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DIET RELATED TO KILLER DISEASES

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DIET RELATED TO KILLER DISEASES

TUESDAY, JULY 27, 1976

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

The select committee met at 9:30 a.m., pursuant to notice, in room 1114, Dirksen Senate Office Building, Hon. George McGovern (chairman of the committee) presiding.

Present: Senators McGovern, Kennedy, Humphrey, Percy, Dole, Bellmon, Taft, and Hatfield.

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

Senator McGOVERN. This morning we will investigate the relationship between diet and health.

With today's hearing, the committee will begin to focus on the role of diet in preventive health care, and the degree to which diet effects the causation of the killer diseases.

This area will be one of major concern for the committee in the upcoming months.

When the term "malnutrition" is used it is usually associated with the problems of underconsumption and poverty. This certainly has been and continues to be a major part of the malnutrition problem. But the problem of malnutrition in the United States is also a problem of overconsumption and undereducation.

Six of the 10 leading causes of death in the United States have been connected to diet: heart disease, stroke, cancer, diabetes, arteriosclerosis, and cirrhosis of the liver. For example, obesity, which may effect 30 percent of Americans, increases the risk of heart attack, diabetes, hypertension, and arthritis, according to HEW's "Forward Plan for Health."

We produce and market more food than any other country in the world. Yet we find that we have not attained widespread nutritional health.

Our goal is simple: A healthy population. Diet can and should play a vital role in preventive health care. A proper diet will not eliminate all diseases, but it can greatly affect the incidence with which the various killer diseases strike.

In our deliberations today, I ask for your guidance on what steps that Government, both Congress and the executive branch, must take

to put this Nation on a sound basis of nutritional health. More specifically we will address today:

(a) The role of nutrition in preventive health care;

(b) The degree to which nutritional factors either play the prime etiological role or else are highly contributory to the development of given diseases; and

(c) Suggestions for modifying the educational, research, and health delivery systems to incorporate nutritional factors.

I think the hearings held today and tomorrow will be of immense importance to the well-being of the American people. This committee is anxious to do what it can to articulate and modernize our national food and nutrition policy, and to assist in the development of such a policy. Included in that policy must be a keen awareness, and a willingness to act on that awareness, of the relationship between diet, health, and disease.

We are very grateful for the presence of these distinguished witnesses today, but before I call on them I'm going to give Senator Percy, the ranking member of this committee on the minority side, an opportunity to make a statement.

STATEMENT OF HON. CHARLES H. PERCY, A U.S. SENATOR FROM THE STATE OF ILLINOIS

Senator PERCY. Mr. Chairman, I join in welcoming our very distinguished witnesses today and express my appreciation also for your being here. Many of us in Congress at one time or another have talked about the problems of the Nation's health crisis. Certainly it looked like a few years ago it was the No. 1 item on the Nation's agenda. We have deplored the escalating cost of health care, dealt with maldistribution of health manpower, criticized the lack of research funding, denounced fraud and abuse in health care programs, and lectured on the growing inaccessibility of health care for the average citizen.

Since the 91st Congress, many of us have participated in the abortive debate on national health insurance, conceived by some as a panacea for the ills of our health care system. In seeking a cure-all to the Nation's health crisis too many of us overlook the underlying weakness of a medical system that is oriented toward death prevention rather than toward health promotion and maintenance.

The problems of health care have changed radically since the turn of the century when infectious diseases were the reported leading killers. Today's killer diseases—heart attack, stroke and cancer—are purportedly caused largely by factors which do not lend themselves to direct medical solutions. It is not easy to prove the causes of disease beyond a shadow of a doubt, but experts have found enough incriminating evidence to conclude that our super-rich, fat-loaded, additive and sugar-filled American diet is sending many of us to early graves unnecessarily. More and more health authorities now agree that spending money for medical care may have no more positive effect on good health than making simple changes in the way we eat and live.

American families can ill afford to spend unnecessarily for medical care. Large and persistent increases in health care costs, which continue to outpace inflation in the rest of the economy, boosted national health expenditures in fiscal year 1975 to an unprecedented $118.5 bil-

lion, or 8.3 percent of the gross national product. Americans now spend on the average 10 percent of their total income on health care alone. If nothing else, the pocketbook incentive should encourage each and every one of us to test the thesis that good nutritional and living habits can go a long way to prevent disease and maintain good health.

This is what the hearings are all about—to increase our understanding about the relationship between diet and preventive health care and to promote public awareness of the need for good nutritional habits in the maintenance of health. At the end of these hearings we hope to find the key to successful preventive health care—how to persuade people to take personal responsibility for their health without trampling on individual choice and freedoms.

Mr. Chairman, I'd like to express appreciation to the members of the majority and minority staff who have worked together on these hearings. Also I'd like to advise our witnesses, that with Congress busy with floor activity and House and Senate conferences, trying to get away for the Republican convention, some of us will have to sometimes alternate and be in and out of the room. But we wish you to know that we very much appreciate your being here, and your testimonies will be read carefully by all members of the committee. We will try to be here to the greatest extent we can, consistent with our other responsibilities.

Senator McGovern. Thank you, Senator Percy. We will now hear from Senator Humphrey and then from Senator Dole.

STATEMENT OF HON. HUBERT H. HUMPHREY, A U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator Humphrey. I wish to commend Senator McGovern for scheduling these hearings involving nutrition and preventative health; diet and disease on the first day and cancer on the second day.

The witness list is a very impressive one, and I am hopeful that we can learn more about how to pull together a sensible nutrition program to improve the health of our people. With today's rapidly escalating medical costs, this should be a top priority.

We have good evidence of the value of sound nutrition. But putting together a sound program which is manageable, not overly complex, or too expensive has been an elusive goal.

I have been especially convinced that good nutrition is especially important for our young people. Several years ago, after demonstrating the critical importance of sound nutrition before and after birth, in terms of mental development, the W.I.C. program was launched.

We all are aware how that noble effort has been treated under the Nixon and Ford administrations. Time after time the courts have intervened to force the Government to follow the directives of Congress in getting the program started and spending appropriated funds as directed.

I have been impressed with the recurring emphasis which educators at all levels have given to nutrition education. It is clear to me that an exciting nutrition education program could be developed to acquaint students with the characteristics, the qualities and importance of food.

Such a program is underway in St. Paul on a pilot basis. I am hopeful that it will be useful in learning more about approaches to a sound and effective nutrition education program.

I have introduced legislation to establish a universal school lunch program with nutrition education as an integral component.

In addition—and in part because of the arguments over the cost of the universal school lunch program—I have introduced nutrition education legislation which would authorize grants to train food service and education personnel and develop educational materials. These people would provide the basis for nutrition education programs in our schools.

In introducing S. 3449, I suggested the numerous economic reasons for improving our nutrition effort. I suggested:

Improved nutrition helps learning and the development of the brain;

Improved nutrition increases the capacity for work and raises the productivity and the motivation of workers;

Improved nutrition results in higher resistance to disease and lowers the severity of disease;

Improved nutrition decreases fetal, infant, child and even maternal mortality;

Improved nutrition among poor children would lead to a 10 to 30 percent higher mental achievement.

It has been estimated that eliminating malnutrition among 3.3 million poor children alone would produce a $6.3 to $18.8 billion increase in GNP over the lifetime of these children.

While we can and need to make a much greater effort to develop nutrition education programs for our youth, I also believe that we need to develop a balanced, comprehensive national food policy with nutrition as an integral feature. And I have introduced S. 3570 to achieve this goal.

Mr. Chairman, I look forward to hearing the ideas and recommendations of this distinguished group of witnesses.

Senator McGovern. Senator Dole?

STATEMENT OF HON. ROBERT DOLE, A U.S. SENATOR FROM THE STATE OF KANSAS

Senator Dole. The effects of the diet on human health should be a subject of compelling interest to all concerned legislators and professionals in the medical and nutritional community. Not only is it a subject which vitally effects every person, but it is an area which covers the widest possible range of problems—everything from under to over nutrition, and all included in the term "malnutrition."

With reference to the more specific relationship between nutrition and cancer, we again are talking to a staggering proportion of the population. Roughly one-half of the cancer cases among men, and one-third of the cancer cases among women are thought to be related to diet. It's a sobering picture.

Equally as overwhelming are the statistics on poor nutrition when considered in terms of dollars, rather than in terms of lives. Testimony given before this committee in 1972 revealed that our Nation's poor dietary habits cost the country about $30 billion in health care each year. This is a tremendous bill to continue paying, and I think it is

about time we look into the situation to see where money and lives can be saved.

The situation is even more costly because of the social and family hardships caused by poor nutrition. I think anyone who has watched someone in their family suffer the effects of malnutrition will attest to the strain and difficulties it inflicts on the family. Nutrition is one of the most serious problems that we have to cope with. To paraphrase a recognizable TV commercial, one's health is his most valuable possession. We should protect it accordingly.

During these hearings, I hope that we will learn of significant conclusions that have resulted from the study of diet and health. Enough correlation has been found between the two that it seems safe to set forth general trends and theories. From there, general guides for revised diets and reformed eating habits should be stressed.

By sharing the information already known about ways in which nutrition affects health, and by presenting viable responses one can make to the problem, I hope today's hearing will enlighten many to these matters, and will encourage them to practice preventive medicine.

Senator McGovern. I might add, we have lost two illustrious members of this committee to the vice presidential selection process, as both Senator Mondale and Senator Schweiker are absent today. We hope there won't be too many more committee casualties as we move along.

Dr. Cooper, we are very pleased to welcome you before this committee. Your expertise in this whole area of health and the public issues associated with it is well known. So on behalf of the committee, I welcome you as the Assistant Secretary for Health of the Department of Health, Education, and Welfare, and I will ask you to introduce the colleagues who have come with you.

STATEMENT OF DR. THEODORE COOPER, ASSISTANT SECRETARY FOR HEALTH, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. Cooper. Thank you, Mr. Chairman. I have with me at the table Mr. Gene Haislip, the Deputy Assistant Secretary for Legislation for Health on my right, and to my left, Dr. Charles Lowe, who is my Special Assistant for Child Health Affairs; and to his left, Dr. Ben Burton from the National Institute of Arthritis, Metabolism and Digestive Diseases of the National Institutes of Health. In addition, we have with us, backing up, for any specific information that may be of interest to the committee, representatives of all six health agencies who would be in a position to respond promptly and completely to any of the issues that may arise during the hearing.

I am delighted to appear before this select committee today to address the relationship between nutrition and health, a subject which I regard as integral to present and future improvements in the health status of the American people.

In formulating future health policy, I believe that we have now reached a crucial point. Many of today's health problems are caused by a variety of factors not susceptible to medical solutions or to direct intervention by the health provider. In that sense, I only underscore what Senator Percy had said in his remarks. Modern medicine has conquered smallpox, tuberculosis, pneumonia and other major diseases

which once were the leading causes of death in this country. We have as yet no vaccine to prevent cancer and we have no single intervention that will cure alcoholism, but we do know that to a substantial extent an individual's behavior is capable of both causing and preventing certain chronic disease problems.

We at the Department of Health, Education, and Welfare believe that we need to call public attention on the underlying conditions or antecedent causes of preventable diseases rather than concentrating solely on the treatment of diseases themselves. It is in this context of prevention, then, that I wish to focus my discussion this morning on diet and health. At the heart of our efforts is the conviction that people throughout the country want and can benefit from more authoritative guidance about nutrition. We feel that there is much already known about nutrition and health which has not been transmitted effectively to the public. It is equally clear, however, that there still are major gaps in our understanding of nutrition and that these gaps must and can be filled by intensified research.

While scientists do not yet agree on the specific causal relationships, evidence is mounting and there appears to be general agreement that the kinds and amount of food and beverages we consume and the style of living common in our generally affluent, sedentary society may be the major factors associated with the cause of cancer, cardiovascular disease, and other chronic illnesses.

Senator McGovern. Dr. Cooper, could I interrupt you? I think we need to underscore the point you just made with regard to the direct relationship between malnutrition and these major diseases. In reading the submitted statements, I noticed that Dr. Winikoff states a 10-percent increase in weight results in a 30-percent increase in the probability of coronary disease. The Department of Agriculture issued a report in 1971 indicating that on a broader level there's a very strong relationship between diet, heart disease, and the other killer diseases.

I'm wondering if, in general, you agree with the thrust of this USDA report, which I have just referred to, entitled "A Study in Human Nutrition Research." The basic assertion here is that a properly balanced diet would have a very dramatic impact on the saving of human lives.

Dr. Cooper. There is no question in my opinion about that particular conclusion, Senator McGovern. When I was Director of the National Heart and Lung Institute we instituted several studies in order to find ways to give specific guidance to the public about what kinds of nutritional information would be of particular help in reducing that relationship between the proneness, particularly of the middle-aged American male to coronary artery disease. So I do feel that particularly excessive weight, which is a form of malnutrition, obesity, that is not from a deficiency but an excess or a disbalance of intake, can substantially contribute to coronary artery disease.

I notice on your agenda for tomorrow you will be talking specifically about some of the dietary relationships to malignancy and, again, I underscore that this is only one of several relationships. As I will point out later in my testimony, throughout the life cycle there are conditions in which susceptibility to infection from real malnutrition only heightens the risk that the individual might face. It is not strickly a question of weight.

I think our perceptions of what is healthy, the robust corpulant person that was our perception of success at the turn of the century, is not appropriate. Whereas I think the American public needs to have the opportunity to make free choice and needs to have the opportunity to take all the advantages of modern technology and preliminary food preparation to make a housewife available for choice to do other things, there is no reason in my opinion why the food industry, the governmental officials, the agriculturists and medical profession cannot provide guidance as to how to do this in a constructive way that is helpful and will further promote the public interest.

Senator McGovern. This particular study, which USDA completed 5 years ago, indicates that there were some 1 million people who died in 1967 from heart disease and related diseases; over 5 million suffering with definite or suspect heart disease; and concluded that this resulted in a total medical cost to the American people was $31.6 billion in 1962.

This study attempts to estimate what the savings might be both in the number of heart cases and also the savings financially to the American people if proper diets were provided. They estimate that they could reduce by 25 percent the number of heart disease sufferers in this country if people had an adequate diet. They also estimate that adequate diets would reduce the medical costs $31 billion—stemming from heart disease by 20 percent.

Do you think those estimates are within reasonable ranges, based on your own studies, Doctor?

Dr. Cooper. Yes. We participated in those studies, Senator, and we provided some of the basic information of an epidemiologic nature that contributed to these kinds of conclusions.

You may recall that 15 years ago the Congress, along with the National Heart Institute at that time, supported preliminary studies of a diet-heart relationship to see whether it was practicable to design a study in this free living population which could give some more solid scientific information about confirming the fact of the relationship of diet to heart disease.

Economic factors and practical management factors led us away from that next step but we have designed in the interim other studies to delineate the role of nutrients, particularly lipids, in the diet. We feel that as with our success with prevention of hypertension as a major factor in coronary artery disease, we could make further inroads on coronary artery disease as the modern epidemic in this time. We are seeing for the first time in these last couple of years a downturn in the rate of increase in coronary artery deaths and deaths from heart attack in this country, and I think the whole preventive effort is beginning to take hold, and if we could add to it a real dimension of a real practical program of diet and nutrition it would greatly help this trend.

I think what we are really talking about here is a practical program. The housewife that goes to the store to purchase foods has to have a little more solid information than we can now provide her about the way to buy healthy foods. In this regard, our programs of food labeling and the efforts of the prepared food industry to make products that are more suitable will contribute to the ability of the housewife to pick out foods in our modern setting that can help us achieve a 25-percent reduction in incidence and 20 percent in savings.

I do think they are within the realm of possibility.

Senator McGovern. Thank you, Doctor.

Dr. Cooper. In this country today, the classic nutrition deficiency diseases such as blindness due to lack of vitamin A, scurvy, beriberi, or pellagra, no longer are the scourges that still unfortunately exist in too many of the developing countries of the world. The overwhelming majority of our population obtains enough of the essential nutrients which are critical in preventing these diseases and thus seem to be free of their threat. This is due to the generally high standard of food intake in the United States, the availability and extensive use of a large variety of wholesome foods in this country, and to remedial action such as fortifying or enriching certain foods with critical nutritional factors which otherwise might be in short supply in the diet of some individuals. For example, the addition of vitamin D to milk and vitamin A to margarine, certain B vitamins and iron in flour and cereals, and iodine to salt.

We must, however, move much further in utilizing optimal nutrition as a preventive health measure. In many instances our knowledge is already adequate to permit us to utilize education as an important tool to prevent disease and to improve the well-being and longevity of our citizens by fostering more healthful food consumption practices. Here I am particularly referring to obesity, a widespread and most important nutritional disease and a public health problem of constantly growing proportions in the United States. And my own figures only underscore those which you made in your opening statement.

Since food patterns are established in infancy, parents and other caretakers of infants and young children must play a strong role in determining the nutritional health of children. Emphasis should be given to helping parents understand the nutrition needs of children and how best to meet them while, at the same time, developing sound food habits. And there's a real biological basis, I might say parenthetically here, for seeing to it that excesses are not introduced as a feature of the food habit process in the young.

Over the long run, one of the most productive ways to improve the health status of the Nation is to increase nutrition education in the schools. We plan to enlarge our cooperative efforts with the Office of Education in the development of model curricula and specialized techniques to assist in the teaching of elementary and secondary schoolchildren about the role of nutrition in total health and how they can practice more healthful food purchasing and food consumption habits. The use of nutrition labeling of food as one focus for such programs and discussion of the nutritional basis for the selection of the components of school lunch programs can serve to reinforce desired practices with respect to diet and nutrition.

There are also under consideration proposals to develop nutrition education programs in the context of the new health education law which you recently passed, and which was signed by the President in June, to alert people to the current, scientific information on the links between nutrition and health. The Food and Drug Administration, for example, already has underway a media-based program to educate the public on nutrition labeling, how to make use of them. Meetings with nutrition authorities and media experts will help to establish the substantive content of such programs and to assist in the design of specific communication strategies.

In other words, we recognize that a different kind of expertise is necessary here to make the kind of impact that I think is lacking in our programs to educate and inform the American public.

Groups such as the Advertising Council or the newly established non-Federal National Center for Health Education, or similar groups could and should be utilized to undertake some phases of the public education campaign.

Senator McGovern. Dr. Cooper, could I interrupt you just momentarily? Are you familiar with the nutrition education bill that I and Senator Humphrey and others have sponsored in the Congress?

Dr. Cooper. Yes, sir.

Senator McGovern. Does that meet the kind of objectives you're talking about in your testimony today of disseminating information that the American people need throughout their lives to know what they should eat?

Dr. Cooper. Yes, sir. I think its specifications do lay out the kind of information that's necessary and the two dimensions which I will mention: How nutrition is important to maintenance of health during the life cycle of the individual, and how abuse of the diet contributes to generation of disease; but also how proper nutrition can contribute to the treatment of disease. I view in your bill that those specifications are the objectives set forth.

Senator McGovern. Just to underscore right at the outset of your testimony the point that you're making on the importance of preventive medicine, would you say that nutrition is currently the Nation's foremost preventive health issue? Is there any other factor that's more important in your judgment in an intelligent effective program of preventive health care, preventive medicine, than good nutrition?

Dr. Cooper. Well, I think it's the building block, Mr. Chairman, on which all other aspects are based. In that sense, I would endorse the idea that good nutritional practice as well as other good personal health maintenance practices are fundamental. As you know, I think in specific areas there are things that we have already shown that can make tremendous impact, like on the field of hypertension. I think in the field of immunization and sanitation we have tremendous opportunities to do things.

But in the personal sense—and this is an area where I feel that the American public from time to time gets led astray about their own responsibility—I think nutrition is one of the fundamentals. I think that it has been neglected and I would agree with you that one of the most, if not the most important thing besides general self-care and self-responsibility is proper nutrition.

Senator McGovern. Is it not a fact that of the 10 leading causes of death in this country at least 6 of them are directly related to malnutrition?

Dr. Cooper. Yes. That's absolutely correct.

Senator McGovern. Just one more question—and I don't want to delay your testimony—this committee in recent years has concentrated on the problems of the poor, the problems of those who don't get enough to eat. Is it not a fact that looking at the problems of the American people as a whole that overconsumption may be as serious a problem of nutrition as underconsumption?

Dr. COOPER. Particularly overconsumption of the wrong things, Senator. I would agree with that. Very often in the poor we see people who are plump who might be called obese, and people would then conclude that they do not have a deficiency because they look rotund, healthy in one sense of the word. But it is true that the consumption of high carbohydrates sources with the induction of obesity constitutes a very serious public health problem in the underprivileged and economically disadvantaged. I would agree with that.

Senator MCGOVERN. Thank you.

Dr. COOPER. Now one area which I view with particular concern and importance is the role of nutrition during various stages of the human life style, and I'd like to spend a few minutes commenting on this topic, starting from the beginning of it, during pregnancy and during the problems of the elderly.

Pregnancy is probably the greatest so-called normal physiological stress and the most common major alteration of the normal biologic life processes to which a woman is subjected during her lifetime. Because of the demand of the growing fetus and physiologic and metabolic changes which take place in the mother, different nutritional requirements apply to this period and to the subsequent period of lactation. There is a strong relationship between the nutritional status of the mother in the course of the pregnancy and the health of the infant. There are fewer stillbirths, premature births, toxemias of pregnancies, and illnesses in the newborn infant if the mother has consumed a balanced adequate diet before and during her pregnancy. Famine conditions during World War II in Holland and the siege of Leningrad led to the well-documented observation that severe undernutrition in terms of total calories also significantly reduces the birth weight of the full-term infant and decreases its body length markedly, though these do not change to an equal degree or proportionate degrees.

In this respect, pregnancy in adolescents is particularly critical. Because they are still growing, most girls under 17 have greater nutritional requirements relative to size than adult women of equal size, and pregnancy may compromise their growth potential and increase the risks of complications in pregnancy such as iron-deficiency anemia, fetopelvic disproportion, prolonged labor, or toxemia. The average birth weight of infants born to adolescent mothers is substantially lower, the proportion of infants with abnormally low birth weight (an index of risk) is greater, and infant mortality rates are higher. Though we are not certain that through nutritional intervention we can change the proportion of low birth weight infants in this age group, we are certain that lack of adequate nutrition complicates an already serious problem. And I might say here it is a growing, if not alarming problem; 20 percent of our pregnancies coming to term at this point in time are in teenage young women and this is creating an important health problem, both for the mother and the infant, and also important problems for the health of society, since it impacts on the social and economic status of families. In sum, special attention should be paid to fulfillment of the nutritional requirements of the adolescent mother and fetus while we do other things in preventive medicine to try to bring the right information to young people, both males and females, about the implications of this par-

ticular situation. We have to be aware also that the risk to the fetus is particularly acute in this age group that has other nutritional problems, since it depends on an adequate intake of calories, protein and other minerals like calcium, iron, and folic acid.

Now in contrast with young animals, the human young take a seemingly infinite time to learn to feed themselves without outside help. For almost 3 years, the infant is dependent on its mother's ability to provide and select its food. The first 9 months of this period are spent in utero abstracting from the mother's bloodstream whatever nutrients are required. If the mother's diet is insufficient, her tissues may have to yield some of the missing nutrients, as in the case of calcium and phosphorous derived from the maternal skeleton. Thus, maternal nutrition affects the fetus long before it first encounters the perils of extrauterine life. Human breast milk may be considered the ideal starting food for the infant but a well-chosen bottle formula is a very satisfactory substitute. The degree of completeness of the infant's development subsequent to the first months on milk, with or without other food adjuncts, now depends on solid food to complete the diet from the nutritional standpoint.

If there is a continued pattern of deficient nutrition, the stage is set for suboptimal development of the child in many dimensions: behavioral, physical, intellectual. It will require many years of subsequent optimal nutrition to effect catchup growth and development, if indeed, this is ever achieved.

The nutritional needs of children and adolescents—are unique and increased over those of normal adults. These requirements are determined primarily by the need for building and maintenance of new body tissue, by the demands of a high order of physical activity, and to some extent by interrelated intrinsic and environmental factors, including emotional changes as the growing child reacts to his maturation and his surroundings. Some problems, even of hypersensitivity, which I haven't mentioned in any detail but need to be kept in mind. In general, adolescents require a high caloric intake because of strong physical activities and an abundance of good quality protein and minerals because of rapid growth. The need for vitamins is enhanced beyond that of a sedentary adult because of the characteristic high metabolic activity of this period in the life cycle.

As the individual reaches adulthood the body's nutritional needs for maintenance of health and optimum working capacity is uninfluenced by growth and development. The level of everyday physical activity plays an important role in determining the content of the daily diet, particularly the caloric content, which should decrease, not increase, as physical activity diminishes. As an individual begins to grow older, the metabolic rate begins to slow down and energy requirements are similarly reduced. You will note that most of my testimony subsequent to this will apply to adults under various circumstances of health and disease.

Sound nutrition in the elderly is not fundamentally different from that in the mature adult. The basic requirements for satisfactory metabolism are essentially similar throughout life except that their appears to be an increase in the requirements for vitamins. However, certain characteristics inherent in the process of aging and peculiar to the elderly add unique facets to geriatric nutrition. Usually less physical

work is performed in advanced age and therefore the individual's caloric requirement diminishes. Dietary calories which are not used are stored in the form of body weight and individuals who continue the richer diet of their physically more active days will gradually become obese. Now the chances, however, for a development in the other direction, toward undernutrition, are equally great. Loneliness, economic strictures, inadequate dentition, decreased physical activity, diminished sensitivity to taste and smell—all work toward a pattern of a decreased food intake and deficit nutrition. Extrabiological factors, a sense of isolation and "uselessness," depression, and poverty frequently set a dangerous trend which must be strongly counteracted to maintain the health of the individual during one's advanced years.

At this point, Mr. Chairman and members of the committee, I would like to deal briefly with specific diseases which can be brought about by faulty nutrition during any point in the life cycle.

The first category that is usually spoken of is malnutrition. Now those that come to mind first are the various classic deficiency diseases caused by the inadequate intake of essential nutrients which usually occurs over a prolonged period of time. Classic examples include such diseases as pellagra, caused by a deficiency in niacinamide; scurvy, the result of severe vitamin C deficiency; rickets, caused by a lack of vitamin D; beriberi, due to chronic vitamin B_1 deficit; iron deficiency anemia, caused by insufficient iron in the diet; and protein and calorie malnutrition, which I have mentioned earlier.

Nutrition research has taught us that the preceding cases involve specific relationships of cause and effect. The picture is not as clear with respect to other diseases where nutritional elements may be important contributing factors in the causation of the illness. I am referring here particularly to degeneration of major blood vessels of the body—atherosclerosis—and its most frequent clinical expression—coronary heart disease. We can cite multiple causes which induce atherosclerosis. It can be attributed to abnormal fat transport or metabolism, bad dietary habits, disorders of blood flow and blood clotting, hormonal imbalance, extensive or long-term use of nicotine, obesity, a sedentary mode of life characterized by habitual physical inactivity, or a stress-seeking personality type. Heredity is an important factor in individual susceptibility, we believe. Also, longstanding hypertension and diabetes constitute predisposing and contributing factors.

In recent decades a body of suggestive research evidence indicates that the nature and extent of fat intake, as well as fat transport and metabolism, are involved in atherogenesis in some as yet unclarified fashion. Patients with known advanced atherosclerosis or with established coronary heart disease very often exhibit elevated blood lipid and cholesterol levels. A relationship exists between the quanity of dietary fat and its qualitative makeup and the blood lipids. The isocaloric substitution of unsaturated fats in the diet for saturated fats results in a marked lowering of the previously elevated plasma cholesterol levels. Even more striking results are obtained if pure polyunsaturated fatty acid esters are administered. Conversely, plasma lipids arise when a diet rich in saturated fats is given. The mechanisms by which polyunsaturated fatty acids lower serum cholesterol are as yet poorly understood. In brief, a correlation between dietary fat and certain features of the blood lipid picture has been established by

research procedures long supported by Congress and carried out in cooperation with the National Heart and Lung Institute. A relationship between high blood cholesterol, B–lipoprotein, and triglyceride levels and atherosclerosis is strongly suggested, but to date there is not enough direct experimental evidence to establish that the three factors are sequentially involved. That is, that the dietary fat pattern leads through elevation of B–lipoprotein or cholesterol blood levels to the development of atherosclerosis. On the other hand, experimental evidence has been emerging during the last decade which seems to establish that maintaining a low serum cholesterol and serum triglyceride level with controlled diets for 5 to 10 years or more results in a reduced incidence of deaths from coronary artery disease.

Now I have dwelt at length on this particular subject because coronary heart disease is statistically our number one killer disease and because altered nutrition has tremendous preventive potential in curbing coronary heart disease. Even if what I said was completely unsubstantiated by future research, there is nothing that I know of in the recommendations to reduce fat intake, to reduce obesity and maintain an optimal body weight with an appropriate level of physical activity would in any sense be harmful. In fact, I'm quite aware that it will be beneficial for the prevention of other diseases as well. And as a real preventative, I cannot give you a formula which will prevent heart disease by diet. We speak of this as a possibility. A great deal more nutrition research work, both on a basic and applied clinical level, will have to be conducted before one can speak with greater certainty concerning large-scale application, but the principles of reduction of obesity, a balanced diet, proper fortification, particularly for the elderly, can only help in my view toward the establishment of a sound basis for the prevention of a wide spectrum of diseases.

