation appears not to have an adverse effect on newborns other than to restrict accumulation of fat and water in their tissues during the last several months of gestation. However, most of the available data have been obtained in populations that had previously had adequate nutrition and were then subject to severe dietary restrictions during war or transportation difficulties. It would be valuable to obtain further information from areas where the diets have always been inadequate so that one may be better able to assess the effects of life-long undernutrition on the offspring. Furthermore, there is a pressing need for more sophisticated means of measuring central nervous system function in these newborns. Interestingly enough, they score quite well on present neuromuscular tests with performance comparable to that of newborns of adequately nourished mothers. This suggests that the inherent potential in these infants is good and that they might expect normal progress in brain growth if they were to receive a good post-natal dietary intake.

Unfortunately, nutrition and the environmental circumstances of the majority of infants in developing countries are so poor that they may begin to show a decline in their neurological competence by four to six months of age. Breast milk is the only source of nutrition of these babies and serves them well until their needs begin to exceed supply. This may occur within a matter of months, even though nursing may continue for several years. The inadequate milk supply is then supplemented with substances of local origin, such as cassava, that supplies primarily carbohydrate for calories. Hence, the infant's ongoing growth and development evolves on a restricted nutritional intake that contains progressively smaller amounts of necessary nutrients for normal cellular metabolism.

After weaning, the diets of these youngsters consist primarily of carbohydrates from corn meal, arrow root, cassava or rice. Furthermore, they may not

participate fully in the family's food supply. For example, some of the available food may be forbidden to them, or the hierarchy of the household may channel important items to the elders. Consequently, by two years of age these children may have been virtually starved for most of their lives. Metabolic, physical, and radiological evidence of growth failure progressively develops with the eventual clinical appearance of kwashiorkor or marasmus.[31] The acute onset of these symptoms may be related to hypothermia in the environment that stresses already borderline physiologic status of the body.[35]

As a result of restricted protein intake, these children exhibit obvious clinical evidence of growth failure, edema, hepatomegaly, and anemia.[47] They also have lesions of the skin and mucous membranes resembling pellagra, and deficiencies of vitamins A, B_1 (thiamine) and B_6 (pyridoxine). There is often a change in pigmentation of the hair as a result of sulphur-containing amino acid deficiencies and from defects in conversion of phenylalanine to tyrosine. In those youngsters with severe calorie deprivation as well as protein deficiency, the symptoms of extreme wasting or marasmus may ensue.

While the obvious clinical entities of kwashiorkor or marasmus have been extensively studied, it is apparent that undernutrition affects central nervous system activity before the appearance of these severe physical symptoms. The apathetic, peevish, unresponsive child with severe undernutrition is reflecting not only his physical status, but alterations in brain function *per se*. Psychometric testing reveals that although their performance as newborns may have been normal, by three or four years of age their responses are subnormal, scoring 75 and less. Comparable findings have been reported by a number of workers in the field, of which Graham, Ramos-Galván, Geber and Dean, Robles and Cravioto, and Stoch and Smythe, have provided the most definitive studies to date.

Reporting from different parts of the world, the findings of these researchers are virtually the same. They indicate a close statistical relationship between the poor central nervous system performance and physical symptoms of undernutrition of height, weight, head circumference etc.[9, 42, 53] Depending upon the age of onset of symptoms, their duration, and extent of dietary therapy, it has been possible to eventually correct the obvious physical findings of malnutrition to a fair degree. The treatment of choice has been found to be milk, although protein-containing, specially formulated substitutes such as Incaperina, have also been satisfactory. Following a graded regimen of an initial 35 Calorie and 0.5 gram of protein per kilogram per day intake, therapy is gradually increased to 6 grams of protein and 130 to 150 Calories per kilogram per day. After months of treatment, there is usually marked improvement in physical symptoms with the appearance of a "catch up" growth spurt that may move these youngsters along the way toward the low percentile range of normal height. Coincidentally, there usually is improvement in central nervous system function. However, in those whose symptoms began during the first 6 to 12 months of life, there may be a continued lag in progress with a demonstrable permanent gap in ability compared to others under treatment and especially to normal controls matched for age.