In recent years obesity has become a public health problem of considerable importance in the United States. Approximately 20 percent of all adults are overweight to a degree that may interfere with optimal health and longevity. Obesity aggravates cardiovascular disease and osteoarthritis and increases the liability to hypertension, atherosclerosis, hernia, and gallbladder disease. It also may facilitate the emergence of latent diabetes in predisposed individuals as they approach an advanced age and adds to the hazards of surgery; it makes for postural derangement, and in extreme cases, it is the cause of obesity dyspnea with plumonary insufficiency. It is also of interest that the mortality from cirrhosis of the liver in obese males is 249 percent of that expected of the non-obese.

Now medicoactuarial statistics make it quite clear that the obese do not live as long as the lean. The chief causes of death among overweight individuals are cardiovascular-renal diseases, diabetes, and disorders of the liver and biliary tract. That's the gallbladder. The burden of obesity is not borne equally among all segments of society. In the United States, it is more likely to be found in the lower socioeconomic strata, as I mentioned before; and this association is particularly marked in poor women and to a lesser extent in middle class males.

Again, I would emphasize the statistical importance of obesity in our population and the strong need for and potential benefits of systematic preventive action beginning in early childhood. In this

case I would say parenthetically, Mr. Chairman, that we do not have to have the benefits of a special insurance policy to implement a nationally important preventive program of medicine. It depends on the individual and the support which we can give them by giving them the right information.

I understand that the subcommittee will be receiving testimony tomorow on the relationship between diet and cancer; therefore, rather than addressing this topic, which I do not wish to downplay since it is the most feared of American diseases, I would underscore that I have reviewed a good deal of that situation and testimony and only subscribe to the importance of paying attention to the benefit that good nutrition can play in studying the cause of cancer, but also in the response to modern therapies of cancer.

Senator McGovern. Dr. Cooper, you said we need more research and more statistics to make definitive statements about the relationship of malnutrition to heart disease and other major killers, but the need for more statistics would in no way, as I understand it, weaken your judgment that there is a very definite adverse relationship between malnutrition and the serious killer diseases. This uncertainty is simply a question of degree and specifics, as I understand it.

Dr. Cooper. It's a question of specificity. I know of no condition where the elimination of obesity wouldn't be a beneficial public health preventive effort. That goes for heart disease; it goes for cancer; it goes for arthritis; it goes for diabetes; it goes for any of the modern killer diseases in America.

I think we have plenty of information to establish that. What I'm trying to help establish with a modern research program is to get more specific information about how certain groups, particularly target groups in the population, can better benefit from specific information, whether they are young or elderly, whether they have certain kinds of diseases or not. That's where the research is needed.

We also need a great deal of research on how to measure deficiencies in nutrition. When I was trained as a physician, I was taught to look at individuals and I could look at a patient and I would write down on the chart that this is a well-nourished 50-year-old white male. We have since learned that my eyes or anyone's eyes may be really not the right mark of adequate nutrition. We may need other information and I think Dr. Gori will be talking about that with you in some technical detail tomorrow.

I think that, as I mentioned earlier, at the turn of the century it was a mark of success to be rather corpulent or obese. Again I think we have changed our notions of what constitutes good nutrition in relationship to disease.

Now I'd like to comment briefly on nutrition and diet as a tool in the treatment of disease. Altered nutritional intake in the form of special diets plays an important role, as you are well aware, in the treatment of certain diseases. With your permission, I would like to take a few moments to cite a few examples. Probably the best known of these is the special diet of patients afflicted with insulin-requiring diabetes, so-called juvenile diabetes. The Congress has taken special notice of this public health problem in a recent commission which it chartered and a recent recommendation to expand our efforts in this regard.

In addition to the daily injection of needed insulin, the patient's total caloric intake is regulated and the intake of refined carbohydrates is restricted to enable the patient to lead a near-normal existence and, hopefully, to postpone the premature onset of the grave complications of this disease. Possibly less familiar is the use of special diets in which the amount of protein and salt is regulated in patients with various kidney diseases. In chronic progressive renal diseases, a properly constituted diet can prolong the normally functioning life of the patient for months and years before the more heroic lifesaving measures of dialysis or kidney transplantation need to be resorted to.

An extreme form of special dietary treatment has come to the fore in recent years that merit your attention. I am referring to the "total parenteral nutrition," a treatment method where all the nutritional requirements of the patient are satisfied through the intravenous infusion of chemically defined, specially constituted solutions. Total parenteral nutrition has been particularly successful in infants with congenital anomalies of the gastrointestinal tract which made normal nutrition—and thus continued survival—impossible. Such infants are now being fed parenterally for months—and grow and develop normally—until they are in an optimal state, and somewhat larger, for elective surgical repair of the defect.

The lifesaving effects of total parenteral feeding have been proven in many patients who could no longer be nourished by way of the gastrointestinal tract prior to contemplated surgery, because of malignant or other severe lesions. In other cases, after massive intestinal resections, which left the patient with an inadequate intestine, or in overwhelming cases of regional enteritis or ulcerative colitis, long-term parenteral nutrition has permitted gradual reassumption of function by the intestinal remnant.

My point is that here again has been another approach that's supported by the research effort in which proper nutritional information has permitted adequate dealing with the treatment of a wide variety of chronic diseases.

I am also interested in presenting to you this morning our suggestions for modifying the educational, research, and health delivery systems to incorporate nutritional concerns.

Mr. Chairman and members of the committee, you're probably well aware of the March 1975 policy statement reviewed in the committee's report on the health aspects of nutrition which was issued by the Secretary of the Department of HEW. Since that time, the Public Health Service has included within its forward plan a detailed statement of the range of nutrition activities to be carried on within the Public Health Service. We have several major objectives for the coming years and we have begun to focus our resources toward our goals.

Our strategy has five aspects. We recommend the continuing research, monitoring, and nutrition surveillance, for the reasons that I have discussed earlier. We think, as I mentioned in the first few pages of my statement, that education of the public is going to be absolutely critical to the success of this effort, with special emphasis on children in schools and professional health personnel. I am concerned that the physicians as well as other health professionals do not always pay enough attention to the newest information on nutrition and how the

newest information can be beneficial in the management of their patients.

We additionally recommend incorporation of nutrition services into the health care delivery system and we shall make those kinds of recommendations. Regulatory efforts, including the food labeling activities of the Food and Drug Administration I have mentioned before. These are not only for the purpose of insuring the quality and safety of the information, but to provide still another resource for the consumer to get the best information possible. It has to have a positive aspect and I think it will.

And, lastly, we are recommending improvement of our interdepartmental cooperation, a facet of our activities which you have pointed out to us in the past could stand strengthening.

Special emphasis will be directed at research to improve our knowledge of human nutritional needs, determine how nutrition affects cognitive development and to improve our understanding of how nutrients interact with each other and with drugs. For example, oral contraceptives. We now understand that we have to be much more sensitive to the long-term administration of a variety of things and their interaction and the role of certain substances like food fiber in our diets, which Dr. Gori will discuss with you tomorrow.

In addition, we will be stressing studies on the biological as well as social and psychological aspects of overeating and how people can modify their eating practices toward more healthful patterns of behavior. We are continuing to monitor the nutritional status of the total U.S. population through the health and nutrition examination survey called the HANES survey, which permits us to determine differences among subgroups of our population and to determine changes over time.

We are also planning over the next several years to expand our surveillance program operated by the Center for Disease Control in the context of the new legislation which I mentioned before, from nine States to a national nutrition surveillance program. This will enable us to maintain current information on the status of individuals and groups with nutrition problems in specific sections of the country and to design intervention programs—in collaboration with State and local authorities—to reduce the disease consequences of poor nutrition. Classical examples here have been iodine deficiencies which resulted in goiters in certain geographical areas of the country.

I previously addressed our education goals as related to prevention strategy and will not detail it further at this point.

Nutrition in the health care delivery system is a real challenge. To make nutrition concerns an integral component of the Nation's health care system, we plan to assist State and local health agencies to establish and conduct nutrition education programs. Information on program planning techniques and background data on nutrition will be distributed to State and local planning agencies. It is also expected that the national guidelines for health planning, which are required in Public Law 93–641, are now under development and will incorporate appropriate goals and standards on nutrition for the healthy as well as those in long-term care facilities.

Another initiative, which I believe has significant implications, will be to develop model nutrition education programs for those in train-

ing for health professions to enable them to improve their patients' eating habits. And in that sense, we have experience with our recent program on high blood pressure to understand how to effect that educational process not only through the development of curriculum, but also through the assessment of accreditation and licensing processes. Similar efforts will be made to design programs to improve the nutritional knowledge of the people already in practice in the various health professions. We have received excellent cooperation in these kinds of plans from the professions involved.

A major nutrition function of the Federal Government is surveillance of the nutritional quality of the national food supply as related to meeting the nutritional requirements of the population. The Food and Drug Administration has intensified efforts in recent years to effect modification of the nutritional quality of the national food supply so as to meet the nutritional needs of the population. The FDA will be intensifying research efforts on the biological activity and safety of vitamins and minerals which are used to fortify foods as well as dietary supplements. Another area which is receiving emphasis is determining the nutritional impact of changes in food processing technology. The knowledge from this research is being used to guide regulatory efforts for improving the nutritional quality of individual foods as well as the total food supply.

The FDA will continue to work with industry to encourage the appropriate nutritional labeling of foods. Survey research has shown that over 50 percent of the consumers use this information for buying or planning purposes. This was widely challenged as a positive step at one time. Efforts are also underway to expand nutritional information on the label which will benefit those who need specific information on specific diseases. We look upon nutritional labeling as an effective way to provide the consumer with nutrition information about the food. We are supporting efforts that will expand one's ability to utilize this information to improve the nutritional quality of one's diet and I, for one, reject the idea that the public is not sophisticated or intelligent enough to use appropriate information.

The Department cooperates in the implementation of the Department of Agriculture's program to provide nutritious foods to pregnant women, infants, and children—the WIC program—who are determined by health professionals to be nutritional risks because of inadequate nutrition and income. As I mentioned earlier on, in our well-baby clinics, we will provide sites of action for this program. We are also now reviewing with the Department of Agriculture how we can interrelate in a statistically useful way the nutrition component of the HANES survey with the food consumption survey of the USDA in order to make it more efficient.

Senator HUMPHREY. Mr. Chairman, may I just interrupt and ask did you, Dr. Cooper, weigh in at all with the Department of Agriculture when they were holding up on the WIC program? Everything you have said here relating to women, infants and children throughout your statement indicates the importance of early dietary sufficiency, in other words, the proper diet during periods of pregnancy and immediately after birth; and yet you know that we have had to go to court repeatedly to get the Department of Agriculture to spend even the limited amount of money that we made available.

Now I want to know did the Department of HEW that expresses to us this deep concern over the health of our people and gives absolutely incontrovertible evidence as to the importance of adequate diet, particularly in pregnancy and immediately after birth of a child, did you tell the Secretary of Agriculture to support the expenditure of these WIC funds?

Dr. COOPER. Senator, in all candor, I did not.

Senator HUMPHREY. Did anybody force you to do so?

Senator DOLE. You did.

Senator HUMPHREY. Besides me and George McGovern and Bob Dole?

Dr. COOPER. Not to my knowledge, Senator.

Senator HUMPHREY. Have you sent this testimony over to the Secretary?

Dr. COOPER. Yes, sir. This was cleared through the regular process.

Senator HUMPHREY. I know how they clear it over there, but did he ever see it?

Dr. COOPER. We have not sent it to OMB. What I meant was that we did send this testimony to the Department of Agriculture.

Senator HUMPHREY. Really, I'm very serious about it because we have tried to get that program underway, as you know, and now it is underway but, quite frankly, there's been waste in it because the court ordered expenditure of funds more rapidly than you were able to program it simply since the Department delayed in putting the program into action. They spent 1 full year dragging their feet and didn't move a muscle. It's like they had political economic and intellectual paralysis. Do you recall that?

Dr. COOPER. I recall the discussion, yes. Those of us in the clinics of the Public Health Service were not suffering from paralysis. We'll be pleased to incorporate the best resources we can to serve the public as they are made available.

Senator HUMPHREY. I know that you wanted to do your job, Doctor. I'm not faulting you at all. I just simply say the OMB and the Department of Agriculture obviously didn't understand what you were saying or the message didn't get through, because I don't believe anybody could be so stupid and cruel as to deny the evidence which you presented in this statement. When you present what you have said here today about the importance of adequate diet during period of after conception, during pregnancy and immediately after birth, it's perfectly obvious that they either didn't understand what you were saying or they are just mean, one or the other.

Dr. COOPER. I think there's one other option. I'm reluctant to step into the controversy at this late date, Senator, but there is one other option that you mentioned before and that's the management problems of getting the program off the ground and the rate at which the funds are expended.

Senator HUMPHREY. The first management problem was minor. It was $40 million for the United States. That would hardly take care of the postage to mail out the notices under the new rates. But seriously, I mean, what happened was——

Dr. COOPER. I know of no——

Senator HUMPHREY. What happened was these appropriations built up over the years and then the court said, "Look, in case you didn't

know it, you have to be a law abiding agency. The law has been passed. It's public law. Mr. Secretary, you have to obey the law." Then you had $269 million or more—I don't remember the exact amount that was piled up, and that regrettably was used rather hurriedly. I'll come back to you. I have a lot of other questions, but I have been very disturbed about this one.

Dr. COOPER. We will work jointly with the Department of Agriculture in trying to make sure our views on health needs are transmitted to them. As I mentioned earlier, my evaluation of the status was transmitted to the Department of Agriculture.

Mr. Chairman, I will not take any more time to review all the activities in nutrition of the six health agencies. I have a detailed summary which I would like to submit for the record that's an updating for your review.[1]

In closing, I would like to mention that the enactment of Public Law 94–317, the National Consumer Health Information and Health Promotion Act of 1976 which was signed June 23, should insure that the initiatives mentioned will be kept on track. The act directs the Secretary to establish in the Office of the Assistant Secretary for Health a new Office of Health Information and Health Promotion. The Office is to be responsible for coordinating activities relating to health information, health promotion, preventive health services, and education in the appropriate use of health care. While its responsibilities are just in the process of being implemented, I expect that the Office will provide an organizational focus for interagency and interdepartmental concerns as well as our own activities as expressed by Senator Humphrey so that we can be an effective community.

I thank you for the opportunity to appear before you today on this topic which I find extremely important to the whole concept of preventive medicine. My colleagues and I would be happy to answer any questions that you might have.

Senator MCGOVERN. Dr. Cooper, I have already had a chance to interject a few questions, so I'm just going to give you one more and then defer to Senator Humphrey and Senator Dole and others on the committee.

But if you were just going to leave us a general rule of thumb to the American people about our eating habits, what advice would you give? What should we be consuming less of? What kinds of foods in general should we be consuming less of and what should we be eating more of? Can you give us just a quick summary of the kind of advice that you would offer to the American people based on our present knowledge?

Dr. COOPER. Well, my first advice would be to eat less. As a general rule, I think the American public eats too much. With very few exceptions, and there are people obviously who would suffer from a weight reduction, most of us would not be terribly affected if we could reduce our total caloric intake.

In order to accomplish this, I think what we need to consider doing is to reduce our total fat intake. The American diet has a rather high content of fat when compared to many worldwide, as well as to our own standards, on an experimental basis. Fat adds a caloric substance

[1] See p. 40.

almost twice as much—9 kilocalories per gram—as compared to sugar. I think in order to have an effective reduction of weight and realinement of our composition we have to focus on reducing fat intake.

I personally believe there is some benefit to reducing our preoccupation with sweet things. I think some people use alcohol as a substitute for that. I would recommend a reduction in that. I would recommend an appropriate amount of protein intake which we could give some recommendations to by group and target populations. A healthy intake of fresh fruits and vegetables with substantial fiber content. I think that we are a very rapidly moving population. It is very attractive for me to say stop eating commercially prepared foods. I believe that they are compatible if they are properly prepared. My own conversations with the food industry leaves me no question that this can be done for the public interest if the proper specifications can be made. That is to say, it would be awfully attractive to say don't eat prepared foods because they are equivalent to junk foods. In my opinion, that is not the same thing. Junk food is junk food. Well-prepared food can be well prepared if it's made to the right specifications.

I think that particularly in the elderly I would have some specific recommendations for some vitamin fortification, and also a balanced diet that gives them access to the whole spectrum of food needs, fresh fruits and vegetables, but above all, proper weight control.

Senator McGovern. Senator Humphrey.

Senator Humphrey. Dr. Cooper, first, I want to thank you for a splendid statement. I think the country is very fortunate to have you in the position that you hold and we are indebted to you for your many years of service. Truly, this statement is one of the most comprehensive I have ever heard and it also carries with it a powerful message and I, as a citizen, want to thank you very much.

Just to go back to something that I was referring to earlier, does your office coordinate with the Department of Agriculture in any way on the school lunch or other nutrition programs? We have a pilot nutrition project out in the city of St. Paul, Minn., and I wondered whether or not you're actively involved in any kind of coordinating work.

Dr. Cooper. I do not coordinate that activity, Senator, but the people in the Department, both from the Office of Education and my office, have been involved at a staff level with these kinds of activities. As I mentioned in my statement, this was one area which I feel we could definitely improve. I'm very concerned that our efforts toward improved production as the breadbasket of the world be transmitted to the public in a useful way. I think our need to have input there is obvious, and I would take the responsibility for seeing to it that we have a more vigorous input to that program.

Senator Humphrey. The Department of Agriculture is primarily interested in—and rightly so—the production of food and fiber and, of course, its transportation and delivery. They published a splendid document called "The Evaluation of Research in the United States on Human Nutrition." It is a 1971 document, and they carry in it tables on the magnitude of benefits from nutrition research. If they are only 50 percent correct the results would be phenomenal. For example, on the whole matter of infant mortality and reproduction, they estimate potential savings from improved diet at 50 percent fewer

deaths for different age groups. And yet this was the same department that, after all of this evidence that's been published at public expense, held up on the WIC program. The WIC program was not an arrow in the dark. It was tested, as you know, at Johns Hopkins, at St. Jude's and at Ford Dearborn Hospital. There were real test runs on this I was interested in it early, as was Senator McGovern, and we saw the Department drag its feet. This is why I was putting the question to you as I did.

Now, Doctor, I understand from your statement, without going into the technical and scientific and medical aspects of it, the following: There's a greater need for communication, for education, for information and that there's apparently a belief on your part—and I subscribe to it—that the American people, if given the information, will accept some of it. The public is more sophisticated and knowledgeable than some of the experts seem to believe.

For example, the military spends millions and millions for billboards and advertising to get a volunteer Army. I drive down Highway 12 in Minnesota, and in a 50-mile stretch there are four big billboards about why you ought to join the Army. I'm for that. But I have never seen HEW put up anything saying, "Look, if you eat right and have something about certain kinds of foods, you might live a little longer," and believe it or not, most people would rather live than join the Army.

Now my point is this: if the Government of the United States can spend money to recruit an Army because the Congress said they wanted a volunteer Army, is there not a possibility that we could get a program that would tell the American people in capital letters, in neon lights, that good nutrition—and then spell it out—would be beneficial in providing a longer, better, and healthier life?

Dr. COOPER. Absolutely. In the context of our new law. I have the authority to do that. It will be a high priority as I outlined. I am very much in favor of that objective.

Senator HUMPHREY. Well, I hope that you will pursue it. May I also add that the private enterprise system in this country has a stake in all of this. Everybody is worried about high taxes and they're worried about the high cost of medical care. It's getting higher all the time, and one of the reasons it's getting higher is that we have learned how to prolong life. But we have not learned how to really make life more enjoyable during the prolongation of it.

Geriatrics—as you indicated here—now geriatric medicine and child medicine are really the two ends of the same health spectrum. I learned a little about that in pharmacy. We have a lot of pediatricians supposedly telling mothers what to do about the babies, and it's only been recently that we've gotten on the geriatric kick primarily because of the high cost of medical care.

Isn't it possible that by proper nutritional education, diet, that the actual cost of health care can be reduced?

Dr. COOPER. Absolutely. I think we still believe that these kinds of preventive measures, which good nutrition is essentially a part of, can in fact reduce the high cost of institutionalization. It requires one other thing besides good information from us though, Senator. It requires an appreciation by the American public of what the need is. I can't correct the feelings of loneliness, uselessness, and isolation of the elderly by a diet program.

Senator HUMPHREY. No. I agree.

Dr. COOPER. We can participate in this and I think it's part of a total preventive strategy, as you were mentioning, at both ends of the spectrum. This expenditure of health care that we talked about yesterday with the Finance Committee and in the newspapers today is really concentrated in large percentage at both of those ends. I think we have a real job to do here in prevention, but it is a comprehensive program of prevention which, as I said to Senator McGovern earlier, is constituted as a major building block of a sound program of nutrition.

Senator HUMPHREY. Well, we're on the same wavelength. I recognize, for example, that even the best of diet cannot help you if you live in the ghetto or if you're an elderly person full of despair and loneliness. All of those things are contributory to bad health. We know that. But we can pick up piece by piece at least.

Dr. COOPER. Yes, sir.

Senator HUMPHREY. I learned a long time ago that you don't wait for the millennium. You start to build upon the sinful present and work with what you have.

I just did a statement for the television broadcasters, and I hate to tell the printed press but what people read is very insignificant in comparison with what they hear and what they see. Eighty percent of all the information that the American people receive in terms of news, current events, documentaries, is not from the printed press. People are not reading. They are listening. They are looking. And right or wrong, that's it, and that's one major reason why we are having problems in our schools today with children and reading.

Assuming what you say is true—and I have to assume it is true—then you and I have a responsibility to convey this information. The Advertising Council can be very helpful, and they are, but only for persons like myself that stay up until 2 in the morning. I get those Advertising Council ads just before the Tomorrow Show and after the Tonight Show.

Many women are listening to programs in the afternoon. They call them soap operas, but they find them enjoyable. Apparently they are effective because the advertisers consider that to be some of the best time, since the woman is the prime family purchaser.

Now why isn't it possible for DHEW to go over to the Federal Communications Commission and say, "Look, I have been looking over the charter that every radio broadcaster gets in this country and there is an obligation for a certain amount of public service time." By public service time I don't mean after most folks have gone to bed. They ought to catch people before 10 o'clock at night because, believe it or not, a large number of people do go to bed before 11 o'clock and most of the public service ads of any consequence come on very, very late.

Senator HATFIELD. Would the Senator yield at that point?

Senator HUMPHREY. Yes.

Senator HATFIELD. I wonder if you could find out what we are spending now to alert the public to the dangers of cigarette smoking?

I think both through the American Cancer Society and HEW and other Federal agencies we have been carrying on such advertising campaigns, and yet I notice the sale of cigarettes is going up.

Dr. COOPER. There is a special problem there.

Senator HATFIELD. How much money are we already spending to make some kind of analysis?

Senator HUMPHREY. There is such an article in the morning New York Times. I simply say there are more people today by far. I don't know whether the per capita consumption of cigarettes is going up. The volume of the number of cigarettes is going up, but that doesn't mean a thing, because you have a larger number of people and therefore the volume of sales has no real relevance.

Dr. COOPER. We have made some progress, Senator Hatfield, on cigarette smoking in the middle-aged males. The young women are falling behind. But in dealing with the problem on television and radio with cigarette smoking, as you know, there is a law that took off the positive advertising, and also took off the negative statements. Whereas with nutrition, as Senator Humphrey pointed out, we have not really made the effort. We will be pleased to talk with the Federal Communications Commission about this particular problem.

I would also be pleased to explore some positive cost advertising as a feature of our program, which is usually not done, although it is done in the voluntary recruitment for the Army. I would be pleased to explore that, and I think here again is a very important area where the private sector, to its own interests, as well as the public interest, can participate more vigorously in the advertising or making the communication process effective.

Senator HUMPHREY. Finally, what are we doing with teachers and the school system?

For years and years we couldn't get the educational system interested in VoTec education. It was considered substandard. If you went to a vocational or technical school you were a misfit, a dropout, they kind of shoved you over there to play around with the toys.

Now the real truth is that if you really want to amount to something today you go to a vocational technical school so you can learn how to make a living. It isn't quite accepted yet, because they still don't permit vocational technical schools to have bands and have football teams. They like to keep them down a little bit, you know.

I really have had a belly full of this kind of nonsense, because the finest education given in the country today for useful citizenship is in the vocational schools. What are we doing with the Federal aid to education program? Why don't we have something that says look, you won't get any money until you start to teach people how to live without having to go to the doctor 15 times a month. Why can't we have nutrition education and personal hygiene in our education program? We are turning out literally hundreds of thousands of youngsters that learn nothing about their health. We don't have compulsory physical fitness training. We don't want anything compulsory, the only thing compulsory is that you buy a candy bar out of a machine.

Senator HATFIELD. If the Senator would yield, you bring up a point that bothers me.

I have been going to a few of the high schools in towns of 12,000 and 15,000, where they have abandoned the cafeteria and put in lieu of that machines. One machine has processed meat sandwiches, another machine has potato chips, another machine has cupcakes, another Coca-Cola. And this is in lieu of the cafeteria. No hot lunches.

So what good is all of this education and teacher training if this is the kind of thing we are exposing the students to?

Senator HUMPHREY. We permitted some of that in a law over my objection, because I thought it was a bad precedent. But in the name of free enterprise it was done. I think the best thing for free enterprise is to have healthy citizens. Otherwise all you are doing is spending your money on doctors and hospitals and pharmacies.

But I am very serious about what the HEW as a Department is doing with the educational structure now and are you meeting with teachers, meeting with the professionals, to start to get programs of home economics, of nutrition, and of personal hygiene into our education? What good does it do to learn a lot of algebra that they are not going to use anyway? If you have access to people working in a camp for young people, ask the camp supervisors what is the No. 1 problem with the children. It is the care of their own rooms, it is their own personal health habits, and it is their dietary habits? Those are the three top problems. Those are kids coming out of middle-class homes. I am not talking about the poor kids.

Dr. COOPER. We have not done an adequate job in this regard, Senator, in my opinion. From our own standpoint, we have not spent the time we need to affect those curriculums. I have had some preliminary meetings with the Parent-Teachers Association and my staff has had some with the Office of Education.

I agree with you 100 percent. It is high time that if we really want to affect behavioral practices, in an American way, that is not to order things to be done, we have to begin to present the right information where people get their education.

I would say parenthetically I am still in favor of algebra and all of the other things.

Senator HUMPHREY. I am, too, but I think you ought to know also how to wash your hands and how to eat.

Dr. COOPER. I am not satisfied with the program of health education. I think we are entering a new era here and I think we should exert some leadership to do it. I will see to it that it is initiated.

Senator HUMPHREY. Do I understand that the bills Senator McGovern and I have introduced basically have your approval?

Dr. COOPER. We just initiated one new program in this health promotion area. We subscribe to that. We subscribe to the objectives of your particular activity. As to how they would complement the bill, we would like to see how we could use them.

Senator HUMPHREY. You are familiar with the $38 million we were able to get into an appropriation for nutrition research and education?

Dr. COOPER. Yes, sir, I am.

Senator HUMPHREY. Is this adequate?

Dr. COOPER. This is, as with all research and education, Senator, an elastic system. I think that if the national budget can support that increment, above the President's request, it certainly could be put to good use.

Senator HUMPHREY. Well, above the President's request doesn't have any impact on me. I think it is a question of what do you need?

Dr. COOPER. I think, as in many areas of health research and education, there is a great opportunity to use additional resources.

Senator McGovern. Senator Hatfield, I think you had another question.

Senator Hatfield. I would like to follow up a little bit, because I have a feeling that there is a difference between having knowledge and then applying the knowledge we have.

I don't frankly feel that it is a matter of simply ignorance or lack of knowledge. I don't know of a dentist that has not told his patients that eating candy and drinking coke and all of the other foul foods we consume is bad for the teeth. I mean that is knowledge.

But then how many of his patients go out and apply it? Would you care to comment a little bit about the body of knowledge we have and whether or not it is really being applied or what are the incumbrances on it?

Dr. Cooper. As I mentioned in my statement, I do think that we have a large body of knowledge which is not uniformly applied.

Some of it is not applied because some people don't get the information; some of it is not applied because people choose not to do it.

I am not in favor of, as I mentioned to Senator Humphrey, ordering everybody to do it. I do recognize that there is more to life than just living. The purpose is not to take all pleasure out of living, such as eating candy, and other practices, including watching football games, which I do on Sunday afternoons.

Senator Humphrey. We want to come out four-square on that.

Dr. Cooper. But I think the interest is in the limits and the moderation that goes into it. What is the proper balance?

I think in that regard we have not been as effective in giving information. It is easy for me to go tell everybody what not to do, what is bad about everything. It is more difficult for me to present it in a way that really makes a meaningful choice.

I think there are experts, as I mentioned, in other fields, in the media and communications, that I need help from, to try to put this in a way that will make more efficient use of the current body of information.

I think it has not been a total failure. Not even in cigarette smoking. But even in nutrition labeling, it is beginning to impact. So I think we have to learn how to do that better, and we have to get to some of the people we are not really reaching.

But the point you make, that we are not using all of the information we have is a valid one.

Senator Hatfield. It seems to me we use the term "education" rather loosely, that somehow there is some magic about people that are just educated to understand. And yet that word is rather complex, when we begin to look at the impingement of cultural values and cultural life styles upon the knowledge that we have. And sometimes we choose to reject the knowledge, or we don't understand the knowledge we already have.

Or it may be the technique with which we communicate the knowledge. Maybe we are relying upon old techniques that are no longer adequate to meet the task. I think of the cultural styles, for instance, I have never been to a political meeting of any significance that there wasn't alcohol. That is part of the cultural style.

Dr. Cooper. I have not been able to convince my children to stop eating potato chips, either. I can't scare them into it; that is correct.

Senator HATFIELD. Then we turn around and spend a lot of money telling people not to become alcoholics, yet it is so much an engrained part of our life style that any significant opening of an art festival or museum, or political meeting or public service of any kind, you have to have it preceded by the serving of alcohol.

Dr. COOPER. The use of spirite fermente is a long cultural history that goes back prior to Biblical times, as you know.

Senator HATFIELD. That is right. Perhaps the alternative—I am not suggesting the alternative is prohibition, but I am saying we are working against certain obstacles here as far as our cultural life styles.

I think of the convenience foods today. We are on this great binge of labor-saving devices. Today we have demeaned labor, we have demeaned the homemaker, we have demeaned all of these things that are important tools to the preparation of a balanced food that comes either from fresh vegetables or from fresh fruit or other such things, rather than buying the convenience package on the way home from the office to feed the kids, Colonel Sanders, pizza, something of that kind.

So we are really working against those cultural obstacles, are we not?

Dr. COOPER. Yes. We have a changing set of cultural values, all of which are not bad, I think, Senator.

Senator HATFIELD. I think if you talk to people, any one who has been able as a result of convenience foods to participate in other activities, they would take a different view of the relative value of being able to have access to these.

Dr. COOPER. My point on the convenience foods is that I don't think that we have to conclude that the convenience foods cannot be suitable. If the industry and ourselves get together and do this in an appropriate way in an evolving cultural pattern, I think it can be done. But the point you make about where the gap is, I think is correct.

Senator HATFIELD. And your reaction is very typical, that the alternative is we must lock the woman in the kitchen.

Dr. COOPER. No, I don't want to lock her in the kitchen.

Senator HATFIELD. You say the convenience food has given her an opportunity to participate in other things. By even raising the question, you become defensive as to the possibility we are suggesting we are going to return to the 18th century.

I am not raising the question for that purpose at all, because I think we are thinking too much today—as you have demonstrated—in the polarized positions. It is either/or. Either convenience food or we lock the woman back into the kitchen.

I don't think those are the options we have today, and we ought to start trying to develop the communications skills and techniques to demonstrate that there are other options.

Dr. COOPER. I do not mean to be on either polarized side. I strongly believe that with the cooperation of a large number of groups we can come to the correct middle position.

Senator HATFIELD. Because I think making available what should be for women to participate in many activities doesn't mean she has to reduce her family back to pizza or fried chicken.

Dr. COOPER. I agree.

Senator HATFIELD. Thank you.

Senator MCGOVERN. Senator Kennedy.

STATEMENT OF HON. EDWARD M. KENNEDY, A U.S. SENATOR FROM THE STATE OF MASSACHUSETTS

Senator KENNEDY. Thank you very much, Mr. Chairman. I want to first of all commend you for commencing these hearings and focusing on an area of very considerable health policy. And also to welcome Assistant Secretary Cooper here.

I notice, Mr. Secretary, in your statement that you mention the recent legislation, "The National Consumer Health Information and Promotion Act of 1976, signed June 23, should insure the initiatives mentioned above will be kept on track."

Of course the administration opposed that legislation during the course of our own hearings. I am glad you are prepared now to refer to it as at least some hope toward being something that can be useful and helpful in this area.

I am wondering, given your testimony here, whether you are going to be prepared to make some recommendations next year to fund that in an adequate way, which will be a source within HEW that can really consolidate and coordinate the different kinds of health diet and health prevention and consumer kind of education and many of the different matters which have been talked about here today, whether you would be prepared to indicate that?

Dr. COOPER. Let me say, first, that during the process of the development of that legislation, as you know, I supported the objectives of the proposal quite strongly. We had a different view on the organizational aspects. I am pleased to say that it was eventually resolved into a workable form; that helped us a great deal.

And the answer to your question is: Yes; I am prepared to make such recommendations.

Senator KENNEDY. Good. I think there is a $10 million authorization in that, which is a bare beginning. You couldn't tell us now whether you would be——

Dr. COOPER. I do not have that information in all honesty. At the moment I am preparing our implementation plan. I will be pleased to share that with you when it is completed.

Senator KENNEDY. Fine. That would be very helpful.

I am sure the members of this committee would feel, as they get to know you, Mr. Secretary, you have been enormously forthright and been very cooperative with our health committee and I am sure with this committee as well.

You know very much of what is being talked about and discussed today I am in complete and wholehearted agreement with, about the health implications of not only an appropriate diet, but the various other kinds of personal conduct that has been listed here. And we are doing tragically little about it.

As someone who believes very strongly, both in supporting national health insurance, developing the kinds of infrastructure which is essential and necessary to insure that that program can actually function and work, I think the real benefits of this hearing have been to remind us of the very central responsibility that individuals have in terms of their own kind of personal health habits.

And there is nothing that can have a greater impact in terms of the prolongation of life and better health than the kinds of preventive health efforts which have been outlined here today, in terms of diet, in terms of smoking, drinking, and exercise.

And that case is clear and unequivocable, and it is compelling, and you have made it, the chairman has made it, it has been made I think continuously very dramatically by Dr. Breslow of UCLA, who we have worked closely with, and I know we will have other testimony here this morning stating this in a very important and significant way.

There is much that can be done in terms of individual effort. But, quite frankly, there also has to be, I believe, a significant readjustment in the allocation of resources in terms of preventive health, and health information. And as you and I know, the whole fascination in terms of the health care delivery system in terms of technology, which has a virtually unlimited capacity to absorb American health dollars, is continuing at an unbelievable rate, in ways I know you have spoken about very strenuously, and which I am sure other members of this committee are very familiar with.

And you make such an important case in terms of health prevention, and health education, and dietary promotion.

I am wondering what steps you are prepared, as the principal adviser to the Secretary of HEW, to take to try to get the break on health technology, which has implications in terms of prolongation of life in so many instances, to get the resources in the areas which can have a really significant and important impact in terms of health, in terms of prolongation of life, and generally in terms of really providing the kind of necessary priorities which the American people have every right to expect?

Dr. COOPER. Senator, I appreciate your comments.

With respect to technology, I would point out that the real problem is not the fact of technology, but its use. So I am prepared to take more vigorous steps in curtailing the inappropriate use of technology.

In addition, I would point out that the solution to part of the problems we are talking about in nutrition will require more sophisticated innovative technology to make it go. I am not interested in eliminating technology; I am interested in promoting the proper use of technology in the treatment phase as well as in the preventive phase.

However, I don't want to mislead the public into thinking that I can recommend some way to stop treating people who are currently ill and shifting the allocation of resources into health education.

As I said earlier, I am quite willing to make the necessary recommendations on improving our program in health education and developing new appropriate technology in that field and I shall make them.

I think the real challenge to all of us in the health policy area is to find out what it is that would help us motivate the individual and the provider to utilize his resources in a more appropriate way. I would be pleased to expedite development in that area as well.

Senator KENNEDY. That is a good comment, and I would agree with you that what we ought to be doing in terms of technology is looking for technology that is going to promote life rather than prolong death.

Dr. COOPER. That is correct.

Senator KENNEDY. I dare say that the primary technological advances that have been made in any recent time have been in the pro-

longation of death rather than in the areas in terms of the promotion of life.

There may be a difference, but at least that is my view.

Let me ask you this, in terms of preventive health care, in terms of nutrition and diet, what percent of the insurance policies that are issued in this country today cover that kind of problem?

Dr. COOPER. I do not know. It is a small percentage, however.

Senator KENNEDY. I mean we are talking about 4 or 5 percent of those that are actually put out.

Dr. COOPER. I think so.

Senator KENNEDY. I think this is a reality. I know it is a matter of concern to you.

Dr. COOPER. But we have to give them guidance on how to use that leverage appropriately. I am not interested in saying we will pay for health education, if it means that when the doctor sits down with you for 5 minutes and tells you to stop smoking you may pay him another fee. That is not the kind of leverage we are talking about.

Senator KENNEDY. I couldn't agree with you more.

Dr. COOPER. So we need to find out how to use that.

I did want to make another comment, that is that a great deal of technology, like the pacemaker, or some of the other things that are often impugned to do so, really don't prevent death. But they have caused enormously longer prolongation of life in some cases.

Senator KENNEDY. That is true. I mean we can find out——

Dr. COOPER. Yes, I will not challenge your conclusion. I think your percentages I might challenge.

Senator KENNEDY. We have a very interesting study now which I know your Department is aware of in terms of the Office of Technology Assessment. We are trying to do a real evaluation of this area. It seems to me that we are just a bit apart, but I will make this comment, that in the area of technology development, and in the grants that are coming from HEW, it seems to me we ought to have some flow chart kind of evaluation of research supported either by you or NIH, so we know where it is going to go in terms of costs and where the realistic health benefits are, so we can make decisions where those dollars, that some of us have control of—and that is another issue—in terms of really having a significant impact in terms of American health.

We just don't have that now, Mr. Secretary.

Dr. COOPER. As we discussed at a previous hearing with you, I think there are needs for modifying our system. In the continuum of research and development there does come a time when you can see the target, and that ought to be evaluated to see if we can find ways to both implement technology and limit it to its proper use.

I agree with you, and I think the advisory councils and other mechanisms of the National Institutes of Health need to be more involved in being aware of this need.

Senator KENNEDY. We are away from the thrust of this hearing, but let me just come back to where we are.

In the area of health prevention and health education, could you give us an estimate now in terms of the health dollars that are being spent, what is being spent now in terms of health prevention?

Dr. COOPER. Well, as I mentioned in hearings earlier this year with you, Senator, the survey that we have made in the areas that could

be equated with health education—I don't want to Mickey Mouse, you might say, your question by saying all research that we do is really prevention when we come to etiology and so on we are talking about roughly $80 or $85 million, most of which is related to specific programatic activities.

A good example of some constructive work was written up in the newspaper yesterday. The National Cancer Institute is working with the carriers to find out in a longitudinal study what kinds of useful activity can be determined from certain kinds of preventive practices. Now that is a small increment, but our earlier estimates this year on total health education and promotion activities of that type were between $80 and $85 million.

Senator KENNEDY. In a total health budget of about $130 billion?

Dr. COOPER. A total national, Federal, total Federal health expenditure of $30 to $35 billion.

Senator KENNEDY. If you included the total health, you are not going to find it in terms of health education or prevention in the other sectors as well, or are you prepared to say that?

Dr. COOPER. No, I am not prepared to give you a figure. But I think there is an increasing awareness in that area.

Senator KENNEDY. You can take the insurance area, it is incidental, by your own testimony, and I dare say how much is there in the VA or the other kinds of health expenditures. It is a very, very small number.

Dr. COOPER. It is a small number. In the private sector, however, the evidence of increasing participation, as I mentioned, was the willingness to underwrite privately the National Center for Health Education. I think this can be enormously helpful, if we can get the private sectors in nutrition and the food industry to participate in a meaningful way.

Senator KENNEDY. I just thank the Chair. I think this has been a very helpful hearing, and we look forward to working with you, and the moving and shifting to the extent that we have some influence or some control getting into these areas, which have been rightfully identified.

The only other area I would mention is the food additive area, with all of the health implications that has, Mr. Chairman, in terms of real health, not only in terms of direct nutrition, but hyperactivity in children, and the responsibility of the Food and Drug Administration in this. I know you are very much concerned about that. But the enormous growth of food additives, artificial coloring, flavoring, sweetening, and I think their implications taken over a period of time will have the same kinds of health—provide the same kinds of health hazards as we have seen in the drug area in certain drugs taken over a prolonged period of time.

Now if you challenge me to say we can justify that or prove it, it is difficult today to do it with the exception of some important areas. But it was difficult to do it in say a drug like Premerin, that was taken and used for 30 years until relatively recently.

It seems to me to be on guard in this area of food nutrition and give it the kind of priority, which I know Secretary Cooper believes in, is something of great importance and I think you really awaken the Congress on this kind of issue and question and the American

people, and it is terribly important, and I hope you will let us know additional ways we can cooperate and help in this.

Thank you.

Senator McGovern. Thank you, Senator Kennedy.

Senator Dole.

Senator Dole. Mr. Secretary, has there been any study by HEW of the relationship between the food stamp programs and the very thing we are talking about this morning, diet and health? Has it had a good impact, a bad impact? Has it led to obesity, or other problems?

Dr. Cooper. I personally do not know of such a study, Senator. I am sure as the National Center for Health Statistics further develops the surveys and expands it to a national surveillance program which I indicated would be our initiative, we will take those kinds of ancillary impacts or factors that impact on it into account.

But I am not prepared to cite any study or data to anwer that question at this time.

Senator Dole. Here is a Federal program that affects 18 or 19 million people, and we spend billions of dollars a year on it.

It is much like the suggestion of Senator Humphrey with reference to WIC.

Dr. Cooper. I think there are evaluations of it from the Department of Agriculture that have indicated some positive effects. But I thought your question was "Do we in the Public Health Service have some studies at the moment?" My answer is we do not. We expect to involve those considerations in our expanded surveillance program.

Senator Dole. And the same is true of school lunch programs and meals on wheels and other programs?

Dr. Cooper. Yes, sir. We are very much concerned about trying to make this evaluation in terms of having a more significant impact on policy development in all of those agencies in the nutritional area, including our national representation in the Internatioal Congress.

Senator Dole. Of course we did insert a nutrition education component in the national food stamp bill, but that is still lingering in the House.

You have also discussed nutritional labeling and indicated there are some signs of hope in that area.

Dr. Cooper. Yes, sir. I think we are beginning to see some signs that proper labeling can be helpful to the consumer. I hope, as we get into some of the specifics that we have outlined here about nutrition problems which are specifically disease-related, that our improvement in the labeling process can be looked on not only in the regulatory aspect, but as having a very positive impact in other areas. I think the Food and Drug Administration is generally looked on rather negatively as to what it can accomplish. But I think what Senator Kennedy was saying is that we have to use it positively to be a consumer advocate, and a resource for the consumer.

Our early reviews of this approach, in talking with the Commissioner, is that it is beginning to have a significant impact.

Senator Dole. As I understand it, most labeling is misleading to protect the industry against underconsumption. What do you do about the resulting overconsumption of sugars and salts and starches?

Dr. Cooper. I think it is related to both. I think caloric intake is a prominent feature, that is size of servings. We are not used to thinking in those kinds of terms in our purchasing, how we buy and sell food.

ButI think part of the labeling process should be concerned with overnutrition as well. I have a very good perception of the impact of indicating caloric content, size, number of servings per package. However, people, particularly the affluent, might tend to take greater personal license with packages of goodies in particular, when there ought to be some greater limitations.

Senator DOLE. We are having hearings in the Finance Committee, in fact, I think you were there yesterday morning.

Dr. COOPER. Yes; I was.

Senator DOLE. We were talking about ways to contain the cost of certain programs under medicaid and medicare, and about third-party payments for the treatment of health problems.

It seems to me that instead of waiting for after-the-fact, we ought to take a look at possible third-party payments for prevention.

Dr. COOPER. I agree with that, Senator Dole. I think the challenge there is how to do it. The challenge is to find what kind of activity we are talking about incorporating into the reimbursement system that will have that positive impact.

I think it is an excellent idea, and I think we need to work out how to do that in a responsible way.

Senator DOLE. It seems to me it would be much less costly in the long run if we can find some practical way to do it.

Dr. COOPER. Yes. The key there is the practical way to do it that doesn't just result in further expenditures for inappropriate activities in the name of higher objectives.

But I agree with the objective.

Senator DOLE. Many times a person's weight is considered an indication whether or not he is in good health. If you are so tall, you are supposed to be so heavy. Are the charts accurate?

It is my understanding that some persons now say the ideal weight may be anywhere up to 20 percent below what all of the popular charts indicate. Would you agree with this?

Senator HUMPHREY. Oh, don't do that.

Dr. COOPER. The charts are changing. As you know, the average American male's height has changed, so has the female's. People have grown larger over the last several generations, with a few exceptions like myself.

But as has been recently reported, there is some indication that this is at least beginning to plateau out. We will be seeing revised data that set actuarial rates of height and weight. But the usual rule of thumb is to stay within 10 or 20 percent of the actuarially determined ideal weight.

When people get outside of that, they are obviously obese on the top side. On the bottom side, it is very important to determine why we are under that weight. Sometimes there are appropriate health reasons why we should be 10 percent or less. On the other hand, that is more likely to be an indication of disease.

Senator DOLE. It has been suggested if you are at your ideal weight or below it, you ought to pay lower life insurance premiums. Do you agree with that?

Dr. COOPER. No; I think that kind of a concept needs a great deal more thought. We thought about that in certain areas where I would be convinced that we have the right data, as in high blood pressure

control. I have worked with the insurance industry in modifying some of their more difficult criteria for getting insurance. Many more companies are now providing life insurance at a lesser premium or penalty if the insured can demonstrate that their high blood pressure is under medical management.

If we can develop the nutritional information that would give me the same confidence that we have something sound to work with, I would be willing to explore other incentives of this type.

The idea of the incentive is an important one in preventive medicine, which in general I support. I am not willing yet to commit myself on considering just overweight or underweight.

Senator DOLE. Can we overcome some of the problems you have outlined concerning fat intake, and cholesterol by moderate or heavy exercise?

Dr. COOPER. Exercise, unless you are into quite heavy labor where your total energy expenditure is in the several thousands of calories, like tree-chopping or lumber workers, is really not the main determinant of weight loss.

Senator DOLE. Talking a lot wouldn't qualify?

Dr. COOPER. When we are talking about general body conditioning, then we are in a much better situation. In that situation, I am an advocate of physical activity of an appropriate amount, removing the stigma that we are falling into of the sedentary population that sits in front of the television tube.

I think physical activity is an important balancing factor in determining nutritional need. I am a believer in a total program of good health education and preventive health.

Senator DOLE. Finally, you mentioned certain patients with various kidney diseases, and that a properly followed diet can prolong the normal functioning life of the patients for months.

If you only have one kidney, should you be wary of what you eat?

Dr. COOPER. I think you should be sensitive to it, because I think you have lost 50 percent of your insurance.

The human body's great engineering feats, or the Maker's feats that have made the human body, usually allow significant compensation when one loses one kidney, by essentially establishing adequate, if not normal, renal or kidney function, with the one remaining. There is some expansion of capacity. The body is built in a remarkable way to allow for that adjustment. Without excesses there is no reason to think of needing a special diet.

But if you are prone to chronic renal disease, or if the reason you lost the kidney related to the possibility of significant disease which is subliminal in the remaining kidney, then the appropriate dietary guidance as developed by the kidney experts is something that people should keep in mind, not only the total load that is put on the body by the general weight increase, but also the composition of the diet.

Senator DOLE. But specifically, if you just lost one kidney, there is no real dietary problem, as long as your eating is not in excess?

Dr. COOPER. There is not a crisis on that basis if the other kidney is healthy. The problem is you are not always sure the other one is healthy, and therefore anybody who loses one obviously needs a very good evaluation to see what that capacity is. Under those circumstances and in any case proper nutrition, good weight, and all of that

are determinants of his general health. But as to whether a special diet is necessary, that would have to be a clinical determination.

Senator DOLE. Do you have any recommendations on how one can discover his or her ideal diet in relation to his body health? That is probably an impossible question. But if you don't go to a doctor, or if you don't read the billboard Senator Humphrey is going to put up in St. Paul or Minneapolis, "Eat more Minnesota products," can a lay person determine what diet is best suited to him?

Dr. COOPER. Yes. There are informational sources. They are not widely, easily, and popularly available in my opinion. We have been trying to develop informational materials that would be of more use to the public. To innundate the public with large amounts of technical information rapidly puts them to sleep. So again we need to develop an expertise outside of the medical field that would enable us to develop more attractive means of providing this information.

I don't think we need to have a visit to the doctor in order to convey good nutritional information. We will pursue that in the context of the discussion we had earlier.

Senator DOLE. We are constantly being asked to do more in the field of medicine and nutrition; to spend more Federal money and State funds; and to create more programs. A lot of the money is spent as the result of an improper diet, or whatever you may call it, during the growth process. Later, we then try to care for someone who's already suffered, or we try to push more food through the food stamp program or some other program to keep the same thing from happening again.

It seems to me that maybe we should focus on how we can determine ourselves what we should eat.

Dr. COOPER. I agree with that. I think one of the great losses is the perception of too many people that, because of the availability of all modern medicine, you can do anything you want and a doctor can fix it. I think we have to get back to the concept of personal responsibility for our health, and personal responsibility for the consequences of abusing it.

I think that I would agree with that, and we shall work in the context of the new legislation toward that end.

Senator KENNEDY. I would like to ask that the publication that has been done in Canada by Dr. Lalonde on Preventive Health—are you familiar with that?

Dr. COOPER. Yes; I am.

Senator KENNEDY. Could I ask that be made a part of the record? It is a very extensive study on this whole issue by the Minister of Health of Canada. It is superb. They have also tried to fashion it in such a way as it can have a personal application in terms of individuals, wide dissemination. I think it might be of use and interest to the members of the committee. It is a very extensive study on these same issues in Canada.

Dr. COOPER. A very excellent study, with some very interesting follow-throughs being undertaken by the Canadian Government. We will be pleased to submit it.[1]

Senator MCGOVERN. Without objection, it will be received.

I would also like to ask the USDA 1971 study that has been referred to be made a part of the record.[2]

[1] See p. 51.
[2] See p. 47.

Senator Percy, you haven't had a chance to do any questioning yet.

Senator PERCY. I haven't asked any questions, but Dr. Cooper heard my opening statement.

I would like to say this to you, Dr. Cooper, that this committee probably has had more of an effect upon my personal habits of life than any other committee in the Senate.

It was 8 years ago in December 1968, that Margaret Meade appeared before this committee. She made a statement that was just startling to me. It caused me to reappraise and reanalyze my own nutrition education and what we were doing at home about nutrition.

By the way, I brought down for you a typical day's menu from Mrs. Percy to submit to you privately, just for your personal consideration, judgment and advice. I am happy to say that I am the same weight I was in 1968.

I went back to see what it was Margaret Meade had actually said that so impressed me, to get the exact words. She said, in December of 1968 before our committee:

> The American people are less well-nourished as a whole than they were 10 years ago. In the face of the affluence of the early 1950's, by 1960 it was possible to say the major nutritional disease in the United States was overnutrition.

She was referring in part, I think, to the 1965 USDA national food consumption survey, which found that the number of Americans receiving a nutritionally adequate diet had declined from 60 to 50 percent in 10 years.

Dr. Cooper, you have already discussed malnutrition as a problem of overconsumption, and Senator McGovern asked a number of questions on that.

Is there anything else you would like to add to shed some light on what has brought about this decline in the nutritional health of the American people?

Do we have any more updated information? Have we reversed this trend, or have we gotten actually worse?

Dr. COOPER. Let me say first, Senator Percy, whereas I would not challenge the modifier you use on nutritional health, I think you have to look at this problem in the larger perspective.

If you look at the health statistics in their totality, you shouldn't become too discouraged. I am interested in promoting nutrition and preventive medicine here, but the performance has been good. In the aggregate the health of the American people has steadily improved. People are living longer, fewer children are dying in infancy, and more mothers are healthier during pregnancy, although we still have a significant gap. I think what we are seeing in those kinds of surveys is a better way of identifying gaps and a more precise identification of what we are satisfied with.

Now my own perception of your last question "Is it getting worse?" is that it is not. I think that through hearing such as this, there is a general awakening of the public or the necessity of preventive medicine. Although I am not at all satisfied with it, there has been some progress. I think there were a lot of factors that contributed to our national habits, a good number of which are not medical in any sense. They are cultural, economic, social, educational, and have been evolving during that period of time.

My own expectation is that we will see a period in which there will be greater attention to personal health, and a lessening of that trend

toward poor eating habits, if I can put it that way, rather than a trend toward worse health.

Senator PERCY. Let me be quite specific about certain confusing factors that come into this picture that I think tend to confuse the average consumer.

I remember that Esther Peterson was a witness before this committee in 1974. At that time I asked her how much knowledge does the average American citizen have about nutrition. She replied: "Next to nothing."

Now it must be a little better than that. But she was describing the way people go in and shop, and what they have in the market basket when they check out. When you look through the basket, shopping isn't done on the basis of nutritional high value. It is, as we discussed at great length in 1974, the convenience food phenomena in the country.

But let's just take a product like milk. I have always thought milk was good for you.

Senator HUMPHREY. It is.

Senator PERCY. Well, I still tend to believe it is. But were you here on the committee at the time, Senator Humphrey, when Bob Choate, I think, had all of the cereals up here? I have been chewing my way through a particular American cereal all of my life, thinking it tastes so terrible, it must be awfully good for me. I found out that of the 60 cereals, it was 59th in nutritional value.

Senator HUMPHREY. I still eat it.

Senator PERCY. It had virtually no nutritional value. Since the hearings they have added a lot of things, and improved the nutritional value of the cereals. But on the subject of milk, and we have some milk in northern Illinois, too——

Senator HUMPHREY. Not as much as we have in Minnesota.

Senator PERCY. Dr. Kurt Oster reported homogenized milk as the fundamental cause of heart attacks. And he did this at an international water quality symposium. Also, I have been taught that egg yolks are the single largest source of cholesterol, and, therefore, a leading cause of coronary heart disease. But there have been full-page advertisements in leading papers stating that there is absolutely no scientific evidence that eating eggs even in quantity will increase the risk of heart attacks.

What is the average consumer to believe in this case? Tell us just confidentially now.

Dr. COOPER. The average consumer can complain about being rightfully confused, there is no question about that. The Oster hypothesis has been reviewed many times, and we have subjected it to intensive scientific review. I have met with Dr. Oster myself, and although he has an attractive scientific hypothesis, I think you have to recognize it is strictly a hypothesis that has not gotten any confirmation at this point in time. Therefore I would not want it to be accepted that homogenized milk is the cause of heart attacks.

It is true that eggs are a high source of cholesterol, and for certain people the consumption of eggs in large amounts is a health hazard. I said so when I was Director of the National Heart and Lung Institute. We have objected to the wording of the ads that you referred to, and have had the proper judicial hearing at the FTC. Not that eggs can't be a very good food, because I believe eggs are an excellent food, but when one concludes that there is no evidence relating to

cholesterol and heart disease. I can't really accept that as appropriate advertising.

Now again I have no objection to people eating eggs in appropriate amounts——

Senator PERCY. Dr. Cooper, do you eat eggs?

Dr. COOPER. I eat eggs, yes, sir, I like eggs.

Senator PERCY. The yolk, too?

Dr. COOPER. Yes.

Senator PERCY. How many times a week, how many eggs a week?

Dr. COOPER. I eat between four and five a week.

Senator HUMPHREY. So do I.

Dr. COOPER. But I am not a type II hyperlipidemic. I am a little fellow, the right weight, and if I have a problem, it is a tendency to gain weight. I happen to know this, having been studied at the National Heart and Lung Institute. I don't recommend that everybody get the high cost test. I am classified type IV. As a type IV, my lipid levels are much more subject to elevation if I consume large amounts of carbohydrates or alcohol. I have no real problem in consuming a reasonable amount of cholesterol. I assume four eggs a week is quite suitable for me. I like them, and I am not trying to have people not eat any eggs, but I am also not interested in having the American people subjected to misleading advertising.

Senator PERCY. I think this sets a new precedent for witnesses. I think every witness ought to have an equal amount of time to talk about their personal approach and be very specific about it.

Dr. COOPER. I agree with you. If I believe it, I ought to do it, and I do do it.

Senator HUMPHREY. Would the Senator yield?

Senator PERCY. I would be happy to yield.

Senator HUMPHREY. I think it is very important what has been said here, because you often get the simplistic approach in the advertising, which overstates the case one way or another.

Body chemistries are very different, and it isn't only we have individual fingerprints. We have individual rates of metabolism. For example, there are certain foods that some people can't eat at all. They are allergic to them and they cause real disturbances.

I have a family of six members, and they all love cucumbers. All I have to do is have a cucumber, and I am out of business for a week. It is the only food that I can't eat, but if somebody really wants to poison me they should give me cucumbers.