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In areas such as Mexico and Costa Rica that have established educational systems, the inadequacies become painfully evident when these youngsters enter school and are confronted with group learning situations.[43, 44, 55] The degree of mental incompetency that is seen appears to be related to age at the onset of undernutrition, its degree of severity, and duration. In those with early onset of severe undernutrition and those who have experienced deprivation throughout most of the first four years of life, central nervous system changes may not be completely reversible as shown by average performance ratings some 10% to 25% below normal.

These initial four years span the important period of growth and development of normal brain structure as already discussed. The process of nerve cell maturation, differentiation, and integration is one of singular completeness and without benefit of regeneration or adaptive function that may be seen in other organs. Consequently, it appears probable that abnormalities of intracellular metabolism may result in inhibition of the formulation of a specific function or at best may limit the capacity of the brain cells for future operation despite the availability of adequate nutrients at a later date. In the latter case, the level of cellular activity may be below that necessary for the ongoing integration of the function in the over-all operant brain experience so that a "critical period" has not been utilized to its fullest.

The few studies dealing with starvation and undernutrition beyond the age of four suggest that once the brain has evolved normally, it is capable of withstanding severe deprivation.[34, 32] Control studies in adults where performance was measured before and after prolonged starvation have been conducted. They have shown that the brain is adversely affected by starvation. With adequate nutritional therapy, however, brain performance can be expected to return to normal. The significant implication is that in dealing with the problem of undernutrition in developing countries, efforts must be focused on reaching the infant and preschool child so that we may prevent not only physical growth failure, but may insure the integrity of brain structure as well.

BIOCHEMICAL MECHANISM ABNORMALITIES IN PROTEIN-CALORIE UNDERNUTRITION

Nutrition is generally considered from the clinical point of view as satisfying hunger, maintaining body structure, and supplying energy for body activity. Actually, in the molecular sense, nutrients comprise all of the elements in the biochemistry and biophysics of cellular metabolism. Therefore, undernutrition implies deficiencies of all of these factors and their resultant abnormalities of cellular environment and function. Under these circumstances, the body makes every effort to compensate for these derangements in order to provide first for the metabolic needs of the nerve cells.

Within the past ten years, interest has centered upon protein-calorie undernutrition. There now is an accumulation of a tremendous amount of data concerning the biochemical ramifications of this specific problem.[57, 39] In developing

countries where undernutrition is prevalent, the diets of infants and children generally provide less than one gram of protein per kilogram of body weight per day. In many areas protein intake may be as low as a half gram per kilogram per day. Furthermore, the protein may be of low biological value and thus poorly used by the body. A restricted intake of protein by children of underdeveloped countries often is further aggravated by coincidental parasitic infestation and diseases which reduce intestional absorption and disturb cellular utilization of the protein.[48] If the caloric intake also is inadequate, a portion of the inadequate available quantity of protein reaching the cell will be converted into energy instead of being utilized in the building of new cellular structure.[33] In addition, first-priority demands by the body to produce biogenic amines and hormones will further reduce the meager amino acid supply available for cell elaboration. This process is exemplified by the metabolic sequence of phenylalanine to tyrosine to norepinephrine; tryptophane to serotin, and phenylalanine to thyroid hormone.[52] Since protein biosynthesis is dependent on the simultaneous availability of adequate concentrations of all necessary amino acids, a diversion of singularly important amino acids will further limit the formation of new protein structure.

The amino acid composition of urine, blood and tissues during protein depletion has been extensively measured by paper and column chromatography.[1, 14, 15, 30] Early studies served to demonstrate the variability of amino acids in biological samples and to facilitate the recognition of trends of changes with various degrees of undernutrition. Recently, Whitehead and Dean modified the paper procedure for use as a rapid screening test in evaluating large numbers of individuals.[59, 61] Their method measures changes in the ratio of dispensable to indispensable amino acids. It has been found to be a reliable criteria for detecting early undernutrition long before the appearance of gross clinical changes and the stigmata of kwashiorkor or marasmus.