I think that it also is important to note that the cholesterol count in people is related a great deal more than intake.

Dr. COOPER. More than just the intake of eggs. That is extremely important. The level of cholesterol in the body is not only a reflection of your intake of eggs. I think that is entirely simplistic. I don't subscribe to the importance of the sensitivity notion. As you are well aware, there have been people like Dr. Finegold, who have come to the Congress and talked about hyperactivity in children.

I don't know the extent to which this is a real problem as he defines it, but we have to be responsible and look into that in a very realistic way.

I have seen the answers to some of those parents. I don't recall any cucumbers, but I do remember several other kinds of specific foods

where a simple modification of the diet has had a very important impact on the people's lives, on the youngster as well as on the family.

Senator HUMPHREY. Dr. Ansel Kees was the man that started some of the initial research in this cholesterol business, and interestingly enough he was from the University of Minnesota. I remember in the early days I used to say, Ansel, don't you realize the milk industry out here is rather poor, and I said I didn't get elected to Congress to preside over the liquidation of the dairy industry because you are a good doctor.

Dr. COOPER. I again do not advocate the elimination of milk. If milk were the only food we had to deal with, it would be a different kind of problem.

Senator HUMPHREY. I think it is less hazardous than bourbon.

Dr. COOPER. I will go along with that.

Senator PERCY. Dr. Cooper, in 1971 I sponsored a nutrition education amendment which was added to the health manpower bill to open up special project funding under the act for training and research programs in human nutrition. I have felt for some time that the medical profession has not taken nutrition seriously as a critical factor in the promotion of health and the prevention of disease. I had hoped the amendment would better equip the medical profession to deal with nutrition as a basic component of health care.

You can imagine my shock, therefore, when I read in the first nutrition and health report of this committee that "Protein calorie malnutrition may be experienced by one-fourth to one-half of the medical and surgical patients having hospital stays of 2 weeks or more."

You are a doctor, all of our witnesses today are medical doctors. How can we persuade the medical profession, your colleagues, to take nutrition seriously, to integrate nutritional care into health care?

Dr. COOPER. I think we have to do a couple of things that we did not do at the time of the other submission.

I think as a result of your calling it to our attention in 1971, there was a greater concern about the development of nutritionists, but the practices of the health providers didn't change as you pointed out.

I think we have other instruments that we can use to bring greater attention to this problem. One is the direct effect on the curriculum. Without controlling the curriculum, there are means that we can use to influence the curriculum, such as in the treatment of high blood pressure, which we can apply to this field as well.

Secondly, I intended, as we did in hypertension, to talk with the testing systems, the National Board of Medical Examiners, the certifying systems, to be sure they are aware that this is a higly important area that we feel they should consider as an important baseline for the accreditation of the physician and other health professionals.

I think it usually follows that there will be greater attention paid in the educational process if people understand that some of their future will depend on it. I will be working on this in the near future.

Senator PERCY. One of the major points in your testimony is that medicine today is limited in its capacity to improve the health status of the people, that individual responsibility for health is needed. You certainly have amplified on that. Where individual responsibility is so critical, what should be the appropriate Government role? What are we supposed to do here?

I am particularly concerned about the danger that government in its zeal to promote nutritional health might compromise the liberties and freedoms of individuals to live their lives as they choose.

I think our history has been to work as cooperatively as we can with the private sector to try to encourage them to do what they are capable of doing voluntarily, rather than by the force of legislation and law.

But what is our proper role, as you see it?

Dr. COOPER. My own relationship with the industries involved, when I was Director of the National Heart and Lung Institute, problems of nutrition and heart disease. I always found them quite responsive with a specific willingness to cooperate.

I think the appropriate Federal role is in several areas.

One is in food protection. We have to do what is necessary here. Our appropriate role is to insure the quality of the food supply and its appropriate identification. Although we tend to become sometimes heavyhanded in this, I think that is the Federal role.

Second, I think we have a role in the support of research related to the whole nutritional field. We have talked about this before.

I think we have a proper role in the education of the youngster, the public, and the health professional. I think we have a proper role in setting models in the delivery system of how to use the information appropriately.

I would agree with you that we mustn't try to put out rules that compromise the individual freedoms of the American citizen. But I do feel that we ought to have a fair share of those things with which the public is inundated in the information and advertising spheres. I think they ought to have a fair chance at all necessary information from which they can make their choice.

I happen to feel that this is not incompatible with a cooperative movement with the industries involved. They have never said they wouldn't be cooperative if we would help give them the guidance and the information.

But I think we need a balanced presentation.

As I said earlier, I understand there is more to life than just living and people want to have pleasurable things and they ought to have a free choice to do it. But I think they ought to have the right information upon which to make that choice.

Senator PERCY. My last question, and I know we are anxious to get on with the next panel.

We have heard a good deal today about the benefits of integrating nutritional care as a basic component of preventive health care.

I agree with the concept, but I want to be sure we don't oversell the idea and promise more than we can deliver.

What are the limits in what preventive health care can do to improve the health status of the American people?

Dr. COOPER. I don't know the answer to that question, but I agree with your position that we should not promise more than we can deliver.

As we discussed before, I am willing to experiment and to recommend inculcation of good preventive nutritional practices in the health care delivery system and in the health financing system, but I don't know how to do that yet with the necessary safeguards built in to pre-

vent abuse of this by people who might use it as another opportunity to spend money.

Senator McGovern. Dr. Cooper, we want to thank you for an excellent presentation here this morning. I had no idea we were going to keep you here for 2½ hours, but we appreciate your testimony and answers.

Senator Humphrey. Mr. Chairman, can I offer some questions to be answered in writing?

Senator McGovern. Absolutely.

Senator Humphrey. I appreciate that very much.

[The following summary was referred to on p. 19.]

[The following material presents a description of the nutrition activities of the six agencies within the Public Health Service:]

NATIONAL INSTITUTES OF HEALTH

The Department's nutrition research activities are vested primarily in the National Institutes of Health. NIH funds support most of the human, particularly health-related, nutrition research in the United States. At the present time we conduct and support a comprehensive nutrition research and training program at an annual cost exceeding $50 million. This substantial effort is carried out both in the laboratories and clinics of several of the National Institutes in Bethesda, and at numerous universities and medical centers throughout the country. Other studies are conducted overseas by American and foreign investigators where much malnutrition research is being carried out mainly because of the presence of large population groups in whom, regrettably, general malnutrition and specific deficiency disease are endemic.

For purposes of our overview, the NIH research effort may be divided into three portions: one relating to normal nutrition, one to nutritional disorders, and one to nutrition in disease.

Research projects in the first category relate to such topics as digestion and absorption of nutrients, and physiology of the gastrointestinal tract; hunger, satiety, and food intake and the factors which regulate appetite; the biochemistry, metabolism, physiologic role, and fate in the body of the various nutrients; the normal nutritional requirements and functions of proteins and amino acids, carbohydrates, fats, minerals, trace elements, vitamins, fiber and fluids; interrelationships and interactions between different nutrients and between nutrients and important regulatory substances in the body such as enzymes and hormones; the relationship of the intestinal flora to nutrition; nutritional requirements and optimal nutrition during different stages in the human life cycle, and in related periods of stress, such as during infancy and childhood, maturity, pregnancy and lactation, and old age.

The second major subdivision in this spectrum of nutrition studies is devoted to primary nutritional disorders and malnutrition: borderline undernutrition, malnutrition states, and frank nutrition deficiency diseases. Another large segment in this subdivision is devoted to obesity, the most common form of malnutrition in this country and a major public health problem in our population.

The last major subdivision of these research activities encompasses studies concerning the relationship of nutrition to specific diseases or stress states, such as diabetes, hypertension and heart disease, bone and joint disease, liver diease, gastrointestinal diseases, infectious diseases, cancer, anemia, endocrine diorders, gallbladder disease, inborn errors of metabolism, skin disorders, kidney disease and surgery, trauma, wound healing and behavioral and environmental stresses. An important subdivision in this group of studies deals with the role of proper or special diets in the treatment of specific diseases.

We would like to illustrate for the Committee the range and depth of the ongoing nutrition research effort conducted or funded by the NIH with the aid of a few specific examples, particularly in the health-related nutrition research area.

For instance, one group of studies relates to the relationship of nutrition to growth and human development. It encompasses studies on maternal nutrition as it influences the course and outcome of pregnancy; elucidation of nutritional requirements during pregnancy and lactation; the role of nutrition in physical, intellectual, and behavioral development for the first four years of life; nutrition

as it relates to the development, maintenance and decline of immune processes from the fetal period through adulthood; nutrition and aging processes; and interactions between nutrition, behavior, and environment.

Another research program concentrates on the relationship between diet and blood vessel disorders and heart disease and encompasses studies on the relationships between certain dietary constituents, the resulting blood fat levels, and the development of atherosclerotic blood vessel disease, and the incidence of coronary heart disease. Other studies delve into the relationship of the level of salt consumption and hypertension.

A third program is devoted to the specialized facets of nutrition as it relates to cancer. In this category belong studies which investigate the possible relationship of dietary excesses or deficiencies to specific types of cancer; the possible role of specific food additives or contaminants or methods of food preparation in the development of cancer; and the possible carcinogenic effects of certain naturally occurring toxicants in agricultural products. Other studies deal with the host-tumor competition for specific nutrients; with behavioral and food modification intervention to overcome lack of appetite and aversion to eating among cancer patients who can no longer eat normally or cannot rely on their digestive tract for nourishment—because of extensive malignancy or radical therapeutic surgery.

Another group of research projects is devoted to the relationship between nutrition and dental health and includes investigations into the role of nutritional factors on optimal developments of teeth; the relationship between nutritional status and specific dietary factors and dental caries or periodontal disease; and the effect of specific nutrients on remineralization or arrest of incipient carious lesions.

Research on nutrition and the eye and vision includes studies such as the effect of vitamin A deficiency on components of the eye or the potential effect of excesses of specific nutrients on cataract formation.

Other studies of high priority encompass research on the effect of obesity on specific diseases and general health and longevity, including the development of methodology for its prevention and control; health significance of nutritional anemias, with emphasis on iron and folate deficiency; the effect of anemia on work performance and susceptibility to infection, and methods of prevention and therapy; the normal human dietary requirements for mineral elements which have only recently been found to be essential for maintenance of optimal health; the role of various fibrous constituents of the diet (roughage) in human nutrition and in specific disorders related to the large intestine; the development of special diets for the treatment of kidney disease; and the development of methods of feeding patients with selected disorders which make traditional food intake unfeasible or unproductive, with the aid of the infusion of sterile nutrient solutions by vein—so-called parenteral nutrition.

Before turning to other subjects, we would mention here that another portion of research conducted or supported by NIH is devoted to development of improved laboratory methods for the assay of specific nutrients and development of more effective and inexpensive methods of appraising the nutritional status of population groups. This information is essential for the early detection of subclinical deficiency states, the monitoring of nutritional status in individuals and groups, and for sound nutrition planning. Such new knowledge must be brought constantly into the realm of applied efforts in order to take on the task of ameliorating and preventing disease and enhancing health and physical well-being through improved diet.

A narrative on our nutrition activities would be incomplete without mention of the programs for the training of research manpower in nutrition. The purpose of these graduate research training programs is to produce well-trained investigators who can pursue careers in health science academic environments. These programs range in setting from university departments of biochemistry to medical schools and schools of public health. The mechanisms involved are research training grants and fellowship awards.

The Department has a strong commitment not only to the production of new knowledge but to the rapid dissemination of new research findings to the relevant scientific constituencies—the community of biomedical research scientists and that of the practicing physician—and to the general public. Newly developed research findings must be communicated rapidly to all other investigators so that they can be verified and utilized in the quest for additional needed knowledge. Moreover, we feel strongly that any newly acquired knowledge, no

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matter how sophisticated and potentially significant, will be of no value unless it is communicated promptly to the physician and applied by him in his practice. Furthermore, general nutrition information must be effectively and rapidly communicated to the public so that it becomes useful to consumers in selecting diets appropriate to individual nutritional needs.

Thus, a wide variety of nutrition education and related efforts are part of the nutrition activities of the various components of the Department. The various Institutes at the National Institutes of Health have prepared and distributed actively such booklets as "Facts About Nutrition", which discusses good dietary practices, malnutrition, obesity, and nutritional requirements at various stages in life such as infancy and pregnancy, and old age, and provides practical information such as meal plans, menus, and tables of desirable body weights. This booklet is systematically supplied to junior and senior high school libraries, health agencies, dotcors' offices, supermarkets, and the public at large and its availability is publicized through radio and television spot announcements. Other nutrition information is widely supplied to patients with specific dietary needs such as the booklet "Diet Guide for Patients on Chronic Dialysis", which outlines for patients and dietitians alike the dietary regimen which the 27,000 patients using artificial kidneys must follow.

Similarly, a series of booklets is distributed to the public which explains the relationship of dental nutrition to health, tooth decay, and periodontal disease, and other pamphlets and reports cover such topics as *How a Mother Affects Her Unborn Baby, Malnutrition and Learning,* and *Nutrition and Society.* To illustrate the magnitude of these efforts, I will just mention the example of the National Heart, Lung, and Blood Institute which distributes a handbook on the dietary management of hyperlipidemia for physicians and nutritionists, as well as individual patient care manuals. In this effort alone, over 2,000,000 copies have been disseminated.

FOOD AND DRUG ADMINISTRATION

The Food and Drug Administration (FDA) is the principal agency responsible for regulating the nutritional quality of the nation's food supply. The FDA has issued approximately 50 regulations which directly impact on the nutritional quality of foods, ranging from standards of identity for enriched flour and bread, to the mandatory addition of vitamin A to margarine. Regulations for foods for special dietary use have also been promulgated but must now be amended to comply with the recently enacted regulatory limitations imposed on FDA by the Proxmire Amendments to the Federal Food, Drug, and Cosmetic Act. A series of 17 further regulations are being promulgated which will establish: the precise nutritional requirements for vegetable protein used as an extender or replacement for meat, poultry, fish, cheese, and eggs; the nutritional quality guidelines for fortified ready-to-eat and hot breakfast cereals; as well as the basic principles for fortification of snack foods.

FDA maintains an active liaison with domestic and international organizations which deal with nutritional matters. Domestically, it works with such organizations as the Food and Nutrition Board of the National Academy of Sciences/National Research Council, the American Institute of Nutrition, and the American Society for Clinical Nutrition. Internationally, the agency works closely with organizations such as the World Health Organization (WHO), the Pan-American Health Organization (PAHO), and the United Nations Codex Alimentarius.

Since the findings of the White House Conference on Food, Nutrition, and Health, the FDA has expanded its activities in the fields of nutritional information and education. Nutritional information has been increased through expanded labeling information, such as fatty acid and cholesterol labeling for certain foods. Nutritional education has been fostered through the use of the FDA-originated U.S. Recommended Daily Allowance (U.S. RDA) system. Educational systems using the U.S. RDA as its basis have been developed for elementary school use, and for community use geared to differing socioeconomic and language groupings.

To assist it in gathering nutrition information, FDA uses the Department of Agriculture's (USDA) food consumption surveys, the USDA National Nutrition Data Bank, and the Health and Nutrition Evaluation Surveys of the National Center for Health Statistics, as well as other resources such as FDA's Market Basket Surveys, and data from the Market Research Corporation of America. Comprehensive compilations of data from these and other sources provide the basis for FDA's regulatory activities in the field of nutrition.

HEALTH RESOURCES ADMINISTRATION

The National Center for Health Statistics of the Health Resources Administration carries out programs designed to collect the needed health statistics information obtainable only through direct examinations of probability samples of the population. In 1970 the Center added a new responsibility in the area of measuring and monitoring over time the nutritional status of the American people. The first Health and Nutrition Examination Surveys (HANES) collected data on a national sample of the population between the ages of 1 and 74 from mid–1971 to mid–1974. The first of several reports of findings is now in preparation and will be completed this year. However, we do have some preliminary data available, which points to deficient intakes of iron in terms of accepted recommended standards and many differences between various subgroups of the total population.

The first national survey of nutritional status (HANES I) provides information on a number of specific indicators of possible nutritional deficiencies (dietary intake data, laboratory tests, clinical findings and body measurements). In young children, rate of growth is one such measure. The average heights, weights, and skinfold measurements at ages 1 through 17 years in the income group below poverty level are all lower than those for children in the other income group. Obesity is an important nutritional problem in American adults, particularly among females, with more than one-fourth classed as obese, based on skinfold measurements. Obesity is most frequent among Black females, affecting nearly one-third at ages 45–74 years. The survey found no evidence of marked nutrient deficiency in the vast majority of Americans—no children with severe protein malnutrition, for example. However, for some important nutrients there were subgroups in the population with indications of inadequate nutrition. This was not true with respect to protein, vitamin C, thiamine or riboflavin for any of the population groups. But the dietary intake data indicated that while mean calcium intakes for males and for White females were generally at or above the standard levels, Black female adults reported means 20 or 30 percent below standards. There was also considerable evidence in females of inadequate dietary intake of iron by accepted standards. White and Black females in both income groups reported mean dietary intake levels of less than 50 percent of the standard throughout most of the age range.

This year the HANES II program got underway. This will provide the first look at change in nutritional status over time, collected during 1976–1978. The survey content for this new program has been planned carefully with a view to benefiting from the experience and findings of the HANES I program.

The Department has placed emphasis on nutrition and dietetics through Allied and Public Health Traineeship grants as well as project grants to support curriculum development in schools of public health. Two major areas of emphasis are (1) broadening the scope of nutrition training in schools of public health to include a wider variety of community health workers, and (2) expanding the competencies of advanced-level practitioners and educators through in-depth continuing education programs. A principal problem in the training of dietitians has been the lack of organized clinical experiences. Baccalaureate programs for dietitians have been developed through support from the Bureau of Health Manpower to incorporate one year of supervised clinical experience (known as "coordinated integrated programs").

We plan to give increased attention to the science of human nutrition in medical education through program educational support designed to increase the scope and effectiveness of undergraduate primary care training. Schools will be encouraged to identify adequate faculty and resources for teaching the application of nutritional principles in clinical and preclinical fields. We feel that special efforts will be required to integrate nutrition education across disciplines within the total medical school curriculum in order to provide needed reinforcement of nutritional concepts. Similarly, the development of model graduate medical education programs and curricula in primary care specialties will include efforts to highlight the place of human nutrition in the maintenance of health as well as in the management of illness.

We are actively engaged in the training and continuing education of community health workers, especially those practicing public health nutrition, health education, environmental health, and health administration and planning. Emphasis is being placed on identifying current and projected roles and functions as observed in different practice settings in order to assess the relevancy of

current training and to develop new and innovative methods of training modules. Further emphasis is being placed on expanding the competencies of advanced level practitioners through in-depth continuing education modules.

In the allied health profession of Dietetics, we are encouraging the implementation of "coordinated integrated programs" at the undergraduate level to assure clinical training experience in dietetics.

Efforts are also being made to identify those allied health practitioners essential to primary care so as to define roles and functions for the purpose of enhancing the quality of their occupational preparation and continuing education.

The American Dental Association will complete in FY 1977 a dental school curriculum survey which includes nutrition education. Although not funded by our Bureau of Health Manpower, the survey will be available for planning nutrition activities in dental schools.

CENTER FOR DISEASE CONTROL

In the past few years, four large-scale national nutrition surveys have been carried out which are relevant to the nutrition status of the United States population. The "10-State Survey" was purposely oriented toward the problems of low-income groups. The "Preschool Nutrition" Survey was targeted to the 0–6-year-old population. The "Health and Nutrition Examination Survey," mentioned earlier, was carried out on a representative sample of the United States population. "Nutrition Canada," a comprehensive survey of Canadians, had many similarities in methodology and results to these surveys in the United States. These four surveys have given us a better picture of our nutrition status than ever before.

Each of the surveys utilized the four classic methods of nutrition assessment. Clinical examinations were performed to look for the stigmata of classical nutritional syndromes. A number of biomedical determinations were made on blood and urine samples. Dietary histories were taken and nutrient intakes calculated from the dietary information. Anthropometric measurements were taken to determine growth and development patterns of children, and the subcutaneous fat stores of adults.

These four surveys generally agree with each other in the portrayal of major nutritional problems of Americans. Their conclusions depend greatly on the standards of interpretation and definitions which are used for the delineation of poor nutrition. These surveys have stimulated a great deal of methodologic research and also debate on the limits of "normal," and have also led to broad agreement about some of the highly prevalent nutritional disorders in the United States.

We can list the major conclusions succinctly. First, only very small numbers of vitamin deficiency problems have been discovered. Second, except for rather widespread iron deficiency, very few mineral deficiencies have been found. Third, obesity is a common problem in all demographic subgroups and all ages. Fourth, disturbingly high prevalences of elevated blood lipids—cholesterol and triglycerides—have been found in most demographic groups. Fifth, retarded growth, presumably on the basis of maternal or early childhood undernutrition, is quite common in the lower socioeconomic population. Last, dental caries, reflecting both poor dental hygiene and diets high in refined sugars, is very widespread throughout the nation.

Now that these conditions have been identified as ones of high prevalence and widespread distribution, a number of programs are attempting to reduce them. These programs require a continued source of information on the prevalence and distribution of these conditions for program planning and evaluation. The Department of Health, Education, and Welfare, through the Center for Disease Control, has been aiding State health departments in constructing ongoing surveillance systems for some of the common nutritional disorders.

Nearly all health-oriented programs for children involve weighing and measuring the children and determining a hemoglobin or hematocrit value. These simple and inexpensive determinations are relevant for three of the major nutritional conditions uncovered by the major nutrition surveys. A carefully done height and weight, charted against standard growth charts, will help determine nutritional stunting from undernutrition, and also identify pediatric obestity. A hemoglobin or hematocrit value is the most simple method for determining anemia, which in

the U.S. pediatric group is most commonly caused by iron deficiency. Thus, intelligent interpretation of growth patterns and anemia data enable local jurisdictions to make individual clinical decisions, and build up a body of surveillance data to help determine the nutritional status of their population.

These simple concepts have some methodologic problems which have been solved to a great extent. Accurate determination of growth retardation and obesity requires a valid standard for growth and development. The Center for Disease Control, in cooperation with the National Center for Health Statistics, has helped developed new reference standards for height-for-age, weight-for-age, weight-for-height, and head circumference comparisons. Computer routines have been developed which make analysis of group data on heights and weights simple and rapid. These computer subroutines are available to States and universities and are being used in the domestic nutrition surveillance.

The nutrition surveillance program is particularly important because it is based on data on all of the children served in State and local nutrition-oriented programs in 10 selected States. While this population is not "representative" of the total U.S. population, it encompasses the population served in remedial programs in the participating States.

In the future, we hope that additional states would be added to the system. Also, it is desirable that the computer technology be fully transferred to those States which wish to process their own data. Various aspects of the nutritional status of pregnant women might also be added to the system. Finally, we anticipate that eventually anemic children who fail to respond to diet or iron therapy will be checked to determine alternate nutritional or non-nutritional reasons for their anemia.

At present, only one State, Arizona, is engaged in the surveillance of cholesterol elevations in the pedatric population. Cholesterol determinations are expensive and difficult to standardize.

As part of the services surrounding the surveillance program, the Center for Disease Control is trying to help State health departments upgrade the quality of laboratory measurements of hemoglobin and hematocrit, and the reliability and reproducibility of clinic personnel's determinations of height and weight.

The data from the surveillance program are summaried on a quarterly basis in the Nutrition Surveillance report, and additional analyses are prepared as requested or needed by the individual State health departments. These Nutrition Surveillance reports are available through CDC's mailing list, through State health departments, and through many medical libraries.

The Center for Disease Control (CDC) since 1970 has supported the Health Resources Administration's (HRA) Health and Nutrition Examination Surveys (HANES) by serving as the primary health laboratory, examining specimens collected from participants in the HANES program. During fiscal year 1976, the Center's Bureau of Laboratories provided data on approximately 52,000 samples. Determinations included the following: serum iron, serum iron binding capacity, erythrocyte-protoporphyvin, serum folate, RBC folate, Vitamin B–12, Vitamin A, Vitamin C, serum copper, serum zinc, glucose, and albumin. A second area of CDC interest is the status of technical laboratory performance in the United States. Five years ago when the Center began its first efforts in support of HANES, many of the analytical methods were inadequately characterized, with regard to their dependability in generating data necessary for making quality nutritional assessments. Since that time, the Center has attempted to develop and refine test procedures. During fiscal year 1977, the Center will publish its first syllabus on methods of nutritional analysis for several important commitments.

Another important area of interest is the evaluation of the commercial kits and reagents used for nutritional analyses. The number of kits and reagents in the area of nutritional analysis has been growing rapidly since the advent of radio-immunoassay (RIA) procedures.

HEALTH SERVICES ADMINISTRATION

The Bureau of Community Health Services (BCHS) activities respecting nutrition services and/or nutrition education and research are an integral part of health care conducted by the various health programs comprising the Bureau, such as Maternal and Child Health and Crippled Children's Services, Community Health Centers, Migrant Health Centers, and Family Planning.

Each of these programs provides nutrition services, including assessment of nutritional status/diagnosis of nutritional problems, dietary counseling, treatment and follow-up of nutritional problems, and assistance in locating food resources, to patients, their families and to the community.

The Bureau assists in the implementation of the Department of Agriculture's program to provide needed food supplements to pregnant women, infants and children (WIC program) programs, principally the MCH program, through its project clinics identify women and children who need food supplements and certify them for the WIC program. The Department of Agriculture recognizes the program certification and food is provided to those persons in need.

Additionally, BCHS administers the section 202 health, nutrition and child care demonstration projects of the Appalachia Regional Development Act of 1965. In June of 1976, BCHS received delegation of authority for Health and Nutrition Demonstration Projects authorized under section 516 of the Public Works and Economic Development Act of 1965, as added by section 205 of P. L. 94-188, (Regional Development Act Amendments of 1975).

Education in nutrition for physicians, nurses and other health care providers is supported by NCH—Title V SSA funds for graduate training programs in maternal and child nutrition, nutrition in public health and in specific aspects of nutrition as needs arise in practice.

The Bureau of Community Health Services also develops and distributes nutrition education materials for health care providers and the lay public.

The Indian Health Service, through its Nutrition and Dietetics Branch, provides preventive and direct patient care nutrition services; operation of the 51 IHS Hospital dietary departments; training of Indian and Alaska Natives for Nutrition and Dietetics careers; providing inservice education and training in nutrition for other members of the Indian Health Service health team; stimulating conduct of appropriate nutrition research related to the health of the Indian and Alaska Native; and applying research findings.

In spite of improvement in the quantity and nutritional quality of their available food supply, substantial numbers of Indians and Alaska Natives still do not have sufficient food and/or food of high nutritional quality to prevent or overcome the relatively common evidences of mild or moderately severe nutritional problems occurring among the population. This is particularly significant for those of highest nutritional risk: infants, preschool children, females in the childbearing years of 15–44, the elderly and the chronically ill. Lack of understanding of the relationship of food to health continues to be widespread.

ALCOHOL, DRUG ABUSE, AND MENTAL HEALTH ADMINISTRATION

The National Institute of Drug Abuse (NIDA) is funding a number of important projects relating to nutrition. Specifically, through a series of research and demonstration projects designed to meet the special treatment needs of female addicts and drug abusers, attempts have been made to improve patients' abilities as parents. Part of this process involves education in nutrition. It is recognized that malnutrition is a frequent secondary effect of many forms of drug abuse and therefore by focusing on the client's nutritional problems, a treatment program can help to restore the client, as well as the client's family, to better physical health. In addition, NIDA has funded two research projects which are examining the effects of methadone treatment on pregnancy and infant development. Included within these studies will be nutritional considerations affecting the health of neonates.

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) is funding a number of projects specifically relating to nutrition. These grants are primarily concerned with the relationship of alcohol ingestion and certain types of nutritional deficiencies. Over half of the funds go to sponsoring research to examine the effects of alcohol intake and thiamin deficiency. The subjects are studied for cardiac hypertrophy, liver malfunction, and brain damage. The NIAAA is also sponsoring research to gain a better understanding of the adverse effects of alcohol on the biochemical and physiological mechanisms involved in cell proliferation, maturation (including protein synthesis) and life span.

[The following material was referred to on p. 34.]

Benefits From Human Nutrition Research

(By C. Edith Weir)

This report is part of a study conducted at the direction of the Agricultural Research Policy Advisory Committee, U.S. Department of Agriculture. A joint task group representing the State Agricultural Experiment Stations and the U.S. Department of Agriculture was assigned the responsibility for making the study. Task group members were:

Dr. Virginia Trotter, co-chairman, dean, College of Home Economics, University of Nebraska; Dr. Steven C. King, co-chairman, associate director, Science and Education Staff, U.S. Department of Agriculture; Dr. Walter L. Fishel, assistant professor, Department of Agriculture and Applied Economics, University of Minnesota; Dr. H. Wayne Bitting, program planning and evaluation staff, Agricultural Research Service, U.S. Department of Agriculture; Dr. C. Edith Weir, Assistant Director, Human Nutrition Research Division, Agricultural Research Service, U.S. Department of Agriculture.