In 1963, Holt *et al* reported a series of elegant studies in which they used the technique of Moore and Stein to quantitate complete aminograms of blood samples of children with kwashiorkor from eight separate geographical areas of undernutrition throughout the world.[28] They demonstrated a remarkable similarity in distribution of essential and non-essential amino acids regardless of the source of the blood samples and the type of protein dietary deficiency prevalent in the particular geographical area. The degree of abnormality in the distribution of the amino acids in the aminogram correlated well with the severity of the kwashiorkor experienced by the individual patient. From these and other data, the authors conclude that the initial major change in protein-calorie undernutrition is the decrease in availability of nitrogen *per se*. This is closely followed by changes in essential and non-essential amino acids so that both forces become inseparately operant in time.

The body's reaction to protein-calorie undernutrition is one of adaptation in an effort to maintain positive nitrogen balance. Within a variable range this can be achieved with establishment of a lower level of cellular activity that may conserve available nitrogen, energy, and necessary cofactors. If the undernutrition

is mild, adaptation may be successful in continuing a reasonable semblance of cellular function. However, with stress, or undernutrition of prolonged duration or increased degree, a further diminishment of protein biosynthesis, enzyme formation and cellular metabolism accompanied by increasing evidence of clinical symptomatology will occur and may eventuate in death.

A number of research workers who have studied persons with kwashiorkor and marasmus have reported finding trends in the concentrations of the amino acids in plasma and in urine of these persons that suggested the possibility of enzymatic dysfunctions in their metabolism similar to those seen in phenylketonuria.[5, 58, 37] In support of this concept, Cravioto demonstrated an abnormally high ratio of phenylalanine to tyrosine in persons with kwashiorkor and marasmus, indicating a reduction in the activity of their enzyme system that converts phenylalanine to tyrosine.[10]

In 1961, Whitehead and Arnstein discovered that urocanic acid (imidazole acrylic acid) was a previously unidentified nitrogenous product excreted in the urine along with urea, creatine, creatinine, free and combined amino acid nitrogen, ammonia and uric acid.[60] Inasmuch as L-histidine is its precursor, Dean and Whitehead undertook an evaluation of this metabolic pathway using a test load of five grams of L-histidine.[13] In contrast to normal controls, the urine of undernourished patients contained tremendous amounts of histidine that apparently could not be immediately metabolized by their bodies. Some hours later there was a marked increase in urocanic acid excretion but there was no evidence of formimino glutamic acid that should normally appear as a degradation product. These data were interpreted as representing reduced enzyme activity at both the histidine to urocanic acid step as well as at the later degradation step to formimino glutamic acid.

These workers have also demonstrated a similar defect in the hydrolase that converts phenylalanine to tyrosine. Using a 5-gram L-phenylalanine test dose in patients with kwashiorkor, they were able to produce excessive urinary excretion of phenylpyruvic acid as well as phenylactic acid and phenylacetyl glutamine.

It is evident from these examples that undernutrition can limit the activity of important enzymes causing abnormalities in the normal intermediary metabolic sequence and producing marked changes in blood and urinary patterns of specific amino acids *per se* as well as in their degradation products. Here then is another mechanism that can limit the concentration of a single amino acid that is necessary for protein biosynthesis.

The variability in concentrations of amino acids may have an additional mode of action in limiting the usual active transport of essential amino acids across the cell membrane.[22, 56] This may seriously alter intracellular metabolism by reducing the quantities of necessary precursors available for normal activity.

In addition to the factors that have been discussed, protein biosynthesis is dependent on the integrity of the nucleic acids and the cellular DNA-RNA system. It is therefore possible that coincidental deficiencies in substances such as vitamin B_{12} and vitamin B_6 may derange nucleic acid synthesis with resultant

changes in DNA and RNA that will disrupt the normal mechanisms for incorporation of amino acid into a new protein structure.[54]

RESEARCH FOR THE FUTURE

The evident importance of broadening our understanding of the effects of undernutrition on central nervous system activity is in reality a corollary to the tremendous need for advancing our over-all knowledge of the normal brain. It appears likely that as we identify new neural mechanisms, the adverse effects of undernutrition on them will become apparent. On the other hand, it is evident that in many instances basic metabolic sequences may best be discovered in patients with nutritional deficiencies. This dual interrelationship emphasizes the need for simultaneous research into brain function of normals and abnormals.

The scope of research needed for this vast problem can arbitrarily be divided into three major areas of measurement. They are: (1) biochemistry; (2) behavior and intelligence; and (3) neurophysiology.

Biochemistry

With the advent of electronmicroscopy and psychopharmacology, new techniques have been developed that have greatly advanced the study of subcellular structures and their chemical components. Neurochemistry has grown tremendously as a discipline and is providing us with information on newly discovered mediators of neural activities such as serotonin, norephinephrine etc., and relating them to well-established substances such as acetyl choline, etc. It is now recognized that these different substances have unique patterns of distribution throughout the various areas of the brain as well as within the subcellular structure of the brain cell *per se*. However, their complex interrelationships within the total framework of brain function is completely unknown. A study of them promises to provide basic information that will further clarify our understanding of neural transmission.

Although strides have been made in understanding the chemical significance of biogenic amines, there has been very little progress in determining the biochemistry of learning. Recently, Hyden and Egyhazi reported a series of fascinating experiments in animals in which they demonstrated a direct relationship between learning and the ratios of purine to pyrimidine bases in the RNA of the brain.[29] They were able to correlate active learning experience with a demonstrable increase in RNA as well as the ratio of adenine to uracil in nerve cells. Studies of this type must be pursued in greater depth with the hope that they will provide us with information on the basic mechanisms of mentation.

Further studies must be done on the integrity of cellular enzyme systems during undernutrition so that their individual capacities to operate in the presence of nutrient deficiencies can be determined. Each system is dependent on its capacity to compete for its required factors as well as to retain them. These data would establish a rank order of specific enzymes according to their ability to

function under conditions of decreasing concentrations of their necessary cofactors. This information would serve to identify the operant systems during undernutrition and help to correlate both the chemical and clinical performances of patients.[7]

Evidence has been cited that supports the thesis of biochemical similarities between undernutrition and phenylketonuria. Although extreme increases in the levels of phenylalanine do not occur in kwashiorkor, there are comparable changes in essential and non-essential amino acid concentrations.[36] Inasmuch as the causative factors of mental retardation in both instances are unknown, these observations need to be further explored to determine whether or not they are of common etiology.

The recent report from Crome *et al* of finding significant changes in concentrations of cerebrosides and free cholesterol in the brains of patients with phenylketonuria has opened another interesting avenue.[12] It is important that similar quantitative measurements on autopsy material from patients with kwashiorkor and marasmus be made to determine whether or not comparable changes can be found that would be indicative of faulty brain maturation and abnormal myelinization.

Psychological and Intellectual

The batteries of procedures that are presently available for psychological testing have in general been validated in specific populations. In most instances the procedures leave much to be desired in their usefulness for testing in the variety of cultural backgrounds that exist in developing countries.[49, 27] Furthermore, there are few well-established tests for exploring specific mental disabilities in depth so that one may clearly define the neuropsychological intricacies of focal disorders. Research must be undertaken to improve our present techniques as well as adapting them to weighted scales so that data from various countries can be compared. The development of such adequate measurements would be of enormous value in helping to quantitate the relative importance of undernutrition and the usually coincidental deprivation of environmental and intellectual stimuli. This tremendous problem may require the development of entirely new test procedures based on responses to relatively culture-free techniques that can be structured to evaluate the inherent conceptual abilities of the individual.[2, 3]

Neurophysiological

The electroencephalogram has been widely used as a standard means for measuring neurophysiological activity of the brain. The characteristic tracings of maturational changes with age, as well as the patterns of some abnormalities of brain function have been well established. This technique has proved valuable in demonstrating the central nervous system abnormalities arising from specific nutrient deficiencies[8] as well as from the general undernutrition of kwashiorkor.[38, 18] As such, it would be valuable to extend its use to monitoring central nervous system activity as a means of bioassaying biochemical changes.