Better health, a longer active lifespan, and greater satisfaction from work, family and leisure time are among the benefits to be obtained from improved diets and nutrition. Advances in nutrition knowledge and its application during recent decades have played a major role in reducing the number of infant and maternal deaths, deaths from infectious diseases, particularly among children, and in extending the productive lifespan and life expectancy. Significant benefits are possible both from new knowledge of nutrient and food needs and from more complete application of existing knowledge. The nature and magnitude of these benefits is estimated in Table 1. Potential benefits may accrue from alleviating nutrition-related health problems, from increased individual performance and satisfactions and increased efficiency in food services. A vast reservoir of health and economical benefits can be made available by research yet to be done on human nutrition.

Major health problems are diet related.—Most all of the health problems underlying the leading causes of death in the United States (Fig. 1) could be modified by improvements in diet. The relationship of diet to these health problems and others is discussed in greater detail later in this report. Death rates for many of these conditions are higher in the U.S. than in other countries of comparable economic development. Expenditures for health care in the U.S. are skyrocketing, accounting for 67.2 billion dollars in 1970—or 7.0 percent, of the entire U.S. gross national product.

The real potential from improved diet is preventive.—Existing evidence is inadequate for estimating potential benefits from improved diets in terms of health. Most nutritionists and clinicians feel that the real potential from improved diet is preventative in that it may defer or modify the development of a disease state so that a clinical condition does not develop. The major research thrust, nationwide, has been on the role of diet in treating health problems after they have developed. This approach has had limited success. USDA research emphasis has been placed on food needs of normal, healthy persons and findings from this work have contributed much of the existing knowledge on their dietary requirements.

Benefits would be shared by all.—Benefits from better nutrition, made possible by improved diets, would be available to the entire population. Each age, sex, ethnic, economic, and geographic segment would be benefited. The lower economic and nonwhite population groups would benefit most from effective application of current knowledge.

These savings are only a small part of what might be accomplished for the entire population from research yet to be done. Some of the improvements can be expressed as dollar benefits to individuals or to the nation. The social and personal benefits are harder to quantify and describe. It is difficult to place a dollar figure on the avoidance of pain or the loss of a family member; satisfactions from healthy, emotionally adjusted families; career achievement; and the opportunity to enjoy leisure time.

Major health benefits are long range.—Predictions of the extent of which diet may be involved in the development of various health problems have been based on current knowledge of metabolic pathways of nutrients, but primarily

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Source: Human Nutrition Research Division, Agricultural Research Service, U.S. Department of Agriculture. Issued August 1971 by Science and Education Staff, United States Department of Agriculture, Washington, D.C.

of abnormal metabolic pathways developed by persons in advanced stages of disease. There is little understanding of when or why these metabolic changes take place. The human body is a complex and very adaptive mechanism. For most essential metabolic processes alternate pathways exist which can be utilized in response to physiological, diet, or other stress. Frequently, a series of adjustments take place and the ultimate result does not become apparent for a long time, even years, when a metabolite such as cholesterol accumulates. Early adjustment of diet could prevent the development of undesirable long-range effects. Minor changes in diet and food habits instituted at an early age might well avoid the need for major changes, difficult to adopt later in life.

Regional differences in diet related problems.—The existence of regional differences in the incidence of health problems has been generally recognized and a wide variation in death rates still exists among geographic areas. These differences in death rate may reflect the cumulative effect of chronic low intake levels of some nutrients throughout the lifespan and by successive generations. A number of examples of regional health problems attributable to differences in the nutrient content of food or to dietary pattern could be given. Perhaps the best known is "the goiter belt" where soils and plants were low in iodine and the high incidence and death rate of goiter was reduced when the diet was supplemented with iodine. Another situation existed in some of the southern states where pellagra was a scourge a few decades ago. Corn was the major food protein source for low income families in these areas. The resulting niacin deficiency raised the incidence of pellagra to epidemic proportions.

Migration from the high death rate areas almost always results in a reduction in the death rate, although the improvement never approaches the level achieved by those who were born and continued to live in the low rate areas. Similarly, persons who move from low rate areas into higher rate areas lose part of the advantage. If the death rate for one of the high death rate areas, Wilkes-Barre, Pennsylvania, were applied to the entire U.S. population, 140,489 more persons under 65 years would have died per year during the period 1959–61. If the death rate for one of the lower rate areas, Nebraska, had prevailed, there would have been 131,634 fewer deaths. The highest death rate areas generally correspond to those where agriculturists have recognized the soil as being depleted for several years. This suggests a possible relationship between sub-marginal diets and health of succeeding generations.

TABLE 1—MAGNITUDE OF BENEFITS FROM NUTRITION RESEARCH

Health problem	Magnitude of loss	Potential savings from improved diet
	PART A. NUTRITION RELATED HEALTH PROBLEMS	
Heart and vasculatory	Over 1,000,000 deaths in 1967	
	Over 5 million people with definite or suspect heart disease in 1960–62.	25-percent reduction.
	$31.6 billion in 1962	20-percent reduction.
Respiratory and infectious	82,000 deaths per year	
	246 million incidents in 1967	20 percent fewer incidents.
	141 million work-days lost in 1965–66	15–20 percent fewer days lost.
	166 million school days lost	Do.
	$5 million in medical and hospital costs	$1 million.
	$1 billion in cold remedies and tissues	$20 million.
Mental health	2.5 percent of population of 5.2 million people are severely or totally disabled. 25 million people have manifest disability.	10 percent fewer disabilities.
Infant mortality and reproduction.	Infant deaths in 1967—79,000	50 percent fewer deaths.
	Infant death rate 22.4 per 1,000	Do.
	Fetal death rate 15.6 per 1,000	Do.
	Maternal death rate 28.0 per 100,000 live births	Do.
	Child death rate (1–4 yrs.) 96.1 per 100,000 in 1964	Reduce rate to 10 per 100,000.
	15 million with congenital birth defects	3 million fewer children with birth defects.
Early aging and lifespan	49.1 percent of population, about 102 million people have one or more chronic impairments.	10 million people without impairments.
	People surviving to age 65: Percent	
	White males 66	1 percent improvement per year to 90 percent surviving.
	Negro males 50	
	White females 81	
	Negro females 64	
	Life expectancy in years:	
	White males 67.8	Bring Negro expectancy up to White.
	Negro males 61.1	
	White females 75.1	
	Negro females 68.2	

TABLE 1.—MAGNITUDE OF BENEFITS FROM NUTRITION RESEARCH—Continued

Health problem	Magnitude of loss	Potential savings from improved diet
Arthritis	16 million people afflicted	8 million people without afflictions.
	27 million work days lost	13.5 million work days.
	500,000 people unemployed	125,000 people employed.
	Annual cost $3.6 billion	$900 million per year.
Dental health	44 million with gingivitis; 23 million with advanced periodontal disease; $6.5 billion public and private expenditures on dentists' services in 1967; 22 million endentulous persons (1 in 8) in 1957; ½ of all people over 55 have no teeth.	50 percent reduction in incidence, severity, and expenditures.
Diabetes and carbohydrate disorders.	3.9 million overt diabetic; 35,000 deaths in 1967; 79 percent of people over 55 with impaired glucose tolerance.	50 percent of cases avoided or improved.
Osteoporosis	4 million severe cases; 25 percent of women over 40	75 percent reduction.
Obesity	3 million adolescents; 30 to 40 percent of adults; 60 to 70 percent over 40 years.	80 percent reduction in incidence.
Anemia and other nutrient deficiencies.	See improved work efficiency, growth and development, and learning ability.	
Alcoholism	5 million alcoholics; ⅓ are addicted	33 percent.
	About 24,500 deaths in 1967 caused by alcohol	Do.
	Annual loss over $2 billion from absenteeism, lowered production and accidents.	Do.
Eyesight	48.1 percent, or 86 million people over 3 years wore corrective lenses in 1966; 81,000 become blind every year; $103 million in welfare.	20 percent fewer people blind or with corrective lenses.
Cosmetic	10 percent of women ages 9 or more with vitamin intakes below recommended daily allowances.	
Allergies	32 million people (9 percent) are allergic	20 percent people relieved.
	16 million with hayfever asthma	
	7–15 million people (3–6 percent) allergic to milk	90 percent people relieved.
	Over 693 thousand persons (1 in 3,000) allergic to gluten.	Do.
Digestive	8,495 thousand work-days lost; 5,013 thousand school-days lost; about 20 million incidents of acute condition annually.	25 percent fewer acute conditions.
	$4.2 billion annual cost; 14 million persons with duodenal ulcers; $5 million annual cost; 4,000 new cases each day.	Over $1 billion in costs.
Kidney and urinary	55,000 deaths from renal failure; 200,000 with kidney stones.	20 percent reduction in deaths and acute conditions.
Muscular disorders	200,000 cases	10 percent reduction in cases.
Cancer	600,000 persons developed cancer in 1968; 320,000 persons died of cancer in 1968.	20 percent reduction in incidence and deaths.
	PART B. INDIVIDUAL SATISFACTIONS INCREASED	
Improved work efficiency		5 percent increase in on the job productivity.
Improved growth and development.	113,000 deaths from accident. 324.5 million work-days lost; 51.8 million people needing medical attention and/or restricted activity.	25 percent fewer deaths and work-days lost.
Improved learning ability	Over 6.5 million mentally retarded persons with I.Q. below 70; 12 percent of school age children need special education.	Raise I.Q. by 10 points for persons with I.Q. 70–80.
	PART C. INCREASED EFFICIENCY IN FOOD SERVICES	
Improved efficiency in food preparation and menu planning.		Not estimated.
Reduced losses of nutrients in food storage, handling, and preparation.		Do.
Improved efficiency in food selection.		Do.
Improved efficiency in food programs.		Do.

LEADING CAUSES OF DEATH

Rates per 100,000, U.S. 1969

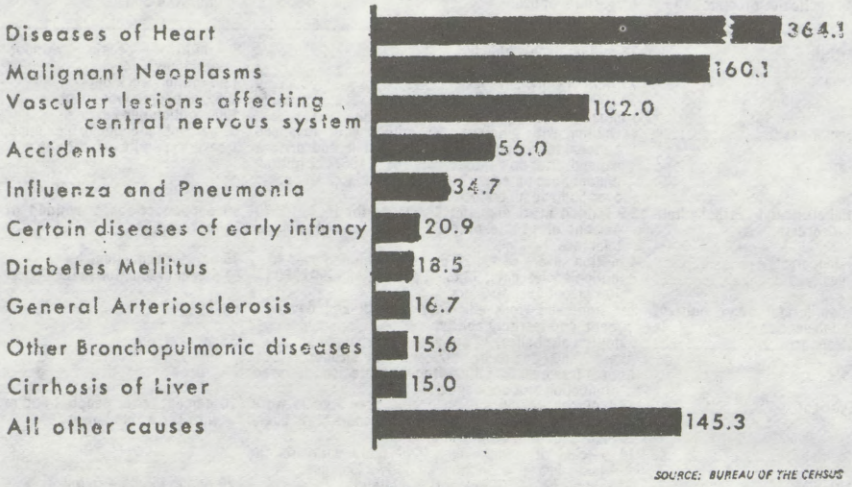

FIGURE 1

[The following report was referred to on p. —.]

Government of Canada Gouvernement du Canada

A NEW PERSPECTIVE ON THE HEALTH OF CANADIANS

a working document

Marc Lalonde

Minister of National Health and Welfare

A NEW PERSPECTIVE ON THE HEALTH OF CANADIANS

a working document

Ottawa, April 1974

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Preface

Good health is the bedrock on which social progress is built. A nation of healthy people can do those things that make life worthwhile, and as the level of health increases so does the potential for happiness.

The Governments of the Provinces and of Canada have long recognized that good physical and mental health are necessary for the quality of life to which everyone aspires. Accordingly they have developed a health care system* which, though short of perfection, is the equal of any in the world. Included in the system has been a program of pre-paid health services which substantially removes financial barriers to medical and hospital care. Coupled with health insurance have been programs for building hospitals and for training more physicians and other health professionals.

The health care system, however, is only one of many ways of maintaining and improving health. Of equal or greater importance in increasing the number of illness-free days in the lives of Canadians have been the raising of the general standard of living, important sanitary measures for protecting public health, and advances in medical science.

At the same time as improvements have been made in health care, in the general standard of living, in public health protection and in medical science, ominous counter-forces have been at work to undo progress in raising the health status of Canadians. These counter-forces constitute the dark side of economic progress. They include environmental pollution, city living, habits of indolence, the abuse of alcohol, tobacco and drugs, and eating patterns which put the pleasing of the senses above the needs of the human body.

For these environmental and behavioural threats to health, the organized health care system can do little more than serve as a catchment net for the victims. Physicians, surgeons, nurses and hospitals together spend much of their

*Throughout this paper the term "health care system" is limited to the system by which personal health care is provided. The term "health field" is much broader and includes all matters affecting health.

time in treating ills caused by adverse environmental factors and behavioural risks.

It is evident now that further improvements in the environment, reductions in self-imposed risks, and a greater knowledge of human biology are necessary if more Canadians are to live a full, happy, long and illness-free life.

While it is easy to convince a person in pain to see a physician, it is not easy to get someone not in pain to moderate insidious habits in the interests of future well-being. Nor is it easy to make environmental changes which cause social inconvenience when the benefits of those changes fall unevenly on the population and are only apparent over the long term. The view that Canadians have the right "to choose their own poison" is one that is strongly held.

It is therefore necessary for Canadians themselves to be concerned with the gravity of environmental and behavioural risks before any real progress can be made. There are encouraging signs that this concern is growing; public interest in preserving a healthy environment, in better nutrition and in increasing physical recreation has never been higher.

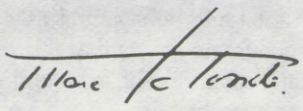
The Government of Canada now intends to give to human biology, the environment and lifestyle as much attention as it has to the financing of the health care organization so that all four avenues to improved health are pursued with equal vigour. Its goal will continue to be not only to add years to our life but life to our years, so that all can enjoy the opportunities offered by increased economic and social justice.

In preparing this Working Paper, the Government of Canada has been fully aware that its concern for the well-being of Canadians is shared by provincial and municipal governments. It is also aware that the provision of personal health services to the general public is clearly a matter of provincial jurisdiction. At the same time there are national health problems which know no provincial boundaries and which arise from causes imbedded in the social fabric of the nation as a whole. These problems cannot be solved solely by providing health services but rather must be attacked by offering the Canadian people protection, information and services through which they will themselves become partners with health professionals in the preservation and enhancement of their vitality.

As in the recent Working Paper on Social Security in Canada, we have examined all aspects of a major subject without regard to jurisdiction. Only through such an examination can the problems and their causes be understood, and legitimate federal responses ascertained. As a result of our examination we have developed a conceptual framework of the health field which was outlined in a speech I gave at the Pan American Health Organization conference in Ottawa on September 10, 1973. The concept has been endorsed by the provin-

cial Ministers of Health, who met in Ottawa on February 13 and 14, 1974. This federal-provincial unanimity of approach offers great opportunities for raising the level of health of Canadians.

The purpose of this Working Paper, as its title suggests, is to unfold a new perspective on the health of Canadians and to thereby stimulate interest and discussion on future health programs for Canada. The Paper is not intended to be exhaustive nor does it constitute a definite commitment to any of the proposed courses of action within a specific time frame; many will no doubt quarrel with the amount of emphasis on different aspects and not everyone will agree with all the ideas expressed. I would not want it any other way because it is only through honest disagreement and warm debate that the broader issues of health can be clarified and further progress achieved.



Marc Lalonde

Minister of National Health and Welfare

Introduction

William Paley, in *Natural Theology* wrote:

> "Nightly rest and daily bread, the ordinary use of our limbs, and senses, and understandings, are gifts which admit of no comparison with any other."[1]

It is these gifts which health and welfare policies seek to ensure for as many Canadians as possible.

Complete well-being for all may be beyond our grasp, given the human condition, but much more can be done to increase freedom from disease and disability, as well as to promote a state of well-being sufficient to perform at adequate levels of physical, mental and social activity, taking age into account.

Most Canadians by far prefer good health to illness, and a long life to a short one but, while individuals are prepared to sacrifice a certain amount of immediate pleasure in order to stay healthy, they are not prepared to forego all self-indulgence nor to tolerate all inconvenience in the interest of preventing illness.

The behaviour of many people also reflects their individual belief that statistical probability, when it is bad, applies only to others. This belief is the comfort of soldiers at war, criminals and racing drivers, none of whom could sustain their activities did they not look on the sunny side of risk and probability. It is also the solace of those whose living habits increase the likelihood of sickness, accidents and early death.

Yet, when sickness strikes, the patient expects rapid, quality care; all available resources must be marshalled on his or her behalf with little regard for cost.

The foregoing attitudes, beliefs and expectations are basic to an understanding of how the health field has developed in Canada. They explain why Canadians are prepared to spend such a large part of their national income on personal health care services, while tolerating environmental and lifestyle hazards which contribute heavily to the frequency of sickness and death.

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One of the purposes of this Working Paper, nevertheless, is to show the links between different kinds of mortality and illness on the one hand and their underlying causes on the other. Only when these links are known will it be possible to make judgments on whether certain risks are worth taking or certain sacrifices are worth making.

These judgments must be made by individuals in respect of their own living habits, by society in respect of the values it holds, and by governments in respect of both the funds they allocate to the preservation of health and the restrictions they impose on the population for whose well-being they are responsible.

Ultimately, it is to help in making those judgments that this Working Paper has been written.

Chapter 1. The Traditional View of the Health Field

The traditional or generally-accepted view of the health field is that the art or science of medicine has been the fount from which all improvements in health have flowed, and popular belief equates the level of health with the quality of medicine. Public health and individual care, provided by the public health physician, the medical practitioner, the nurse and the acute treatment hospital, have been widely-regarded as responsible for improvements in health status. Individual health care, in particular, has had a dominant position, and expenditures have generally been directed at improving its quality and accessibility.

The success of the Canadian personal health care system, particularly in the treatment of disease, is unquestioned, and the demand by the Canadian people for more and better personal health care continues unabated. Preventive medicine, as exemplified by immunization, has practically eliminated such scourges as smallpox, diphtheria and poliomyelitis, and advanced surgical procedures save thousands more lives annually than they did thirty years ago. Graduates of Canadian medical colleges and of post-graduate specialty training are the equal of any in the world and Canadian hospitals have a general high level of service and equipment that matches that of any other country. In both numbers and skills the members of the Canadian nursing profession generally provide the finest of nursing care. Taken as a whole, then, the amount, quality and method of financing health care in Canada, while still improvable, is one to be envied.

In most minds the health field and the personal medical care system are synonymous. This has been due in large part to the powerful image projected by medicine of its role in the control of infective and parasitic diseases, the advances in surgery, the lowered infant mortality rate and the development of new drugs. This image is reinforced by drug advertising, by television series with the physician as hero, and by the faith bordering on awe by which many Canadians relate to their physicians.

The consequence of the traditional view is that most direct expenditures on health are physician-centered, including medical care, hospital care, laboratory

tests and prescription drugs. When one adds dental care and the services of such other professions as optometrists and chiropractors, one finds that close to seven billion dollars a year are spent on a personal health care system which is mainly oriented to treating existing illness.

Chapter 2. The Limitations of the Traditional View

There are two approaches which can be taken to assess the influence of various factors on the general level of illness. One is by analysing the past and determining the extent to which various influences have contributed, over the years, to changes in the nature and incidence of sickness and death. A second approach is to take present statistics on illness and death and to ascertain their underlying causes.

The historical approach is most clearly expressed by Dr. Thomas McKeown, Professor of Social Medicine at the University of Birmingham Medical School.[2] Dr. McKeown traces the level of health in England and Wales back to the eighteenth century, and evaluates the effect of the several influences on the health level. His conclusions are:

> "that, in order of importance the major contributions to improvement in health in England and Wales were from limitation of family size (a behavioural change), increase in food supplies and a healthier physical environment (environmental influences), and specific preventive and therapeutic measures"[3]
>
> and
>
> "Past improvement has been due mainly to modification of behaviour and changes in the environment and it is to these same influences that we must look particularly for further advance".[4]

These conclusions, drawn from an analysis of the history of the level of health of the population, are not surprising when one recalls the progress in income security, in education and in protection from public health hazards during the past century.

The second approach is to examine the nature and underlying causes of present mortality and hospital morbidity in Canada.

Mortality

Looking first at mortality it was found that overall statistics on causes of death are dominated by deaths over age seventy. Since more than 50% of deaths in 1971 occurred beyond age seventy, the causes of death in old age have an overwhelming impact on total figures and thus obscure the relative significance of the deaths that come before their time. It is the early deaths that reflect adversely on the health status of Canadians, as far as mortality is concerned, and they can be properly assessed only if they are separated from overall mortality statistics.

All of the following figures reflect Canada's experience in 1971 when there were 157,300 deaths recorded from all causes, of which 75,200 came before age seventy. These early deaths are the ones which were analysed.

Of the 75,200 early deaths, 7,600 or roughly 10% occurred before age five. Of these, 1,500 were due to congenital anomalies, and 3,300 more were due to other conditions which caused death shortly after birth.

Given that the present high level of obstetrical and neo-natal service can be maintained, it is generally conceded that early pre-natal care, along with the early identification of high-risk pregnancies, is the principal means by which the infant mortality rate can be further lowered. It is also true that economically-deprived segments of the population, including its native peoples, contribute disproportionately to the infant mortality rate in Canada. It is also true that the importance of early pre-natal care is recognized more by the relatively affluent levels of society than by the under-privileged. Finally, it is true that universal pre-paid health care has practically eliminated any financial barrier between a pregnant woman and the pre-natal care she should receive. All these conditions lead to the conclusion that economic circumstances, health education, attitudes and facility of physical access to health care, as well as improved pre-natal care, are the principal factors to be considered in lowering the rate of infant mortality. In brief, environment and self-imposed risks, including attitudes, are the main influences by which infant mortality rates can be further improved.

From age five to age thirty-five, the principal cause of death is motor vehicle accidents, the second most important cause is other accidents and the third is suicide. These three, taken together, account for 6,200 of the 9,700 deaths for the group aged five to thirty-five. Since all these causes of death are mainly due to human factors, including carelessness, impaired driving, despair and self-imposed risks, it is evident that changes in these factors are needed if the rates of death are to be lowered.

At age thirty-five, coronary-artery disease first appears as a significant (over 5%) cause of death. By age forty it becomes the principal cause and holds this position in increasing ascendancy through all subsequent age groups.

For the age group thirty-five to seventy, diseases of the cardio-vascular system accounted for 25,700 deaths out of a total of 58,000. While the causes of circulatory diseases are various, there is little doubt that obesity, smoking, stress, lack of exercise and high-fat diets, in combination, make a dominant contribution. All of these are due to environmental conditions and self-imposed risks.

At age fifty, the second most important cause of death in men is cancer of the larynx, trachea, bronchus or lung. These accounted for 3,600 deaths, male and female, between forty and seventy. Bronchitis, emphysema and asthma, in this age group, accounted for another 1,400 deaths. For these 5,000 deaths, cigarette smoking is a major contributing factor. Once more the root cause is found in a self-imposed risk.

In order to ascertain and measure the principal causes of early death, calculations have been made of the years of potential life lost by each cause, measured against a life expectancy of seventy and eliminating causes of infant mortality. Years lost due to early death for the five main causes, by this definition, were as follows for 1971:

Cause	Total Years Lost
Motor Vehicle Accidents	213,000
Ischaemic Heart Disease	193,000
All Other Accidents	179,000
Respiratory Diseases and Lung Cancer	140,000
Suicide	69,000

It will be noted that self-imposed risks and the environment are the principal or important underlying factors in each of the five major causes of death between age one and age seventy, and one can only conclude that, unless the environment is changed and the self-imposed risks are reduced, the death rates will not be significantly improved.

Hospital Morbidity

Mortality rates are not the only indicators of health, so a similar analysis was made of hospital morbidity, i.e. those illnesses which required hospitalization.

For analytical purposes, morbidity can be classified under three headings:

1. hospital morbidity, defined as sickness requiring hospitalization

2. non-hospital morbidity for which treatment was given but outside the hospital

3. untreated morbidity, sickness which was self-treated or self-limiting, or undetected morbidity.

The only available morbidity statistics in Canada, i.e. those who required hospitalization, were examined. For this analysis, hospitalization due to uncomplicated deliveries of babies was set aside on the premise that this is not sickness so much as a normal part of life.

Diseases of the cardio-vascular system were by far the principal cause of hospitalization as measured by the number of hospital days, accounting for 7,600,000 hospital days out of a total of 38,600,000 in 1970, in acute general hospitals. Fractures, head injuries, burns and all other causes arising from accidents and violence accounted for 3,100,000 hospital days. For these causes of hospitalization, individual behaviour and carelessness are the principal or important underlying factors. Mental illness accounted for 2,200,000 hospital days in acute general hospitals but it also accounted for 21,200,000 patient days in psychiatric institutions in 1970.

Self-imposed Risks

The effect of self-imposed risks on these and other kinds of sickness, as well as on mortality figures, is reflected in the following grisly litany of the more destructive lifestyle habits and their consequences:

1. Drugs

(a) *alcohol addiction:* leading to cirrhosis of the liver, encephalopathy and malnutrition,

(b) *social excess of alcohol:* leading to motor vehicle accidents and obesity,

(c) *cigarette smoking:* causing chronic bronchitis, emphysema and cancer of the lung, and aggravating coronary-artery disease,

(d) *abuse of pharmaceuticals:* leading to drug dependence and drug reactions,

(e) *addiction to psychotropic drugs:* leading to suicide, homicide, malnutrition and accidents,

(f) *social use of psychotropic drugs:* leading to social withdrawal and acute anxiety attacks.

2. Diet and Exercise

(a) *over-eating:* leading to obesity and its consequences,

(b) *high-fat intake:* possibly contributing to atherosclerosis and coronary-artery disease,

(c) *high carbohydrate intake:* contributing to dental caries,

(d) *fad diets:* leading to malnutrition,

(e) *lack of exercise:* aggravating coronary-artery disease, leading to obesity and causing lack of physical fitness,

(f) *malnutrition:* leading to numerous health problems,

(g) *lack of recreation and lack of relief from work and other pressures:* associated with stress diseases such as hypertension, coronary-artery disease and peptic ulcers.

3. Others

(a) *careless driving and failure to wear seat-belts:* leading to accidents and resultant deaths and injuries,

(b) *promiscuity and carelessness:* leading to syphilis and gonorrhea.

Environmental Risks

Turning to the physical and social environment, about which the individual can do little or nothing, it is generally assumed that all known public health measures have been put into effect across our land, and that we are protected through governmental action against public health hazards. On closer examination it will be found that the application of known public health measures is both imperfect and uneven. The contamination of drinking water, as illustrated by the analyses carried out by Pollution Probe in Western Quebec and Eastern Ontario, is far more widespread than one would have thought in this day and age. Sewage from a substantial proportion of Canada's population is still poured out raw into Canada's rivers and lakes. Many large centres still do not fluoridate drinking water, in spite of the low cost and the preponderance of scientific opinion in favour of fluoridation. So contaminated are some Canadian lakes and streams that many public beaches have had to be closed down because of their threat to health.

The total effect of air pollution on the health of Canadians has not been ascertained with any precision but links have been established between air pollution and sickness. Direct cause-and-effect relationships are now being proved and measured.

Urbanization, and all its effects on physical and mental health, has not been assessed in any comprehensive way. Crowding, high-rise living, and the dearth of intensive-use recreational areas in cities are all contributors to sickness in Canada.

Working conditions, including the deadening effect of repetitive production line tasks on the human spirit, take their toll in terms of physical and mental illness. Workmen's Compensation Benefits alone cost 400 million dollars yearly.

One of the most important but least understood environmental problems is the effect of rapid social change on the mental and physical health of Canadians. Some of the social change is due to technological innovation, such as the introduction of television, but significant disorientation and alienation arise as well from the crumbling of previous social values and their replacement by others whose long-term effect is still unknown. When a society increasingly pursues private pleasure by sacrificing its obligations to the common good, it invites stresses whose effect on health can be disastrous.

Finally, on the subject of the environment, the number of economically-deprived Canadians is still high, resulting in a lack of adequate housing and insufficient or inadequate clothing.

All the foregoing environmental conditions create risks which are a far greater threat to health than any present inadequacy of the health care system.

Conclusion

When the full impact of environment and lifestyle has been assessed, and the foregoing is necessarily but a partial statement of their effect, there can be no doubt that the traditional view of equating the level of health in Canada with the availability of physicians and hospitals is inadequate. Marvellous though health care services are in Canada in comparison with many other countries, there is little doubt that future improvements in the level of health of Canadians lie mainly in improving the environment, moderating self-imposed risks and adding to our knowledge of human biology.

Chapter 3. Major Problem Areas in the Health Field

The major problem areas in the health field fall generally into two separate categories: 1) the health status of the population and 2) the problems involved in the actual organization and delivery of health care.