However, there is need for far more sophisticated techniques for measuring neurophysiological responses in both normal and abnormal persons. During the past several years, advances have been made in electronics that have permitted more definitive measurement of the evoked response patterns of the brain so that they can be computer programmed following the presentation of trains of stimuli of visual, auditory, tactual, and participating origin.[17, 16] New information that is emerging from these studies indicates the probability that the maturational status at birth can be more clearly defined and that central nervous system function at later ages may be better quantitated. If these results can be extended, it is possible that these procedures will help to integrate the over-all complex of the physiological, biochemical, psychological and intellectual aspects of the brain.

SUMMARY

Today's pressing challenge is to solve the intricacies of the roles of nutrients in normal central nervous system metabolism and to clarify the relationships of nutritional deficiencies to the pathogenesis of mental retardation. With better understanding of these problems, it would be possible to develop appropriate measures for prevention and correction that could be instituted for preschool children in developing countries. If present estimates of the prevalance of undernutrition and possibly related subnormal brain function are valid, the upgrading of mental ability by 10% to 20% could be the critical factor of bringing children in developing countries to a level of performance that would immeasurably advance their productive capacities for self and nation.

Identification of specific mechanisms involved in brain function may have further value in helping to advance man's intelligence in the future to new levels well beyond the present norms. As a matter of fact, with this generation's accelerated rate of growth, earlier maturation and increased physical size, it is quite possible that their central nervous system is being affected and may have critical nutrient requirements for optimal function. Indeed, an immediate 20% to 40% increase would be a most welcome adjunct for coping with the array of research problems that must be solved.

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The CHAIRMAN. The committee will recess subject to the call of the Chair.

(Whereupon, at 4:20 p.m., the committee recessed, to reconvene subject to the call of the Chair.)

APPENDIX

Dr. Arnold E. Schaefer Presented the Following Information to the Committee

The ten states comprising the National Nutrition Survey all have nutrition programs within the official health agency. Despite severe personnel limitations, these programs include a variety of activities, with a major emphasis on maternal and infant care programs, children and youth projects, and services to the chronically ill and aging. Much of the service is channelled through the public health nurses, the homemakers aides, and via consultation to nursing homes and extended care facilities.

There is an increasing trend toward locating positions at local levels, making possible direct service by the nutritionist to the public. Currently, lack of funds and lack of existing manpower curtails this trend.

The public health nutritionist and hospital dietitian are frequently the only persons available to the community who have training in both normal and therapeutic nutrition. The nutritionist, therefore, often serves as a consultant and coordinator for various other community programs that have potential for providing nutrition education such as: neighborhood centers, senior citizens groups, home delivered meal programs, Head Start programs, school lunch, food stamp and commodity programs, crippled children services and welfare programs.

Duval County, Tex.

Following is a description of the commodity food distribution program for the month of July 1968 at which time Duval County was being surveyed as part of the Texas sample of the National Nutrition Survey.

The total county had an estimated population in 1967 of 13,900 persons. Two districts, San Diego and Benavides, contain almost 100% of the population. These districts are the distribution points for commodities, with distribution being made three days per week in San Diego and twice per month in Benavides. No single family, however, receives commodities more than once per month.

During July 1968 for the two districts, there was a total of 3434 individuals certified to receive commodities.

Of those receiving commodities, 958 were on public assistance and 2251 were not on public assistance. The 3209 individuals represent 555 families in San Diego and 242 families in Benavides.

The July 1968 commodity distribution in Duval County was as follows:

Food	Total amount	Average amount per person for 1 month
Cheese	4,000 lb	1⅓ lb. (approximately).
Nonfat dry milk	14,300 lb	4½ lb. (approximately).
Rolled oats	3,300 lb	1 lb. (approximately).
Peanut butter	3,400 lb	Do.
Rice	6,200 lb	2 lb. (approximately).
Wheat flour	17,000 lb	5 lb. (approximately).
Cornmeal	4,500 lb	1½ lb. (approximately).
Raisins	3,200 lb	1 lb. (approximately).
Dehyrdated potatoes	3,209 lb	Do.
Lard	6,300 lb	2 lb. (approximately).
Split green peas	1,650 lb	½ lb. (approximately).
Dry beans	6,200 lb	2 lb. (approximately).
Chopped meat	6,117 lb	1 lb. 14 oz.
Grapefruit juice	4,202 qt	1 qt. 10 oz.

Assigned to Central Office, Louisiana State Department of Health

Acting State Health Officer, and Director, Bureau of Community Health Services, Andrew Hedmeg, M.D., M.P.H.;
Head, Division of Communicable and Preventive Diseases, John A. Trautman, Ph.B., M.D.; Mattie Boagni, M.D., Pediatrician;
Chief, Epidemiology Section, Charles T. Caraway, D.V.M., M.P.H.
Director, Bureau of Health Conservation and Training Center, Ben Freedman, MD., M.P.H.
Chief, Dental, Sight and Hearing Section, Paul Cook, D.D.S., M.P.H.
Head, Division of Maternal and Child Health, Marie Louise Pareti, M.D., M.P.H.; Carolyn Talley, M.D., Peditrician; Marie Heller, M.D., Peditrician; Louise Lutz, M.D., Obstetrician.
Director, Bureau of Laboratories, George H. Hauser, M.D., F.C.A.P.
Dr. Robert Ownes and Dr. Charles Behlen II: On 2-year assignment from U.S. Public Health Service.

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Dr. J. P. Gillaspie: Ascension, Monday, Wednesday, Friday; Iberville Tuesday, Thursday.
Dr. Sarah M. Braud: Assumption, Friday; Lafourche, Monday, Tuesday, Wednesday, Thursday.
Dr. R. F. Miller: Cameron, Thursday; Jefferson Davis, Monday, Tuesday, Wednesday, Friday.
Dr. Kendrick Taylor: Grant, Thursday; Rapides, Monday, Tuesday, Wednesday, Friday.
Dr. H. E. Cannon: Livingston, Friday; St. Tammany, Monday, Tuesday, Wednesday, Thursday.
Dr. W. C. Summer: Morehouse (½ day), Tuesday, Friday; Ouachita (½ day), Tuesday, Friday, Monday, Wednesday, Thursday.

DIRECTOR OF THREE HEALTH UNITS

Dr. T. B. White: Catahoula (½ day), Monday, Tuesday, Wednesday, Friday; Concordia (½ day), Tuesday, Wednesday, Thursday; LaSalle (½ day), Monday, Thursday, Friday.

Dr. F. L. Foster: DeSoto (½ day), Tuesday, Thursday; Red River (½ day), Tuesday, Thursday; Webster, Monday, Wednesday, Friday.

Dr. Eddie M. Gordon: St. Charles, Monday, Tuesday, Friday; St. James, Wednesday; St. John, Thursday.

Physician and Parish Health Unit

Dr. M. P. Martin: Iberia (½ day), Monday, Wednesday, Friday; Lafayette (½ day), Monday, Tuesday, Thursday, Friday; St. Martiu (½ day), Tuesday, Thursday.

Dr. N. D. Blanchard: Jackson, Wednesday; Lincoln, Monday, Thursday, Friday; Union, Tuesday.

Dr. John B. Stotler: St. Bernard, Monday, Friday; St. Helena, Wednesday; Tangipahoa, Tuesday, Thursday.