Health Status of the Population

Three main indicators of the health status of the population are (a) life expectancy and mortality rates, (b) causes of death and (c) morbidity.

(a) Life expectancy and Mortality Rates

Life expectancy at birth has increased significantly between 1941 and 1971, from 63.0 years to 69.4, for males and from 66.3 to 76.5 for females. The main reason is the significant drop in infant mortality, from 61 deaths per 1,000 births in 1941 to 17.5 deaths per 1,000 births in 1971.

Once a male has survived beyond childhood, however, there has been very little improvement in the number of remaining years he can expect to live. A twenty-year old male in 1941 could expect to live to 69.6 years of age, while in 1971 this had only increased to 71.8. For twenty-year old females the improvement has been more significant, from 71.8 in 1941 to 78.3 in 1971.

These figures reflect a widening gap between male and female life expectancy, whose gravity is underlined when one looks at specific statistics.

In 1971 twice as many men as women died between the ages of fifteen and seventy. The actual figures are 43,450 male deaths and 22,150 female deaths in this age group. In simple terms, death overtook two men for every woman in these prime years of life.

In 1931, women, on the average, could expect to live two years longer than men. In 1971 this difference had grown to seven years.

Turning to comparisons with other countries, there are only three nations in the world, Sweden, Norway and The Netherlands, which have a greater life expectancy for females than Canada, and the difference between Canada and the best nation is only one year. For male life expectancy, there are six countries, Sweden, Norway, The Netherlands, Denmark, Switzerland and Greece, which outperform Canada and the gap between Canada and the best nation is two and a half years.

Another analysis was made of years lost due to early death between the ages of one and seventy, using relativity at age seventy. By this definition the following comparison was obtained:

Cause	Years Lost Male	Years Lost Female
Motor Vehicle Accidents	154,000	59,000
Ischaemic Heart Disease	157,000	36,000
All Other Accidents	136,000	43,000
Respiratory Disease and Lung Cancer	90,000	50,000
Suicide	51,000	18,000
TOTAL	588,000	206,000

For these five main causes of early death, as defined, males lost almost three years of potential life for every year lost by females.

Turning next to the actual number of deaths by cause and sex, one finds that between the ages of thirty-five and seventy there were 18,400 men who died of diseases of the cardio-vascular system compared to only 7,300 women. For each sex at all ages, major differences in numbers of deaths were also found in the following selected categories for 1971.*

*More complete mortality statistics are shown in the ensuing table.

Cause	Deaths Male	Deaths Female
1. SPECIFIC ACCIDENTS		
(a) Automobile Accidents	4,100	1,600
(b) Other Transport Accidents	500	70
(c) Industrial Accidents	700	55
(d) Accidental Drownings	600	150
2. LUNG CANCER	4,600	800
3. BRONCHITIS, EMPHYSEMA AND ASTHMA	2,800	700
4. SUICIDE	1,900	700
5. CIRRHOSIS OF THE LIVER	1,300	650

From the foregoing analysis, there is no doubt that Canada has a male mortality problem of great significance.

As already noted, life expectancy is much influenced by changes in the infant mortality rate and most of the improvement in Canadian life expectancy can be attributed to a reduction in the infant mortality rate from 102.0 deaths per 1,000 live births in 1921 to 17.5 in 1971. While Canada's performance has been outstanding, it still falls well below that of Sweden with a rate of 11.0 per 1,000 live births. What offers hope for improvement is the difference in infant mortality rates between certain socio-geographic segments of the Canadian population. By attacking the problem among high-risk populations, improvements can still be made. At the same time one must keep the importance of infant deaths in perspective. Of 157,300 deaths in 1971, only 6,400 occurred before age one and of these many are due to congenital anomalies about which little can be done after a baby is born.

(b) Causes of death

The graphic at Annex A provides a vivid picture of the major causes of death for each sex and age group in 1971. It highlights the fact that the importance of each cause of death varies according to sex and age group. Noticeable immediately is the tremendous importance of motor vehicle accidents and all other accidents, which account for large percentages of death in young males between the ages of five and forty and in females between five and thirty. Suicide is an

important cause of death in males and females as young as fifteen years. Coronary-artery disease becomes and remains the major cause of death in males from age forty on, and in females from age fifty on. Cancer strikes at most ages, but at a much earlier age among women. Deaths due to respiratory diseases and lung cancer are important in men over fifty years. Cirrhosis of the liver appears as a major cause of death in males between the ages of forty and fifty.

An overall view of the major causes of death at all ages, with predominant ages for each, is as follows:

Major Causes of Mortality (1971)	No. of Deaths	% of All Deaths	Predominant Ages
Ischaemic heart disease	48,975	31.1%	40 and over
Cerebrovascular disease	16,067	10.2%	Age 65 and over
Respiratory diseases and lung cancer	15,677	10.0%	Under 1 year and 55 and over
Motor Vehicle and all other accidents	12,031	7.6%	All ages
Cancer of the gastro-intestinal tract	7,947	5.1%	50 and over
Cancer of the breast, uterus and ovary	4,816	3.1%	40 and over
Diseases specific to the newborn	3,299	2.1%	Under 1 week
Suicide	2,559	1.6%	15 to 65
Congenital anomalies	1,967	1.3%	Under 1 year
TOTAL	113,338	72.1%	
ALL DEATHS	157,272	100.0%	

It will be noted that the major causes of death are now chronic illnesses and accidents, with relatively few due to infectious diseases. This is a drastic change from the situation around the turn of the century when the major causes of death were primarily, or related to, infectious diseases such as influenza, pneumonia,

tuberculosis, gastro-enteritis, chronic nephritis and diptheria. These diseases have largely been brought under control, and the only ones which remain major problems of mortality are influenza and pneumonia, and certain diseases of early infancy. Whereas the major problems of the past were acute illnesses, which have a fairly abrupt onset and a finite duration, the major problems now are chronic illnesses, which have a gradual onset and an indefinite duration (see Chapter 10), and accidents.

(c) Morbidity

With regard to the incidence and causes of illness, the available information is more limited and less reliable than it is on mortality. In order to have key indicators of health, it would be necessary to have a measure of ill-health in the population, including the whole range of disabilities from the severe conditions that often require hospitalization and medical treatment to the minor ailments and mild chronic conditions. However, the only Canadian data that are current relate to illness treated in hospitals, and to certain contagious diseases which must be reported by physicians to public health authorities.

Looking at acute treatment hospital morbidity, measured by *the number of hospital days,* one finds that diseases of the cardio-vascular system, injuries due to accidents, respiratory diseases and mental illness, in that order, are the four principal causes of hospitalization, accounting for some 45% of all hospital days.

By another measure, *the number of hospital admissions,* diseases of the respiratory system come first, followed by child-birth, diseases of the digestive system, diseases of the genito-urinary system, diseases of the cardio-vascular system and accidents.

The difference between the two rankings is due to the fact that one measures the number of hospital days while the other measures the number of admissions. Since hospital stays, on the average, are longest for cardio-vascular disease and accidents, these are more prominent in the ranking by hospital days.

Hospital morbidity, like mortality, is of limited use in assessing the general level of health of the population because it reflects only the severe cases, i.e. those requiring hospitalization. Furthermore, if one makes year-to-year comparisons, it is necessary to take into account factors other than the rate of sickness, such as the effect of prepayment of hospital and medical care and of more sophisticated diagnostic techniques. These factors are difficult to measure at present.

What is really needed is a measure of the prevalence of ill-health in the population, counting not only mortality and hospital morbidity, but illness treated by health professionals outside hospital, illnesses which are self-treated or self-

limiting, undetected morbidity, and a count of the chronically disabled. Only when this comprehensive view is obtained will it be possible to ascertain the level of health and to identify year-to-year changes. Conceptual and technical problems need to be resolved before this comprehensive view is obtained, and substantial funds would have to be made available for surveys of the population and for the establishment of useful data series.

To operate most effectively in regulating dangerous products there is a need for accurate, comprehensive knowledge of the causes of accidents and for the identification of the products, if any, involved. This points to the need for a broadly-based, well-designed statistical system for reporting accidents.

One of the ironies of obtaining and analysing health data is that it is so difficult to act upon the conclusions reached. Taking coronary-artery disease as an example, one finds that it is the major killer and the major cause of hospital days. Contributing factors are well known and include genetic inheritance, the relative absence of estrogenic hormones in men, smoking, obesity, high-fat diets, high serum cholesterol, lack of exercise and stress as well as such morbid conditions as atherosclerosis, diabetes and high blood pressure. Yet, when one looks for programs aimed at reducing the prevalence of coronary-artery disease through an abatement of known contributing factors, one finds that they are weak or non-existent.

Deaths and injuries due to automobile accidents could probably be reduced by 50% if everyone wore seat-belts, and if stricter measures were taken to reduce the number of impaired drivers. In spite of this knowledge the rate of seat-belt wearing stays at about 10% and alcohol continues to be a factor in half the traffic accidents.

Cigarette smoking contributes heavily to respiratory disease and lung cancer. Educational campaigns have succeeded in reducing the number of smokers in the twenty years-and-over bracket from fifty-eight per hundred to fifty per hundred but the recruitment of new smokers among teenagers has increased alarmingly, especially among teen-age girls.

Some 40% of all alcoholic beverages in Canada are purchased by but 7% of the drinking population, the alcohol abusers. At December 31, 1969, there were sixty-seven children under the age of fifteen with a diagnosis of alcoholism in Canadian mental hospitals. One-quarter of all first male admissions to psychiatric hospitals are due to alcoholism, and the heavy contribution of alcohol abuse to motor vehicle accidents, poisonings, accidental fire deaths, cirrhosis of the liver and falls has been ascertained. Absenteeism due to alcohol abuse costs a million dollars a day to Canadian industry[5]. Yet the control and treatment of alcohol abuse in Canada is fragmented and weak.

The lack of physical fitness of the Canadian population has been measured and one criterion, the capacity to use oxygen efficiently, indicates that Canadians are not as fit as citizens of some European countries.

A study in 1972 showed that 76% of Canada's population over age thirteen spend less than one hour a week participating in a sport, and that 79% have less than one hour per week in other physical activity such as walking. This same survey shows that 84% of the population over age thirteen watches four or more hours a week of television. Some 36% watch in excess of fifteen hours a week. This pattern of living, dominated by sedentary living, explains why so few Canadians are fit.

Accurate statistics on the incidence of gonorrhea and syphilis are hard to come by but those that are reported indicate that venereal disease is again reaching epidemic proportions. Efforts to combat this health problem are at best of uneven effectiveness.

The common dental diseases of caries, periodontal disease and malocclusion are not dramatic but in terms of numbers of people affected they constitute one of the greatest public health problems in Canada. Almost 60% of Canadians appear to receive little or no dental care, and yet few dentists are in a position to accept more patients. A greater number of dental auxiliaries is needed, to relieve dentists of the more routine procedures.

It is estimated that about half the burden of illness is psychological in origin and this proportion is growing. An indication of the seriousness of the problem can be seen from the following facts: one-third of all hospital beds and hospital days are for mental care patients; three out of 1,000 Canadians are hospitalized in psychiatric institutions at any given time; between 5% and 10% of school children suffer from mental or learning disorders; there is a significant increase in alcoholism and drug addiction, homicide and suicide, crime, anxiety neuroses and depressive psychoses. And yet mental health, as opposed to physical health, has been a neglected area for years; unfortunately there is still a social stigma attached to mental illness.

When one looks at the foregoing major health problems of Canada and their underlying causes it is obvious that we are failing to act on the information we already have.

The health care system, for all its facilities and for all the numbers, training and dedication of its health professionals, still tends to regard the human body as a biological machine which can be kept in running order by removing or replacing defective parts, or by clearing its clogged lines. The medical solution to health problems, while an extremely important aspect of health, is only one of

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many aspects revealed by an examination of the underlying causes of sickness and death.

If government is, at least in part, a mirror of the people's collective will, then the people collectively must accept the blame for any causes of sickness arising from the deterioration that has taken place in the environment.

In addition to the health care system and the people collectively, individual blame must be accepted by many for the deleterious effect on health of their respective lifestyles. Sedentary living, smoking, over-eating, driving while impaired by alcohol, drug abuse and failure to wear seat-belts are among the many contributors to physical or mental illness for which the individual must accept some responsibility and for which he should seek correction.

Finally, the medical research community, with its emphasis on human biology, must continue to evaluate the direction of its research in terms of the country's major health problems and of the gaps in knowledge that need to be closed if those problems are to be solved. Balancing the need to respect the independence of the researcher with the need to relate research to health problems is a question of continuing debate; it is true, however, that the research community could pursue with more vigour the application of new knowledge in the environment, lifestyle and health care sectors.

This section on Canada's health status dwells necessarily on the problems which still face the country and because of this tends to project a picture that is gloomier than is actually the case. By comparison both with its past history and with other countries, Canada has much to be proud of, and thankful for. This is no less true in the health field than it is in other areas of social progress.

Problems in the Organization and Delivery of Health Care

With the introduction of universal pre-paid medical and hospital care, Canadian provinces, with federal financial assistance, have substantially eliminated the spectre of catastrophic medical and hospital bills. Various measures are also in effect to help pay for other services, including special assistance to the needy.

There are three overall indicators of the level of health services: the ratio of various health professions to the total population, the ratio of treatment facilities to the population, and the extent of pre-paid coverage.

The following table shows how Canada compares with other countries in some of these respects. The actual years for which statistics are shown vary slightly according to the availability of the most recent figures.

Country	% covered by Medical and Hospital Insurance	No. of Hosp. beds per 10,000 Population	No of Physicians per 10,000 Population	No. of Nurses per 10,000 Population
Australia	79% (hosp.) 75% (Med.)	117.4	11.8	66.6
Canada	Almost 100%	102.3	15.7	57.3
Denmark	96.7%	89.4	14.5	53.4
Sweden	Almost 100%	145.8	12.4	43.7
United Kingdom	Almost 100%	111.4	12.5	35.1
United States	85% (Hosp.) 65% (Reg. Med.) 35% (Maj. Med.)	82.7	15.3	49.2

In hospital and medical insurance coverage Canada equals the best of the five countries chosen for comparison; it leads in respect of physicians, is in the middle rank in respect of hospital beds, and is second only to Australia in nurses. Since the countries chosen are among those with the best health care services in the world, there is no doubt that, by the four measures used in the table, Canada is among the world leaders.

Canada's national health expenditures, including personal health care,* in 1971, were as follows:

	As % of G.N.P.	As % of Personal Income	Per Capita Annual Expenditures
Canada	7.1	9.0	306.11

These figures reflect total health expenditures. For that part which comprised personal health care only, the per capita cost in Canada was $271.72, or about $1100 for a family of four. This is a substantial sum by any measure, even if most of the costs were met by insurance.

* Personal health care consists of services received by individuals and provided by hospitals, physicians, nurses, dentists, pharmacists, etc.

In spite of the great strides made in recent years, there are a number of difficult problems facing those with responsibilities for providing health care services:

1. The annual rate of cost escalation has been between 12% and 16%, which is far in excess of the economic growth of the country; if unchecked, health care costs will soon be beyond the capacity of society to finance them.

2. The past twenty years have seen an emphasis on the construction of hospitals and not enough on other needed health care facilities. As a result, Canada now finds itself with an excess of expensive acute care beds, coupled with a shortage of alternative treatment, convalescent and custodial care facilities and increasing pressure on hospital emergency services.

3. Medical services are not yet equally accessible to all segments of the population because health manpower tends to concentrate in cities and is not attracted to rural or isolated locations.

4. Dental services are not equally accessible to all segments of the population, mainly because of the cost to the patient of dental care, a shortage of dental professionals, as well as a maldistribution of available dental manpower.

5. Present organizational arrangements for providing health care services could be improved to more satisfactorily meet the needs of the population.

6. Over the years, a large proportion of Canada's needs for physicians have been met by the immigration of personnel from foreign countries. Over the decade 1961-1971, the average annual number of immigrant physicians was 914. During the same decade, an average of 919 students graduated each year from Canadian medical schools. This reflects a problem of dependency on other countries for physician supply.

7. Certain sectors of the population have special health problems, due to a number of factors such as mode of living and isolation; they require supplementary services which must be provided at higher than average cost.

8. There is a lack of a uniform and integrated system for maintaining health records of individuals; essential data are scattered in many locations: in physician's offices, hospital records, clinics, etc.

9. Health manpower planning is difficult because of interprovincial mobility, immigration and emigration.

10. Present cost-sharing arrangements between the federal and provincial governments tend to encourage the use of physicians and acute treatment hospitals, even for services which could be adequately provided through less costly means.

11. Improved ambulatory health centres, with round-the-clock, comprehensive out-patient care are needed in order that accessibility of care will not be dependent on the individual availability of physicians.

12. Regional health authorities with the power to plan and manage the health care requirements of a given geographical area are needed.

The foregoing problems in the provision of health care services are principally the concern of provincial governments, who are charged with ensuring that adequate health care is available at a cost that can be afforded.

Conflicting Goals in the Health Care System

Some of the problems of providing and financing health care within reasonable limits arise from attempts to meet conflicting goals.

On the one hand, it is a goal to make physician services equally accessible to everyone; on the other hand, it is also a goal to permit physicians to practise where they wish. The result is that physicians are maldistributed among provinces and between urban and rural areas. At the two extremes, British Columbia, in 1971, had one physician for every 603 citizens while Prince Edward Island had one physician for 1143 citizens. Ontario had one to 616 in 1971 and calculated that by the end of 1973 it had one physician for less than 600 citizens, in spite of the fact that there is no evidence to suggest that the standard of health care is improved when the ratio of 1 to 600-650 is exceeded.

A second set of conflicting goals consists of trying to control costs while removing all incentives to patients, physicians and hospitals to do so. The existence of a generous supply of hospital beds and of increasing numbers of physicians makes it easy for patients to seek care even for minor conditions and for physicians to hospitalize more patients, particularly when there are no financial barriers. Thus the goal of ready access to health care services, both physical and financial, conflicts with the goal of controlling costs.

A third set of conflicting goals consists of providing a balanced supply of the various medical specialties while permitting physicians to select their fields of special training. The shortage of physicians specializing in rehabilitation medicine and in the care of the aged is evidence that mechanisms are needed to reconcile these two goals.

Fourth, health care administrators would like to see services provided by staff trained only to the level of skill needed for the task performed. However, the present licensing patterns for health professionals as well as the fee-for-service system, coupled with the principle that the physician or dentist alone

bears responsibility for his patient, encourages the practice of physicians and dentists carrying out tasks which could be done by others, as well or better, and often at a lower cost. In the Canadian North the role of the nurse has been expanded along these lines with great success. Similarly, the Government of Saskatchewan has successfully implemented a dental care system for school children in which a major part of the work is done by dental health professionals other than dentists, according to protocols established by dentists and under their overall supervision.

Finally, there is the paradox of everyone agreeing to the importance of research and prevention yet continuing to increase disproportionately the amount of money spent on treating existing illness. Public demand for treatment services assures these services of financial resources. No such public demand exists for research and preventive measures. As a consequence, resources allocated for research, teaching and prevention are generally insufficient.

It would appear that steps need to be taken to reconcile the foregoing, and other conflicting goals and principles, while retaining all that is necessary to properly reward health manpower, control costs and ensure accessibility to quality service.

Chapter 4. The Health Field Concept

A basic problem in analysing the health field has been the absence of an agreed conceptual framework for sub-dividing it into its principal elements. Without such a framework, it has been difficult to communicate properly or to break up the field into manageable segments which are amenable to analysis and evaluation. It was felt keenly that there was a need to organize the thousands of pieces into an orderly pattern that was both intellectually acceptable and sufficiently simple to permit a quick location, in the pattern, of almost any idea, problem or activity related to health: a sort of map of the health territory.

Such a Health Field Concept[6] was developed during the preparation of this paper and it envisages that the health field can be broken up into four broad elements: HUMAN BIOLOGY, ENVIRONMENT, LIFESTYLE and HEALTH CARE ORGANIZATION. These four elements were identified through an examination of the causes and underlying factors of sickness and death in Canada, and from an assessment of the parts the elements play in affecting the level of health in Canada.

Human Biology

The HUMAN BIOLOGY element includes all those aspects of health, both physical and mental, which are developed within the human body as a consequence of the basic biology of man and the organic make-up of the individual. This element includes the genetic inheritance of the individual, the processes of maturation and aging, and the many complex internal systems in the body, such as skeletal, nervous, muscular, cardio-vascular, endocrine, digestive and so on. The human body being such a complicated organism, the health implications of human biology are numerous, varied and serious, and the things that can go wrong with it are legion. This element contributes to all kinds of ill health and mortality, including many chronic diseases (such as arthritis, diabetes, atherosclerosis, cancer) and others (genetic disorders, congenital malformation, mental retardation). Health problems originating from human biology are causing untold miseries and costing billions of dollars in treatment services.

Environment

The ENVIRONMENT category includes all those matters related to health which are external to the human body and over which the individual has little or no control. Individuals cannot, by themselves, ensure that foods, drugs, cosmetics, devices, water supply, etc. are safe and uncontaminated; that the health hazards of air, water and noise pollution are controlled; that the spread of communicable diseases is prevented; that effective garbage and sewage disposal is carried out; and that the social environment, including the rapid changes in it, do not have harmful effects on health.

Lifestyle

The LIFESTYLE category, in the Health Field Concept, consists of the aggregation of decisions by individuals which affect their health and over which they more or less have control. The importance of the LIFESTYLE category has already been elaborated on in the section on *The Limitations of the Traditional View.* Personal decisions and habits that are bad, from a health point of view, create self-imposed risks. When those risks result in illness or death, the victim's lifestyle can be said to have contributed to, or caused, his own illness or death.

Health Care Organization

The fourth category in the Concept is HEALTH CARE ORGANIZATION, which consists of the quantity, quality, arrangement, nature and relationships of people and resources in the provision of health care. It includes medical practice, nursing, hospitals, nursing homes, medical drugs, public and community health care services, ambulances, dental treatment and other health services such as optometry, chiropractics and podiatry. This fourth element is what is generally defined as the health care system.

Until now most of society's efforts to improve health, and the bulk of direct health expenditures, have been focused on the HEALTH CARE ORGANIZATION. Yet, when we identify the present main causes of sickness and death in Canada, we find that they are rooted in the other three elements of the Concept: HUMAN BIOLOGY, ENVIRONMENT and LIFESTYLE. It is apparent, therefore, that vast sums are being spent treating diseases that could have been prevented in the first place. Greater attention to the first three conceptual elements is needed if we are to continue to reduce disability and early death.

Characteristics of the Health Field Concept

The HEALTH FIELD CONCEPT has many characteristics which make it a powerful tool for analysing health problems, determining the health needs of Canadians and choosing the means by which those needs can be met.

One of the evident consequences of the Health Field Concept has been to raise HUMAN BIOLOGY, ENVIRONMENT and LIFESTYLE to a level of categorical importance equal to that of HEALTH CARE ORGANIZATION. This, in itself, is a radical step in view of the clear pre-eminence that HEALTH CARE ORGANIZATION has had in past concepts of the health field.

A second attribute of the Concept is that it is comprehensive. Any health problem can be traced to one, or a combination of the four elements. This comprehensiveness is important because it ensures that all aspects of health will be given due consideration and that all who contribute to health, individually and collectively, patient, physician, scientist and government, are aware of their roles and their influence on the level of health.

A third feature is that the Concept permits a system of analysis by which any question can be examined under the four elements in order to assess their relative significance and interaction. For example, the underlying causes of death from traffic accidents can be found to be due mainly to risks taken by individuals, with lesser importance given to the design of cars and roads, and to the availability of emergency treatment; human biology has little or no significance in this area. In order of importance, therefore, LIFESTYLE, ENVIRONMENT and HEALTH CARE ORGANIZATION contribute to traffic deaths in the proportions of something like 75%, 20% and 5% respectively. This analysis permits program planners to focus their attention on the most important contributing factors. Similar assessments of the relative importance of contributing factors can be made for many other health problems.

A fourth feature of the Concept is that it permits a further sub-division of factors. Again for traffic deaths in the Lifestyle category, the risks taken by individuals can be classed under impaired driving, carelessness, failure to wear seat-belts and speeding. In many ways the Concept thus provides a road map which shows the most direct links between health problems, and their underlying causes, and the relative importance of various contributing factors.

Finally, the Health Field Concept provides a new perspective on health, a perspective which frees creative minds for the recognition and exploration of hitherto neglected fields. The importance on their own health of the behaviour and habits of individual Canadians is an example of the kind of conclusion that is obtainable by using the Health Field Concept as an analytical tool.

One of the main problems in improving the health of Canadians is that the essential power to do so is widely dispersed among individual citizens, governments, health professions and institutions. This fragmentation of responsibility has sometimes led to imbalanced approaches, with each participant in the health field pursuing solutions only within his area of interest. Under the Health Field

Concept, the fragments are brought together into a unified whole which permits everyone to see the importance of all factors, including those which are the responsibility of others.

This unified view of the health field may well turn out to be one of the Concept's main contributions to progress in improving the level of health.

Chapter 5. Issues Arising From the Use of the Health Field Concept

The Concept was designed with two aims in view: to provide a greater understanding of what contributes to sickness and death, and to facilitate the identification of courses of action that might be taken to improve health.

The Concept is *not* an organizational framework for structuring programs and activities, and for establishing lines of command. The rigid allocation of problems and activities to one or another of the four elements of the Concept would be contrary to reality and would perpetuate the present fragmentary approach to solving health problems. For example, the problem of drug abuse needs attention by researchers in human biology, by behavioural scientists, by those who administer drug laws and by those who provide personal health care. Contributions are needed from all of these and it would be a misuse of the Health Field Concept to exploit it as a basis for capturing all aspects of a problem for one particular unit of organization or interest group.

A second practical problem is the perennial one of federal-provincial jurisdictional boundaries in the health field. Since the Concept was intended to cover the whole health field without regard to jurisdiction, and since there are very real limits on federal powers, the argument could be made that we were looking at matters which had no history of federal concern or authority. The only answer here, of course, is that the right questions must be posed about the health field before a determination can be made of legitimate federal responses.

A third issue, more theoretical, was whether or not it was possible to divide external influences on health between the environment, about which the individual can do little, and lifestyle, in which he can make choices. Particularly cogent were arguments that personal choices were dictated by environmental factors, such as the peer-group pressures to start smoking cigarettes during the teens. Further, it was argued that some bad personal habits were so ingrained as to constitute addictions which, by definition, no longer permitted a choice by a

simple act of will. Smoking, alcohol abuse and drug abuse were some of the lifestyle problems referred to in this vein.

The fact that there is some truth in both hypotheses, i.e. that environment affects lifestyle and that some personal habits are addictive, requires a philosophical and moral response rather than a purely intellectual one. This response is, that if we simply give up on individuals whose lifestyles create excessive risks to their health, we will be abandoning a number who could have changed, and will be perpetuating the very environment which influenced them adversely in the first place. In short the deterministic view must be put aside in favour of faith in the power of free will, hobbled as this power may be at times by environment and addiction.

One point on which no quarter can be given is that difficulties in categorizing the contributing factors to a given health problem are no excuse for putting the problem aside; the problem does not disappear because of difficulties in fitting it nicely into a conceptual framework.

Another issue is whether or not the Concept will be used to carry too much of an analytical workload by demanding that it serve both to identify requirements for health and to determine the mechanisms for meeting them. Although the Concept will help bring out the problems and their causes, and even point to the avenues by which they can be solved, it cannot determine the precise steps that are needed to implement programs. Decisions as to programs are affected by so many other considerations that they will require the analysis of many practical factors outside the Concept proper.

The ultimate philosophical issue raised by the Concept is whether, and to what extent, government can get into the business of modifying human behaviour, even if it does so to improve health. The marketing of social change is a new field which applies the marketing techniques of the business world to getting people to change their behaviour, i.e. eating habits, exercise habits, smoking habits, driving habits, etc. It is argued by some that proficiency in social marketing would inevitably lead government into all kinds of undesirable thought control and propaganda. The dangers of governmental proficiency in social marketing are recognized but so are the evident abuses resulting from all other kinds of marketing. If the siren song of coloured television, for example, is creating an indolent and passive use of leisure time, has the government not the duty to counteract its effects by marketing programs aimed at promoting physical recreation? As previously mentioned, in Canada some 76% of the population over age 13 devotes less than one hour a week to participation in sports while 84% of the same population spends four or more hours weekly watching television. This kind of imbalance extends to the amount of money being spent by the private sector on marketing products and services, some of which if abused, contribute

to sickness and death. One must inevitably conclude that society, through government, owes it to itself to develop protective marketing techniques to counteract those abuses.

Finally, some have questioned whether an increased emphasis on human biology, environment and lifestyle will not lead to a diminution of attention to the system of personal health care. This issue is raised particularly by those whose activities are centred on the health care organization. On this issue it can be said, first of all, that Canadians would not tolerate a reduction in personal health care and are in fact pushing very hard to make service more accessible and more comprehensive. In response to this demand, several Canadian Provinces have extended insured health care services beyond those whose cost is shared by the Federal Government. These extensions will no doubt continue.