DIRECTOR OF FOUR HEALTH UNITS

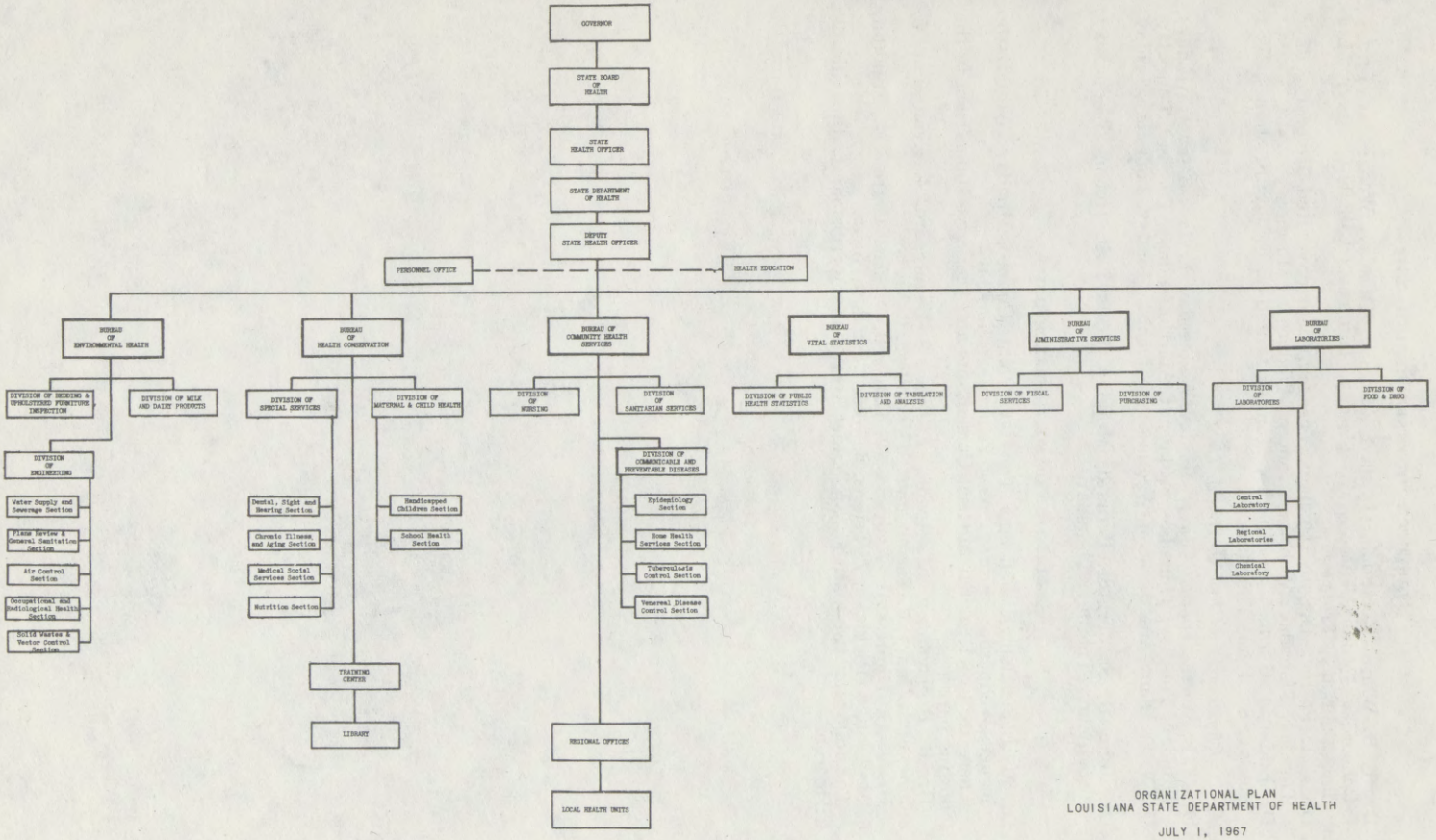
Dr. M. J. Picinich: E. Feliciana, Tuesday; Pointe Coupee, Monday; West Baton Rouge, Wednesday, Friday; West Feliciana, Thursday.

There are two Regional Medical Consultants and they give supervision to the following parishes:

Dr. R. B. Thompson: 1. Acadia, 2. Allen, 3. Beauregard, 4. Evangeline, 5. Sabine, 6. St. Mary, 7. Terrebonne, 8. Vermilion. 9. Vernon.

Dr. J. G. Dupress: 1. Avoyelles, 2. Caldwell, 3. East Carroll, 4. Franklin, 5. Madison, 6. Richland, 7. Tensas, 8. West Carroll, 9. Winn.

The following two parishes are under Regional Supervision: 1. Bienville, 2. Claiborne.



ORGANIZATIONAL PLAN
LOUISIANA STATE DEPARTMENT OF HEALTH

JULY 1, 1967