More important, if the incidence of sickness can be reduced by prevention then the cost of present services will go down, or at least the rate of increase will diminish. This will make money available to extend health insurance to more and more services and to provide needed facilities, such as ambulatory care centres and extended care institutions. To a considerable extent, therefore, the increased availability of health care services to Canadians depends upon the success that can be achieved in preventing illness through measures taken in human biology, environment and lifestyle.

In this section some practical, theoretical and philosophical issues arising out of the Health Field Concept have been sketched out. No doubt other problems, including those of analytical methodology, will be encountered but as long as the ultimate goal is kept in mind, which is to increase the average number of disability-free days in the lives of Canadians, these difficulties can be overcome.

Chapter 6. Populations At Risk

An average is a useful indicator of a general condition but it usually contains such a wide range of values that it is of very limited use in the identification and solution of problems.

Life expectancy at birth in 1971 was 73 years but included in this average were deaths at age one week and deaths at age one hundred years. Similarly, wide ranges of values can be found in Canada's infant mortality rate of 17.5 deaths per 1,000 live births. Included are rates as low as 11 per 1,000 in a wealthy Canadian suburb and as high as 40 per 1,000 in the Canadian northlands.

The average consumption of absolute alcohol is 2.6 gallons a year per drinking adult (the drinking population represent some 80% of the total adult population, aged 15 or over). Converted into beverages, and distributed among these beverages according to national drinking patterns, this represents 33 dozens of beer, *plus* 14 bottles of table wine *plus* 13 26-oz. bottles of spirits.

It has been estimated that some 7% of the total drinking population purchase 40% of all alcohol sold; this amounts to an average of 15 gallons of absolute alcohol for each individual within this 7%. Again distributed according to national drinking patterns this is equal to 190 dozens of beer, *plus* 77 bottles of table wine, *plus* 76 bottles of spirits for each of these individuals per year.

On the other hand, 93% of the drinking population purchase 60% of all alcohol sold, which amounts to an average of 1.7 gallons a year only.

For every statistical average reflecting a condition in the health field, or in any social field for that matter, there are a number of "populations" which contribute very unevenly to the average. Average annual income is a glaring example of an economic indicator which, if taken at face value, would conceal the wide spread in numbers and incomes between the poor and the rich.

In order to improve the health conditions underlying a particular average, it is therefore necessary to sub-divide the contributing "population" so that attention can be focused on that part of the population which is making the greatest adverse contribution to the average. This segment of the total population we call a "population at risk".

When a population at risk is identified, it is necessary to spell out the characteristics of its profile, so that risk factors can be assessed. Males between 40 and 70 years of age, for example, are particularly susceptible to death from coronary-artery disease. Within this population the typical high-risk profile would be of an obese man who gets little or no exercise, ingests excessive amounts of animal fats, smokes cigarettes, drinks a lot of coffee and works in a high-pressure job. Men such as these are "candidates for coronaries".

"Risk" is a statistical term which is expressed in percentages or odds. Thus a man with the many high-risk characteristics outlined in the previous paragraph increases the odds that he will die from a heart attack before reaching age seventy. He will not *necessarily* die from a heart attack and in fact may live to be eighty years old, but his chances of doing so are small by comparison with someone who has a low-risk profile. Inevitably, when the subject of risk is raised, someone will cite a particular case as proof that the theory of risk is invalid; Winston Churchill is most often cited as a man with high-risk characteristics who outlived many of his low-risk contemporaries. At the opposite end of the spectrum, one can always find a skinny, non-smoking jogger who dropped dead at age forty-five. These illustrations reflect the logical fallacy of arguing from the particular to the general, and it is a matter of constant surprise that they are given so often.

In dealing with risk one does not profess to make predictions about individuals but about the likelihood of an event occurring in a population of given characteristics. At the expense of labouring a simple point, it is essential that the concept of risk be understood because the application of the Health Field Concept depends on it.

Populations at risk are obtained through an analytical process which matches up three kinds of information: causes of mortality and kinds of morbidity, underlying reasons for their occurrence, and susceptible segments of the population. The analytical process is not a particularly complicated one. In its simplest form, it can be illustrated by the occurence of Downs' Syndrome (mongoloidism) in new-born children. The *morbidity* is Downs' Syndrome; the *underlying cause* is a defective chromosome; and the *population at risk* are the unborn children of pregnant women over age forty.

In a more complicated form, the process of identifying a population at risk would be as follows: *mortality* from coronary-artery disease; *predisposing morbid condition:* atherosclerosis; *contributing factors:* high serum lipids, hypertension and diabetes, obesity, high-fat diet, lack of exercise, stress, relative absence of estrogens, cigarette smoking; *population at risk:* males over forty with foregoing conditions or habits.

Traditional medicine, as is proper, will tend to concern itself with treating the mortality-morbidity end of the spectrum while the course of action suggested

by the Health Field Concept would be to focus on reducing the contributing factors in the population at risk, once that population had been identified.

Although the example used, coronary-artery disease, dwells particularly on causes which fall under the LIFESTYLE category, the technique is not limited to use for this category. There may be populations at risk due to biological factors such as high blood pressure, or aging, or due to environmental factors such as air pollution or urbanization, or due to deficiencies in the way health care is or is not made available, such as the availability of physicians in rural and remote areas. In every case, however, the target is the high-risk population as opposed to the episode of individual illness, and the aim is to reduce the risks in that population.

The multiplier effect of risk-reduction is its outstanding positive feature. For example, while an elegant heart transplant might prolong one life for two years, the risk-reduction that could be obtained from achieving even a 50% rate of wearing seat-belts would save seven hundred traffic deaths a year.

The identification of high-risk populations as targets for national risk-reduction programs depends on a number of factors including the gravity and incidence of various kinds of sickness and death, the availability of practical measures, and the costs.

Some high-risk populations are readily identifiable, such as the "candidates for coronaries" already described. Other obvious high-risk populations are drinking drivers, cigarette smokers, abusers of alcohol, very fat people, drivers who do not use seat-belts, and people who live in remote areas where medical and other social services are not readily accessible.

Some populations at risk, however, can only be identified by subtle analysis and insight. For example, when one measures the incidence of sickness and death among children aged 5 to 14, one finds that it is the lowest of any age group. Of the 157,300 deaths from all causes recorded in 1971, only 2,000 occurred in this age group. At first glance it would therefore appear that the 5 to 14 age group was a very low risk population.

Penetrating to one more level of analysis, however, it will be found that these years are critical in the formation of habits and attitudes which are important to health, often for a lifetime. Decisions made by adolescents include whether or not to start smoking, to use drugs and alcohol, to follow a pattern of sedentary living or of physical recreation, to eat wisely, or to drive carefully. In respect of these choices, the pre-adolescents are a "threshold" population which will shortly be taking decisions that will determine whether they will become high-risk or low-risk individuals in later life. To neglect the health education of the 5 to 14 age group on the grounds that sickness and death rates for it are low, would be a serious error.

Digging down to even one more level of analysis, one could identify, within a general population aged 5 to 14, certain individuals whose behaviour is not only negative as it affects themselves but who also exercise a strong influence on their susceptible acquaintances. The phenomenon of adolescents adopting the values and habits of rebellious peers, rather than the values of society in general or those of their parents, is not new but the scale on which it is now happening is truly alarming. In a recent paper on adolescent cigarette smoking in the United States,[7] John A. Tamerin points out that the percentage of boys and girls aged 13 to 19 who smoked cigarettes regularly had grown from 14.7% to 18.5% for boys, and from 8.4% to 11.9% for girls, during the two years from 1968 to 1970, in spite of all the propaganda that has been made in schools and on television about the dangers of smoking. This trend is also evident in Canada where, between 1965 and 1972, the percentage of female smokers in the 15 to 19 age group grew from 22.2% to 33.0%.

In explaining the psycho-social determinants of teen-age smoking, Dr. Tamerin found that peer smoking practices were by far the best predictor of adolescent smoking. He also points out the prevalence, among teen-age smokers, of such attitudes as wanting to be older than they are, of rebelliousness against authority and social norms, of impulsivity and risk-taking, and of poor academic performance. He also found that these same underlying attitudes could be found among teen-age abusers of alcohol and drugs.

There is no doubt, therefore, that there is a readily identifiable sub-group within the age class 5 to 14 who are not only themselves at high-risk but who pull many others along with them. This sub-group may well be a target population of the first order, even though this would not be perceptible on the basis, alone, of the incidence of sickness and death.

In addition to populations at risk there are many people who are ill but whose health care needs, for one reason or another, are not being adequately met. For these persons, who have gone beyond risk to actual illness, a principal cause of neglect is that their conditions often do not lend themselves readily to cure, and they therefore do not satisfy the healing instincts on which the health care system thrives. The disabled, the chronically ill, the retarded, the mentally ill and the aged, to name only a few, exist in large numbers and will increase as medicine conquers causes of acute illness and early death. The care of these patients is a substantial and increasing proportion of the medical task.[8]

If the needs of these populations are to be met, the values of the health care system will have to be changed. "Care" will have to be raised to the same level of importance as "cure" before sufficient attention is paid to the needs of many populations with chronic or intractable illnesses. (see Chapter 10)

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In this section, on populations at risk, it is proposed that programs are needed which will reduce risk factors among high-risk populations; it is also proposed that more attention is needed to providing care for populations whose afflictions do not lend themselves to ready cure. In both cases the target is a particular part of the overall population, rather than the individual episode of sickness.

Chapter 7. Constitutional Powers and the Present Federal Role

Any comprehensive review of health activities and policies must, of course, take into full account the division of powers under the Canadian Constitution. This section will outline the general constitutional framework within which federal interventions in health matters must be viewed, and the present nature of those interventions.

Governmental involvement in health care services in 1867, at Confederation, was minimal. For the most part, the individual was compelled to rely on his own resources and those of his family group, and hospitals were administered and financed by private charities and religious organizations.

Since the role of the State was so modest, the subject of health could not be expected to claim an important place in the discussions leading up to Confederation, nor in the British North America Act, because the Fathers of Confederation could not have foreseen the pervasive growth and range of health care needs of a large industrialized urban society, the advances of medical science, nor the public expenditures required to maintain high quality health care.

The only specific references to health matters in the distribution of legislative powers under the British North America Act are to allocate to the Federal Parliament jurisdiction over quarantine and the establishment and maintenance of marine hospitals, and to Provincial Legislatures jurisdiction over "the establishment, maintenance and management of hospitals, asylums, charities and eleemosynary (charitable) institutions in and for the Province, other than marine hospitals". In the context of the circumstances existing in 1867, this latter reference probably was meant to cover most health care services. Furthermore, since the Provinces were assigned jurisdiction over "generally all matters of a merely local or private nature in the Province", it is probable that this power was deemed to cover health care, while the Provincial power over "municipal institutions" provided a convenient means for dealing with such matters. The provision of health care services has, therefore, traditionally been acknowledged as primarily a provincial responsibility.

Nevertheless, there is a measure of federal responsibility in health matters which has been expressed over the years in many policies and programs of the Federal Government. These areas are:

1. Quarantine and the Establishment and Maintenance of Marine Hospitals.

This power is assigned to the Federal Parliament under Section 91(11) of the British North America Act. Medical, nursing and sanitation staff are provided at most ports and airports, in order to protect the population against entry into Canada of quarantinable diseases and reduce the incidence of health hazards by common carriers.

2. Indians, and Lands Reserved for Indians.

This power, assigned to the Federal Parliament under Section 91(24) of the British North America Act, has enabled the Federal Government to provide health services to Indians. However, federal legislation in this regard does not stand in the way of provincial laws relating to health services being applicable to Indians in common with other residents of a Province.

3. Yukon and Northwest Territories.

A constitutional amendment, the British North America Act 1871, stated that "the Parliament of Canada may from time to time make provision for the administration, peace, order, and good government of any territory not for the time being included in any Province". This has enabled the Federal Government to provide health services for the population of the Yukon and Northwest Territories.

4. Criminal Law.

Section 91(27) of the British North America Act assigns to the Federal Parliament jurisdiction over "the Criminal Law, except the Constitution of Courts of Criminal Jurisdiction, but including the Procedure in Criminal Matters". This power has been invoked by the Federal Government to support prohibitory enactments aimed at protecting public health, such as the Food and Drugs Act, the Narcotics Control Act, and the Proprietary or Patent Medicine Act.

5. Immigration.

Section 95 of the British North America Act gives concurrent powers over immigration to Parliament and the Provincial Legislatures, with the proviso that federal legislation has predominance over the provincial. This, along with the quarantine power, has enabled the Federal Government to be involved in immigration health services.

6. International Matters.

There is no provision in the B.N.A. Act in respect of the distribution of powers in foreign affairs. These powers were originally retained by the British Government and were later turned over to the Government of Canada. While the Federal Government is empowered to act on behalf of Canada in the foreign affairs field, the Provinces are legitimately concerned with health matters because of their constitutional responsibilities. Cooperation between the federal and provincial governments is, therefore, essential in those areas of international health matters in which the Federal Government does not have specific regulatory jurisdiction.

7. Statistics.

Section 91(6) of the B.N.A. Act gives the Federal Parliament jurisdiction over statistics, and this enables the Federal Government to be involved in the collection, analysis and dissemination of health data and statistics.

8. Militia, Military and Naval Services, and Defence.

Section 91(7) of the B.N.A. Act identifies the above as a federal power, and this enables the Federal Government to provide health services to personnel of the Armed Forces and to veterans.

9. The Establishment, Maintenance and Management of Penitentiaries.

Section 91(28) of the B.N.A. Act identifies the above as a federal power and this enables the Federal Government to provide health services to federal penitentiary inmates.

10. Peace, Order and Good Government: Incidental and Residual Power.

The preamble of Section 91 of the B.N.A. Act identifies in a general manner the federal power "to make laws for the Peace, Order and Good Government of Canada, in relation to all matters not coming within the classes of Subjects by this Act assigned exclusively to the legislatures of the Provinces". This power, together with powers incidental to subjects assigned exclusively to the Federal Parliament, has enabled the Federal Government to be involved in such things as the health of public servants, civil aviation medicine, radiation protection, and emergency health services.

11. Spending Power.

In addition to the powers of the Federal Parliament to legislate in certain areas, the Constitution, as it has been interpreted by the Courts, gives it the

power to spend from the Consolidated Revenue Fund on any object, providing the legislation authorizing the expenditures does not amount to a regulatory scheme falling within provincial powers. The "spending power" of the Federal Parliament under the Constitution has, therefore, enabled it to make payments to Provinces and persons in fields where it has little or no regulatory authority: for example, Hospital Insurance, Medicare, Health Resources Fund, Health Grants of various kinds, Fitness and Amateur Sports, etc. In addition, it has enabled the Federal Government to undertake research and to provide both information and consultative services.

The role of the Federal Government is necessarily circumscribed by its powers but the Health Side of the Department of National Health and Welfare now finds itself, thirty years after its creation, with numerous, varied and important activities which have been developed over time, in collaboration with the Provinces, to cope with evolving changes in the health needs of Canadians.

To illustrate the full range of health problems which face the Department of National Health and Welfare one needs only to enumerate the kinds of things which it has undertaken to do. These programs and activities will be described within the context of the Health Field Concept, that is, in terms of HUMAN BIOLOGY, ENVIRONMENT, LIFESTYLE, and HEALTH CARE ORGANIZATION.

Taking HUMAN BIOLOGY first, the Department proper finances research in two ways: by grants or contracts to outside researchers either in problems of public health or in problems directly related to departmental activities, or by the direct conduct of research in its own laboratories, such as the Food and Drug Laboratories.

The most extensive research funding in HUMAN BIOLOGY comes from the Medical Research Council which is not a part of the Department but reports directly to Parliament through the Minister of National Health and Welfare. Its main function, as set out in the Medical Research Council Act, is to "promote, assist and undertake basic, applied and clinical research in Canada in the health sciences, other than public health research". Its more detailed objectives are: "to expand the scientific and technical base for health care, to improve the application of scientific principles to health care, to ensure an adequate research base for education in the health sciences, to support research contributing to new knowledge in the health sciences, and to support the training of research investigators in the health sciences."[9]

To achieve the above objectives, the Council pays grants and scholarships in aid of operating and equipment requirements for research projects, supports

investigators and research trainees, provides incentives for the development of research in highly productive fields where major contributions may be expected and in fields or regions where research is not adequately developed, and supports symposia, international scientific activities and the exchange of scientists with other countries.

Under the ENVIRONMENT category of the Health Field Concept, the Department of National Health and Welfare administers the Food and Drugs Act, (excepting parts of Section 23 and Sub-section 25(4) thereof, which are administered by the Department of Consumer and Corporate Affairs), the Proprietary or Patent Medicine Act, part of the Narcotic Control Act, part of the Hazardous Products Act, and the Radiation Emitting Devices Act; and Regulations in force under these Acts.

These Acts and Regulations provide the Department with authority for the control of:

1. Food Quality and Hazards.

Including nutritional content, microbial hazards, and chemical hazards both added and natural.

2. Drug Quality and Hazards.

Including assessment of effectiveness and wise use of drugs; microbial and chemical hazards in the drug and cosmetic supplies; and control of the movement of narcotic and other drugs subject to abuse from the licit to the illicit market.

3. Environmental Quality and Hazards.

Including assessment of the health effects of environmental pollutants; assessment and control of health hazards and effectiveness of medical devices, radiation emitting devices and, with the Department of Consumer and Corporate Affairs, hazardous products; assessment of health effects of technological and sociological environments.

4. Health Surveillance.

Including through the Laboratory Centre for Disease Control the provision of national health and disease information; the provision of a national reference service for the identification of disease producing bacteria, viruses and parasites; and the assessment and improvement of laboratory diagnostic procedures.

Canadians must also be protected against aircraft accidents due to pilot failure, a health hazard about which they can do nothing themselves. The Department's role in Civil Aviation Medicine is to provide a total Aviation Medicine Service to the Ministry of Transport including:

1. The determination of health standards for licensing pilots, aircrew and air traffic controllers.
2. The medical assessment of individual applicants.
3. Assistance with flight safety and accident prevention programs.
4. Aviation medicine research and development.

Greatly increased international travel has augmented the danger of communicable diseases being "imported" into Canada. The Department's Quarantine Service provides protection through medical, nursing and sanitation staff at most ports and airports.

Still in the ENVIRONMENT category, the Department, in collaboration with the Department of Manpower and Immigration, protects the population against the entry into Canada of immigrants who may have serious health problems. Medical examinations or medical assessments are made of persons seeking entry into Canada as immigrants.

The Department is also involved in the monitoring and enforcing of various sanitary and public health codes for property under federal jurisdiction, common interprovincial carriers, ports and airports.

As part of its special responsibilities for providing health services in the Yukon and Northwest Territories, the Department is concerned with the hydraulics, chemistry and microbiology of providing good water, safe milk, safe food and safe sewage disposal, as well as with natural and industrial factors affecting health.

Societal hazards of increasing importance to health are under surveillance by the Department, including the effects of rapid social changes imposed on people by the physical, technological and economic phenomena that now exist and are emerging.

In the third category of the Health Field Concept, namely LIFESTYLE, the Department now carries out activities in the following areas:

1. Drug Abuse: The Department promotes, develops and implements measures to deal with the problems of the non-medical use of drugs including the promotion and evaluation of research and studies, the analysis and dissemination of data, the provision of analytical services and the promotion of innovative services.

2. Alcohol Abuse: The Department undertakes activities related to alcohol abuse. These include determining the nature, extent and implications of the problem of alcohol abuse.

3. Tobacco Smoking: The health hazards of cigarette smoking have been well documented and publicized through education and advertising activities. Research and control activities are also carried out.

4. Fitness and Recreation: The Department administers the Fitness and Amateur Sports Act and provides funds for the National Sport and Recreation Center. Two directorates, Recreation Canada and Sport Canada, recommend grants and provide services in mass physical recreation and competitive sports respectively. Services are also provided to the National Advisory Council on Fitness and Amateur Sport.

5. Nutrition: The Department, through its Health Protection Branch, has recently carried out a national nutrition survey to assess the nutritional status and dietary intake of Canadians. Reliable data were collected, identifying nutritional deficiencies, their incidence and their relationship to age, sex, dietary habits, income and region.

6. Indian and Northern Health Services: The Department has undertaken some activities to encourage Indians and Northern residents to pursue lifestyles conducive to good health; health stations and centres have been engaged in teaching public health practices. Included are special programs for training native persons as health educators, for alcohol abuse and for fitness and recreation.

7. Personal Health: The Department has developed health standards and guides, promoted health education and provided information and consulting services in such fields of health as mental, dental, child and maternal, chronic illnesses, aging, rehabilitation and family planning.

8. Contagious Diseases: Of special importance has been the initiation of measures to control gonorrhea and syphilis.

The fourth and final category of the Health Field Concept is HEALTH CARE ORGANIZATION, defined as all the people, facilities and systems involved in providing personal health care. In this category federal programs and activities are as follows:

1. Health Care Accessibility: Under the Hospital Insurance and Diagnostic Services Act and the Medical Care Act, the Federal Government

makes contributions to Provinces amounting to some 50% of the cost of providing hospital care, medical care and diagnostic services. As conditions for the receipt of this money, amounting to nearly 2,300 millions of dollars in 1973 [including transfers to Quebec under the *Established Programs* (Interim Arrangements) *Act*], the Provinces agree to ensure portability and universality of coverage, and accessibility and comprehensiveness of service.

2. Health Manpower. The Department of National Health and Welfare acts as a focus for cooperative efforts to improve the quality, supply, productivity and distribution of health manpower. This includes the provision of technical and consultative services.

Financial assistance for training is provided by the Department under the Professional Training Grant program. There is also a federal Health Resources Fund of 500 million dollars to be spent by Provinces over a fifteen-year period in the acquisition, construction or renovation of health training and research facilities.

3. Health Services Improvement: The Department provides special services to Provinces to assist them in developing national priorities and standards for health care systems; it assists Provinces, institutions and individual researchers in conducting research studies directed at making the systems more efficient; and provides consulting services on regional planning, quality and quantity assessment of medical and hospital care use, nursing, dietetics, industrial engineering and facility design.

4. International Health Services: The Department coordinates Canadian participation in the World Health Organization (WHO), the Pan American Health Organization (PAHO), the United Nations Commission on Narcotic Drugs, and other international agencies in the health field.

5. Emergency Health Services: The Civil Emergency Measures Planning Order places upon the Minister of National Health and Welfare the specific responsibility for having adequate health services for a national emergency. Plans and services at the provincial and municipal levels are developed in collaboration with relevant authorities.

6. Indian Health Services: Section 91(24) of the British North America Act places legislative responsibility for Indians and lands reserved for the Indians with the Parliament of Canada. Although the Indian Treaties mention specific matters affecting the lives of Indians, only one mentions medical care. Treaty Number 6, covering Indians in part of West Central Saskat-

chewan and East Central Alberta, provided "that a medical chest shall be kept at the house of each Indian Agent for the use and benefit of the Indians at the discretion of such Agent".

Judicial decisions have concluded that the Treaty does not vest in the Indians covered by it a legal right to be served by free medical services.

Nonetheless, the Federal Government through the Appropriations and other Acts has provided various services affecting the general welfare of Indians, including hospital and medical care. The Provinces also have provided certain services to Indians as Canadian citizens and residents of the Provinces. The nature of these services and the responsibility for providing them is constantly under review.

7. Northern Health Services: Prior to 1954, health care in the Yukon and Northwest Territories was dependent on the interest of corporations, the enterprise of individuals, private institutions, physicians and missionaries. In 1954, the Federal Government assumed administrative functions akin to those of a provincial health department on behalf of the Territorial Governments. The Department of National Health and Welfare assists the Territorial Governments in the operation of hospital and medical insurance plans. Services include: treatment by departmental staff, and facilities including hospitals, nursing stations, health centres and health stations; health care arrangements with private practitioners and health agencies; public health services and health education; advice to territorial authorities on health matters and advice to the Department of Indian Affairs and Northern Development on northern problems with health aspects.

8. Prosthetic Services: Since 1965, the Department has been administering the Prosthetics Services formerly administered by the Department of Veterans' Affairs. This was done in order to extend the service beyond veterans only. The Department provides a total limb, brace and orthopaedic shoe service to veterans, and also to the general population where arrangements have been made with a Province.

9. Public Service Health: The Department provides diagnostic counselling, preventive, occupational and advisory services on health matters to federal Public Service employees.

The foregoing activities in HEALTH CARE ORGANIZATION emanate from the Department of National Health and Welfare. The nature and costs of all activities are reflected by the following table of departmental expenditures:

DISTRIBUTION OF GROSS HEALTH EXPENDITURES, NATIONAL HEALTH AND WELFARE, FISCAL YEARS 1969-70 – 1973-74

1. DISTRIBUTION – ($ Millions)

Year	Human Biology*	Environment	Lifestyle	Health Care Organization**
1969-70	31.2	21.5	12.0	1,255.8
1970-71	34.4	24.2	12.7	1,552.1
1971-72	36.1	26.3	23.3	1,903.2
1972-73	38.1	34.9	28.9	2,095.5
1973-74	40.1	38.4	45.4	2,320.4

2. PERCENTAGE AND DOLLAR INCREASE 1969-70 TO 1973-74

	Percentage	$ Millions
HUMAN BIOLOGY*	29%***	8.9
ENVIRONMENT	79%	16.9
LIFESTYLE	278%	33.4
HEALTH CARE ORGANIZATION	85%	1,064.6

*MEDICAL RESEARCH COUNCIL BUDGET ONLY:
EXCLUDES ASPECTS OF HUMAN BIOLOGY DEALT WITH THROUGH NATIONAL HEALTH GRANTS AND DEPARTMENTAL LABORATORIES.

**INCLUDES FISCAL REIMBURSEMENTS TO QUEBEC UNDER THE ESTABLISHED PROGRAM (INTERIM ARRANGEMENTS) ACT:

	($ MILLIONS)
1969-70	291.8
1970-71	310.1
1971-72	377.2
1972-73	398.6
1973-74	436.9

***IT SHOULD BE NOTED THAT THE BUDGET OF THE MEDICAL RESEARCH COUNCIL HAS MORE THAN QUADRUPLED SINCE 1966.

Among the many other Federal Departments whose activities have an effect on health, one of the most important is the Department of Veterans' Affairs, which is responsible for providing or financing health care to qualified veterans, and, under contract, to the R.C.M.P. Pursuant to a Cabinet decision dated December 5, 1963, some of the D.V.A. hospitals have been turned over to provincial authorities. Such transfers are made in the joint interests of the veterans and the community, and are facilitated by medical care and hospital insurance plans. Health services to veterans in 1972 cost the Department 76,999,000 dollars.

The Department of Labour administers *The Canada Labour Code* and, under Part 4, *The Safety of Employees,* issues regulations governing conditions of work for employees in the federal field of jurisdiction, both private and public sectors. Not only is direct control exercised for a working population of 750,000 but the regulations are models that increasingly are being adopted as standards by other jurisdictions. The medical fitness standards of commercial motor vehicle drivers, and hearing conservation standards, are two illustrative fields where federal initiatives are leading to a national upgrading of these requirements. Supplementing this regulatory and leadership role, the Departement of Labour provides an educational and technical information service in the field of employment accident prevention generally.

The Department of Consumer and Corporate Affairs has the main responsibility for administering the Hazardous Products Act and Regulations. Accidents (exclusive of motor vehicle accidents) are the second most important cause of death between the ages 5 and 35, causing not only the loss of enjoyment of life but economic loss and heavy medical and hospital expenses. Many of these accidents occur in the home and a significant proportion involve household products, some of which could be regulated under the Hazardous Products Act and Regulations.

Under the Hazardous Products Act the sale, advertisement or importation of certain dangerous products is forbidden, while the importation, advertising and sale of others is permitted only under specified conditions including, among other things, adequate warning to the consumer of the hazards associated with the possession and use of such products. The Hazardous Products Regulations are being constantly extended to cover products found to be dangerous to health.

The Department of National Defence maintains health services and facilities for uniformed personnel, consistent with its need to maintain a state of preparedness for military emergencies, and the Penitentiaries Service provides or finances health care for inmates.

If one defines health in its broadest sense there is a multitude of other related federal activities, including the National Parks Services, the Department of the Environment, the Ministry of Transport, and the cultural activities of the Department of the Secretary of State.

Finally, at the most basic health level of all, the Federal Government has important activities in maintaining economic progress and in ensuring, through a redistribution of income, that most Canadians can provide for the essentials of life, which is a prerequisite to both the reduction of morbidity and mortality as well as to the enhancement of the quality of life.

This extended description of the federal role was necessary in order to

illuminate the strengths and limitations of federal authority. But it must be noted, once more, that the main burden of providing personal health care to Canadians still falls on the provincial governments. They must not only administer the personal health care system, including the sharing of the financing of professional and institutional services, but must also carry heavy responsibilities in the education of health professionals and in a multitude of provincial programs where the impact on health is a major consideration. The school system, the environmental control system, the system for providing recreation and the rules governing safety and health in industry and on the highway are only some of the areas of major provincial concern. Escalating health care costs and defects in the accessibility of health care to those who need it are still major problems with which Provinces must grapple.

Chapter 8. Research and the Health Field Concept

Many issues in health research were brought out at a National Symposium on Health Research Priorities held at McGill University on May 25, 1973. With some three hundred participants and nineteen speakers, this Symposium provided a platform for the many, and sometimes conflicting, points of view of the health research community in Canada.

As might be expected most speakers favoured their respective fields, with basic researchers asking for increased support of basic research, clinical researchers asking for more funds for clinical research and so on. In spite of this, a certain pattern emerged with the following points:

1. Health research, in its broadest terms, including basic, clinical, socio-medical and organizational, is under-financed when account is taken of the fact that health care is a seven billion dollar industry in Canada.

2. Of the money that is spent on research, an insufficient proportion is allocated to clinical, socio-medical and organizational aspects of health and health care.

3. Many proven advances resulting from basic and clinical research are not being applied at the level of the practising physician.

The application of the Health Field Concept, by which answers to health problems will be sought in each of the four categories of HUMAN BIOLOGY, ENVIRONMENT, LIFESTYLE and HEALTH CARE ORGANIZATION, puts a heavy burden on research. This burden:

first, is the traditional one of adding to the store of knowledge of basic human biology;

second, much research is needed to determine and measure the effects of various environmental hazards to both mental and physical health;

third, research is needed to identify the links between the living habits, or lifestyle, of individuals, and the levels of both mental and physical health;

fourth, more clinical research is needed to convert knowledge of human biology into application at the point where personal health care is provided;

fifth, studies are required to improve the cost, accessibility and effectiveness of the health care system;

sixth, studies are needed to find out how Canadians can be influenced to take more individual responsibility for the health of their minds and bodies, and for reducing the risks which they impose on themselves by neglecting important lifestyle health factors.

If all the foregoing research requirements are to be pursued with vigour it will be necessary for researchers in all fields to develop a unity of purpose which has often been lacking because of the destructive competition for limited funds. Balanced progress in all fields can only be obtained when researchers pull together toward the common objective of raising the health status of Canadians.

Chapter 9. Science Versus Health Promotion

The spirit of enquiry and skepticism, and particularly the Scientific Method, so essential to research, are, however, a problem in health promotion. The reason for this is that science is full of "ifs", "buts", and "maybes" while messages designed to influence the public must be loud, clear and unequivocal. To quote I Corinthians, Chapter XIV, Verse 8:

> "If the trumpet give an uncertain sound, who shall prepare himself to the battle?"

The scientific proof underlying cause-and-effect relationships between, on the one hand, environment and lifestyle and, on the other, sickness and death, is fraught with disagreement. Without looking too hard we can find scientists on both sides of the following questions:

(a) does exercise lessen the likelihood, or abate the severity, of coronary artery disease?

(b) is obesity an important contributory factor to sickness and death?

(c) does marijuana have any serious long-term effects?

(d) does the ingestion of high levels of fatty foods and cholesterol increase the likelihood of coronary-artery disease?

(e) is frequent self-medication, particularly with over-the-counter drugs, bad?

Even such a simple question as whether one should severely limit his consumption of butter and eggs can be a subject of endless scientific debate.

Faced with conflicting scientific opinions of this kind, it would be easy for health educators and promoters to sit on their hands; it certainly makes it easy for those who abuse their health to find a ready "scientific" excuse.

But many of Canada's health problems are sufficiently pressing that action has to be taken on them even if all the scientific evidence is not in. The Chinese

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have an expression "Moi Sui" (pronouced MOO SUE) which means "to touch, to feel, to grope around". It reflects a deliberate approach to innovative and creative action even when scientific certainty and predictability are in question.

The scientific community, then, needs to make special efforts to resolve some of the debates on health-related questions of the environment and lifestyle. Until it does, the principle of "Moi Sui" will be applied in promoting health according to the following hypotheses which now appear sufficiently valid to warrant taking positive action:

1. It is better to be slim than fat.
2. The excessive use of medication is to be avoided.
3. It is better not to smoke cigarettes.
4. Exercise and fitness are better than sedentary living and lack of fitness.
5. Alcohol is a danger to health, particularly when driving a car.
6. Mood-modifying drugs are a danger to health unless controlled by a physician.
7. Tranquillity is better than excess stress.
8. The less polluted the air is, the healthier it is.
9. The less polluted the water is, the healthier it is.

In due course the validity of the foregoing and similar hypotheses will likely be resolved in a scientific way, precise cause-and-effect relationships will be ascertained and measured, and the exact significance of each factor determined.

Meanwhile, major health problems lie before us and we must move ahead with programs on precepts such as the foregoing. The scientific "yes, but" is essential to research but for modifying the behaviour of the population it sometimes produces the "uncertain sound" that is all the excuse needed by many to cultivate and tolerate an environment and lifestyle that is hazardous to health.

Chapter 10. Care Versus Cure

Trained in a system which focuses its attention on curing illness, the medical practitioner deals effectively with the problems of infectious disease, with episodes of acute illness and with accidents that call for the high technology of the hospital.

During the past fifty years, infectious diseases, other than respiratory infections and venereal diseases, have largely been brought under control. Of the ten major causes of death in 1900, six were either infectious or related to infectious processes. In 1970, none of the ten major causes of death were infectious except influenza-pneumonia and certain diseases of early infancy. Today the list is headed by chronic diseases and accidents.

Chronic diseases also afflict large numbers of the living for long periods of their lives. As health has improved in early life so has the prevalence of the less tractable forms of disability in later life.

Many chronic diseases are a consequence of aging and as the number of survivors into old age increases so do the cases of chronic diseases. In respect of chronic illnesses, all who are over sixty years of age are members of a "population at risk" in respect of heart and circulatory disease, cancer, arthritis, rheumatism, diabetes and other chronic diseases connected to the aging process. As health programs succeed in extending the life of more Canadians, the number of aged will increase and their needs will augment accordingly. Unless training programs for health professionals specializing in the care of the aged are expanded, these urgent needs will not be met.

Other important populations, at all ages, with permanent or chronic illness include the severely retarded, those with emotional disorders and those disabled by accidents.

For a health care system whose essential motivation is based on curing the sick, the treatment of the chronically ill is not very satisfying because the treatment is long and in many cases success cannot be measured by cure so much as by controlling the disability created by a chronic condition.

The number of physicians specializing in the treatment of patients with chronic and disabling conditions of an indefinite duration is, therefore, small

relative to the number who specialize in the diagnosis and treatment of acute illness. There are, for instance, only one hundred physicians in Canada who specialize in physical medicine and rehabilitation, a ratio of one for every 200,000 Canadians. Specialists in geriatrics are equally scarce.

Turning to treatment institutions one finds the same imbalance, with an emphasis on acute hospital beds and a scarcity of beds for patients requiring extended care for chronic illness.

Somehow, the value system of the HEALTH CARE ORGANIZATION will have to be revised so that the care of the chronically ill will be seen to be as rewarding as the cure of acute conditions. The need for this revision of the value system is already pressing and will become more so as the percentage of the aged in Canada's population increases.

In 1965 only 8% of Canada's population exceeded 65 years of age. By the year 2000 the proportion will have grown to 11%, based on today's survival rates. Even at a stabilized rate of growth they will number some 3.2 million people of a total estimated population of 29 million. Should measures to reduce environmental and lifestyle risks prove successful, the survival rate to age 65 will be even higher.

Raising "care" to the level of "cure" in the value system of the HEALTH CARE ORGANIZATION is of critical importance if resources are to be marshalled on behalf of the chronically ill, who constitute a large and growing part of our population.

In redirecting some concern toward the chronically ill, it may well prove fruitful for chronic care in clinics and institutions to be provided by nursing personnel trained to carry out procedures and provide counselling in areas now requiring the intervention of a physician. Where chronic care clinics of this kind have been established, such as at the Kaiser-Permanente Foundation, Oakland, California, it has been found that four nurses in collaboration with one physician can deliver as much care as four physicians, and at a much lower cost.

Chapter 11. Mental Health

The social stigma attached to mental illness is still so strong and generates such feelings of guilt that the subject is rarely discussed openly except in the abstract. Few want to admit to the parenthood of a child with an emotional disorder, or to the death of a spouse by suicide. The great sense of shame that surrounds a family with a member afflicted by mental illness is perpetuated constantly by newspaper stories of those who have been found innocent of a violent crime by reason of insanity. Mental illness has thereby often been associated with violence, sin, guilt and shame.

In the light of this social attitude it is not surprising that the nature, prevalence, and underlying causes of mental illness are not widely-known or understood. These are the facts.

In Canada:

1. 5% to 10% of school children have an emotional or learning disorder that should receive professional care.

2. In 1970, *general* hospitals provided 2,200,000 days of hospital care for neuroses and psychoses.

3. In 1970 *psychiatric* institutions provided 21,200,000 more days of institutional care.

4. On December 31, 1969, there were 66,500 patients registered in Canadian psychiatric institutions. Of these, 33,200 were psychotic, 24,100 mentally retarded, 4,800 alcoholic, 2,300 neurotic and 2,100 with non-specified disorders.

In addition to the foregoing it is estimated that mental disorders, such as anxiety, are a factor in 50% of the patients seen in general medical practice.[10] At any moment 3 out of 1,000 Canadians are hospitalized in psychiatric facilities. Using a city of 400,000 as an example, there are some 1,200 residents hospitalized for mental illness at any given time, plus those being treated on an outpatient basis.

As a point of fact, statistics on mental illness are grossly inadequate because of the shame and fear attached to these disorders, which prevent people from seeking treatment and because of the legal, social and religious blame from which professionals try to protect their patients.

The shame may be explained in terms of the historical belief in demoniac possession and banishment of the insane by society, the belief still prevalent in many circles that mental illness is hereditary and a consequence of such vicious behaviours as alcoholism and promiscuity, or the belief of other groups that it is a direct outcome of parental inadequacy in child-rearing.

The legal, social and religious implications of mental illness are exemplified in the rules of many schools and employers (including hospitals) that prevent admission or hiring of candidates with a history of mental illness, and in the criminal charges sometimes made against people who attempt suicide.

Moreover, the severity of mental illness as described in the statistics is biased by the frequent psychiatric practice of minimizing the diagnosis in the case of young people, because carrying a label of "psychosis" through one's whole life is a heavy burden indeed which in itself is a handicap to adequate rehabilitation.

Consequently, much needs to be done in terms of revising obsolete laws and practices strongly tinted by the historical myth of evil attached to mental illness. Much needs to be done in providing the mentally ill with adequate protection, care and readaptation opportunities and in informing the public and modifying attitudes towards mental illness. Much needs to be done also in preventing mental illness, identifying positive health factors and promoting them.

The pathological processes at work in our families, our school systems and in our society's value system indicate that programs of prevention directed at large population groups are desperately needed. These programs of prevention would have the advantage of reducing the risks of mental illness while permitting a sharing of responsibility which would abate some of the guilt which individuals find so intolerable.

Mental health problems lend themselves to analysis through the Health Field Concept. The impact of Human Biology, of the Environment, of Lifestyle and of the Health Care Organization, respectively, can be identified and estimated so that programs of prevention and therapy can be launched that will attack principal underlying causes. These programs, however, will not be given the priority they deserve until the element of shame is dispelled. Measures to lift the cloud that obscures the subject of mental illness are an urgent prerequisite to action.

Chapter 12. The Health Field Concept and Strategies for the Future

The ideas proposed in this paper provide a universal framework for examining health problems and for suggesting courses of action needed for their solution. Because they are comprehensive, they have a unifying effect on all the participants in decisions which affect health, bringing together into one common front:

1. the health professions,
2. the health institutions,
3. the scientific community,
4. the educational system,
5. municipal governments,
6. provincial governments,
7. the federal government,
8. the business sector and trade unions,
9. the voluntary associations, and
10. the Canadian people as individuals.

The Health Field Concept disregards questions of jurisdiction which may be important to governments but are not of primary concern to the people of Canada when their health is at stake. It identifies requirements for health without regard to the niceties of professional or sectoral boundaries, and it focuses attention on the broad and important factors underlying the health of the population.

In putting the Health Field Concept to work, that is, in using it for analysing federal health policy, it was found that HUMAN BIOLOGY, ENVIRONMENT and LIFESTYLE were national in character and that problems in these areas

tended to pervade Canada's population with little regard for provincial boundaries, always excepting purely local environmental matters. Protecting the food supply from contamination and drugs from being abused, as well as recognizing alcohol abuse, smoking, obesity, lack of physical fitness, chronic illness, mental illness, venereal disease and traffic deaths as national health problems, opens up corridors in which federal leadership can function with considerable jurisdictional freedom as long as it leads, reinforces and supplements, without duplication or conflict, the goals and services of the provinces, and respects the provincial ascendancy in health care services. In short, the first three elements of the Health Field Concept are open to federal initiatives in addition to those which are already under way. (see Chapter 7)

Turning to the expressed and latent needs and wants of the Canadian people, this paper responds strongly to the recent trends and attitudes of Canadian society. The preservation and enhancement of the environment are the goals of a very strongly felt need and constitute a powerful current of popular opinion. In the lifestyle area, nutrition and weight control, as well as mass physical recreation, are subjects of growing interest, indicating an increased desire by many Canadians to break out of an unhealthy pattern of living. These and similar national lifestyle concerns can be eased by measures growing out of the Health Field Concept, assuming such measures are wisely chosen and respond to Canadian needs.

For a more particular community, that of the research scientists, this paper not only gives due recognition to the need for research in basic human biology, but also points out the necessity of linking up the purposes and uses of health research to problems in the environment, in lifestyle and in the delivery of care.

For the health professions, who often despair of getting patients to act on their advice to reduce self-imposed risks, and of governments to attack the underlying causes of sickness and death, this paper offers them the opportunity to recruit powerful forces to their cause.

Voluntary associations, dedicated to increasing the awareness of Canadians of the factors influencing health and to the gravity of specific diseases, will more easily be able to identify and marshal the assistance of those who share their goals.

Neglected segments of the Canadian population, in terms of health, can look forward to getting more of the attention they deserve. The chronically ill, the aged, the mentally ill, the economically-deprived, the troubled parents, and others who either are at high risk or are receiving insufficient health care, can expect that programs for populations will increasingly recognize and respond to their needs.

The federal role suggested by this paper constitutes a promising new departure. In the past the Federal Government has limited its activities in the health

field to its traditional responsibilities such as quarantine medicine and the protection of the food supply, to product safety, to ensuring accessibility to personal health care through substantial financial assistance to provincial health insurance plans, and to financing research. The basis for concentrating its interests in these areas has been the belief that the improvement of personal health care was the principal means of raising the level of health of the Canadians. In 1973, for example, the federal contribution to provincial health insurance plans was 2,300 millions of dollars, and financial barriers to medical and hospital care have largely been eliminated.

The evidence uncovered by the analysis of underlying causes of sickness and death now indicates that improvement in the environment and an abatement in the level of risks imposed upon themselves by individuals, taken together, constitute the most promising ways by which further advances can be made.

Accordingly, it is the intention of the Government of Canada, first, to maintain at a high level the services and support provided through its present activities in health protection, research and the financing of personal health care. To these will be added measures directed at specific national health problems, chosen in consultation with provinces, consumers, professions and associations according to their gravity and incidence, and aimed at removing or reducing the factors underlying sickness and death.

Some of these measures in time will no doubt be directed at environmental factors, others will be directed at lifestyle risks, still others will expand the horizons of health research, and yet others will encourage more personal care services to neglected parts of the Canadian population. In every case the measures will be based upon the expressed interest and concern of all those who contribute to the health of Canadians, including in particular the people themselves.

Since direct health care is already consuming some 7% of the wealth that Canadians produce annually, it is evident that the rate at which the Government of Canada can expand its activities in the field of health is severely limited by financial considerations. It is also true that measures directed at the prevention of illness will take some time before they are translated into savings in the costs of providing curative health services.

These two factors make it imperative that the measures developed in consultation with provinces, professions and associations be chosen with great care, and with due regard for the costs and benefits that can be anticipated. In choosing the measures, consideration will be given to a number of factors, among which will be:

1. the gravity of the health problem,

2. the priorities of those who share in decision-making,

3. the availability of effective solutions results of which are measurable,

4. the costs involved, and

5. the multiplier effect of federal initiatives in marshalling and accelerating support from all those who make vital contributions to raising the level of health or who have a key role in controlling the cost of health services.

With the foregoing considerations in mind, and with the recognition that the good health of Canadians is an objective that shines brightly above the thicket of jurisdictions and special interest groups, the Government of Canada proposes to take steps that will start the nation on the road to levels of health even higher than those that Canada now enjoys.

In taking these steps, the Government of Canada, in cooperation with others, will pursue *two broad objectives:*

1. *To reduce mental and physical health hazards* for those parts of the Canadian population whose risks are high, and

2. *To improve the accessibility* of good mental and physical health care for those whose present access is unsatisfactory.

In pursuit of these two objectives, *five strategies* are proposed:

1. A *Health Promotion Strategy* aimed at informing, influencing and assisting both individuals and organizations so that they will accept more responsibility and be more active in matters affecting mental and physical health.

2. A *Regulatory Strategy* aimed at using federal regulatory powers to reduce hazards to mental and physical health, and at encouraging and assisting provinces to use their regulatory powers to the same end.

3. A *Research Strategy* designed to help discover and apply knowledge needed to solve mental and physical health problems.

4. A *Health Care Efficiency Strategy* the objective of which shall be to help the provinces reorganize the system for delivering mental and physical health care so that the three elements of cost, accessibility and effectiveness are balanced in the interests of Canadians.

5. A *Goal-Setting Strategy* the purpose of which will be to set, in cooperation with others, goals for raising the level of the mental and physical health of Canadians and improving the efficiency of the health care system.

In implementing these strategies much analysis and consultation within the framework of this paper is still needed. This will be undertaken in respect of the following possible courses of action.

For the *Health Promotion Strategy* some possible courses of action among others could be:

1. The development for the general public of educational programs on nutrition.

2. The enlistment of the help of the food and restaurant industries in making known the caloric value and nutritional content of the food they sell.

3. Educational campaigns to increase awareness of the gravity and underlying causes of traffic accidents, deaths and injuries.

4. Activities to promote a more widespread understanding of the gravity and underlying causes of coronary-artery disease.

5. Measures to lift the veil from mental illness, and to create a more realistic sense of urgency in respect of the gravity of this problem.

6. Information to increase awareness of the hazards of self-medication.

7. Further information campaigns to increase public awareness of health problems due to the abuse of alcohol, drugs, tobacco and to venereal disease.

8. Encouragement among employers of programs designed to ease the transition from employment to retirement.

9. Reinforcement of successful programs for making life more interesting for the aged.

10. Promotion and coordination of school and adult health education programs, particularly by health professionals and school teachers.

11. Direct awareness activities tailored to the responsibilities of specific sectors for the reduction of self-imposed and environmental health risks including business, trade unions, governments, voluntary associations and action groups, communities, professions, parents and teachers.

12. Continued and expanded marketing programs for promoting increased physical activity by Canadians.

13. Enlistment of the support of the educational system in increasing opportunities for mass physical recreation in primary and secondary schools, in community colleges and in universities.

14. Promotion of the development of simple intensive-use facilities for more physical recreation including fitness trails, nature trails, ski trails, facilities for court games, playing fields, bicycle paths and skating rinks.

15. Continued pressing for full community use of present outdoor and indoor recreation facilities, including gymnasia, pools, playing fields and arenas.

16. Continued and reinforced support for sports programs involving large numbers of Canadians.

17. Encouragement of private sports clubs to accept more social responsibility for extending the use of their facilities to less-privileged segments of the Canadian population.

18. Extension of present support for special programs of physical activity for native peoples, the handicapped, the aged and the economically-deprived.

19. Enlistment of the support of women's movements in getting more mass physical recreation programs for females, including school children, young adults, housewives and employees.

20. Enlistment of the support of employers of sedentary workers in the establishment of employee exercise programs.

21. Enlistment of the support of trade unions representing sedentary workers in obtaining employee exercise programs.

22. Increase in the awareness of health professionals of factors affecting physical fitness.

23. Completion of the development of a home fitness test to enable Canadians to evaluate their fitness level.

For the *Regulatory Strategy* some possible courses of action among others could be:

24. Regulations for improving the nutritional content of food.

25. Consultation with the Department of Justice in respect of the laws against driving while impaired by alcohol.

26. Increased control of advertising for products which are so frequently or deeply abused as to constitute serious hazards to health.

27. Increased control of health hazards due to air, water, food, noise and soil pollution to the extent that the power to legislate with regard to these may fall into federal jurisdiction.

28. Increased control of death hazards from communicable diseases, radiation, medical devices and cosmetics.

29. Increased control under the Hazardous Products Act over the advertisement, importation and sale of household products the possession or use of which is accompanied by some significant accident hazard or danger to health.

30. Assistance to the Provinces in promoting the acceptance by the public of regulations passed pursuant to provincial legislation making compulsory the wearing of seat-belts in motor vehicles.

31. Regulations governing child-resistant closures on drug products.

For the *Research Strategy* some courses of action among others to be explored include:

32. An ongoing dialogue between health planners and the research community on the priorities for mission-oriented health research while preserving for the research community the setting of priorities in basic research.

33. The implementation of a regular National Health Survey to determine the prevalence and nature of acute and chronic mental and physical illness, to permit an assessment of the health status and needs of Canadians and to measure changes in status and needs.

34. The institution of a special program for identifying health status indicators and high-risk segments of the Canadian population, for the evaluation of the nature and gravity of mental and physical health risks, and for the proposal of measures to abate the level of risk.

35. Measures to help integrate, improve and use, on a national basis, the data and statistics being recorded at various governmental and institutional levels.

36. The establishment of a well-designed comprehensive system for the reporting of accident statistics which would, among other things, identify accident-associated products.

37. The promotion of increased support for research on underlying causes of coronary-artery disease.

38. Support for more research on the causes and treatment of mental illness.

39. The support of projects designed to evaluate the results of present mass-screening programs and to test the effectiveness of future ones.

40. The establishment of a National Drug Abuse Institute covering all

abusive drugs including psychotropic drugs, both licit and illicit, alcohol and cigarettes, and responsible for gathering statistics, supporting research, evaluating preventive and treatment measures and recommending policy.

41. The undertaking of a broad continuing study into the ways and means of effectively informing the Canadian people on changes in behaviour which will significantly reduce self-imposed risks.

42. The continuation and strengthening of present research into the effect of the physical environment on health.

43. The establishment of a program for assessing the effect of social and environmental change on health including the calculation of risk factors due to lifestyle.

44. The continuation of support for research on physical and mental fitness and for fitness testing.

45. Continued and increased support for research into better ways of providing health care.

46. Continued support for research consistent with the scale of the health care industry.

For the *Health Care Efficiency Strategy* it is important to note that the word "efficiency" in this context is not limited to the narrow economic meaning of low cost per unit of production, but includes, as well as cost, the other two important elements of accessibility of service and the effectiveness of results. For this strategy, some measures that could be considered among others are:

47. Pursuing a method of financing health care that will provide incentives for providing satisfactory care at the lowest cost, and will permit the extension of pre-paid care to additional essential services.

48. Strengthening industrial and emergency health services, including the training of personnel.

49. The identification, treatment and follow-up of Canadians with high blood pressure.

50. The support of programs aimed at reducing the risk of premature coronary-artery disease, including weight-control, exercise, stress-reduction and anti-smoking.

51. The identification, treatment and follow-up of Canadians suffering from a high serum cholesterol level (hypercholesterolemia).

52. Support for programs for increasing the number and skills of professions dealing with mental health and mental illness including particularly

nurses, social workers, health educators and teachers.

53. The subsidy of programs for training counsellors on alcoholic problems and their treatment.

54. The promotion of employer programs for employees with alcohol problems.

55. The support of home visit and other programs for helping chronically ill and aged people to stay in their communities.

56. The development and support of programs of professional training in gerontology and geriatrics, including physicians, nurses and health support personnel.

57. A continued adherence to the principle that accessibility to ambulatory, institutional and home care must be based upon the perceived needs of the public.

58. Making continued federal support for the training of health professionals conditional upon effective measures to ensure that health manpower is better distributed geographically, among specialties and according to economic levels served.

59. The continued extension of the role of nurses and nurse practitioners in the care of the mentally ill, in the care of the chronically ill, in the provision of home care, in family counselling on preventive health measures, both mental and physical, and in the abatement of environmental hazards and self-imposed risks.

60. The organization and administration of an improved drug information system to physicians so that they will make a more effective and objective use of drugs.

61. The continued promotion of the establishment of community health facilities that are physically and professionally integrated.

62. The introduction of practical measures, including the use of expert committees, to diminish the time between the latest medical knowledge and the application of that knowledge in the practice of medicine.

63. The encouragement of the development of regional bodies with comprehensive authority over the delivery of health care in their respective regions.

64. The enlistment of the support of pharmacists in establishing, under physician direction, a follow-up system on the compliance of patients with drug therapy.

65. Work with genetics counsellors in improving the use and availability of genetic services to Canadians.

66. The continuation and extension of assistance to Provinces in their campaign against venereal disease.

67. The examination of the possibility of integrating authority over federal treatment services, including those for veterans, Indians, Eskimos, Northern Territories, and penitentiary inmates.

For the *Goal-Setting Strategy,* which applies to the four foregoing strategies, consultation will be intensified so that a rational array of specific goals can be established, providing a united and reinforced sense of direction for those who work in the health field. A goal has a time limit and is stated in quantitative terms. Possible courses of action include among others:

68. The development of specific reductions in the incidence of major mortality and morbidity.

69. The establishment of specific dates by which reductions in mortality and morbidity are to be achieved.

70. The development of specific improvements in the efficiency of the health care delivery system, including improvements in cost performance, accessibility of care, and the effectiveness of results.

71. The establishment of specific dates by which improvements are to be achieved.

72. The setting of standards of care in both mental and physical health care systems.

73. The extension of national standards of nutrition to include definite recommendations on safe levels of intake for hazardous substances occurring naturally in food.

74. A renewed commitment toward the health goals of the World Health Organization and the Pan American Health Organization.

Conclusion

The foregoing formulation of two broad objectives, five main strategies and seventy-four proposals constitutes a conceptual framework within which health issues can be analysed in their full perspective and health policy can be developed over the coming years. Since all of the propositions do not have equal weight, and since authority for their pursuit is widely dispersed among governments, professions and organizations, the Working Paper does not attempt to pre-judge jurisdictional and financial issues nor to set priorities for other levels of government. Limitations on the availability of funds will require that expanded initiatives be carefully paced in relation to the ability of the economy to absorb them without adding to existing levels of taxation. With the Health Field Concept and this Working Paper, however, there will be a much clearer picture of the options available. In the end—by individuals, by society and by governments—choices must be made.

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Annex A. Panorama of Mortality in Canada

The enclosed chart gives a broad overview of the prevailing causes of death* for each sex and age group in Canada (1971). It demonstrates the importance of the contribution of our lifestyle to mortality up to middle age, for example motor vehicle accidents, cirrhosis of the liver, heart disease, etc. It also emphasizes the different mortality patterns and rates for males and females.

The causes included are responsible for at least 5% ** of the deaths within each sex and age group, thus one cause may be important only relative to certain age and sex groups, such as leukemia among young children. The 13 first cause-groups used in this chart represent two thirds of the total deaths after the age of 5.

PITFALLS TO AVOID

As indicated in note 2 on the chart, the areas of the circles are proportionate only to the absolute number of deaths, therefore one is unable to determine if the *mortality rate* of one group is greater than another by simple comparison between two circles. The mortality rate, expressed in "per thousand", for each age and sex group is obtained by dividing the number of deaths (d) by the corresponding population (p).

Shown hereunder are 3 examples of pitfalls resulting from ignorance of this fact:

a) The number of deaths among males aged 30 to 34 (1,090) is less than that of the preceding age group, 25-29 (1,176) although the mortality rate among males aged from 30 to 34 ($\frac{1,090}{660.9}$ = 1.65 per thousand) exceeds that of the 25-29 group ($\frac{1,176}{800.7}$ = 1.47 per thousand)

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* Taken from "Vital statistics, 84-201, 1971" published by Statistics Canada, using the International Intermediate "A" List of 150 cause-groups.

** The arbitrary criterion of 5% has been selected so as to limit the causes to a manageable number. It must be noted that some causes of death listed are identical to those of the classification used (motor vehicle accidents: AE 138, Breast Cancer: A 54. . .) whereas others correspond to groupings representing a more comprehensive entity (other accidents: AE 139-146, respiratory diseases: A 89-96, gastro-intestinal cancer: A 46-49, and cancer of the uterus and ovary: A 55, 56, 58D).

b) In the same way, deaths among women over 80 are more numerous than those among men of the same age group (23,285 and 21,016), nevertheless the mortality rate in women is less than that of the men from the same age group ($\frac{23,285}{201.3}$ = 116 per thousand. $\frac{21,016}{140.3}$ = 150 per thousand)

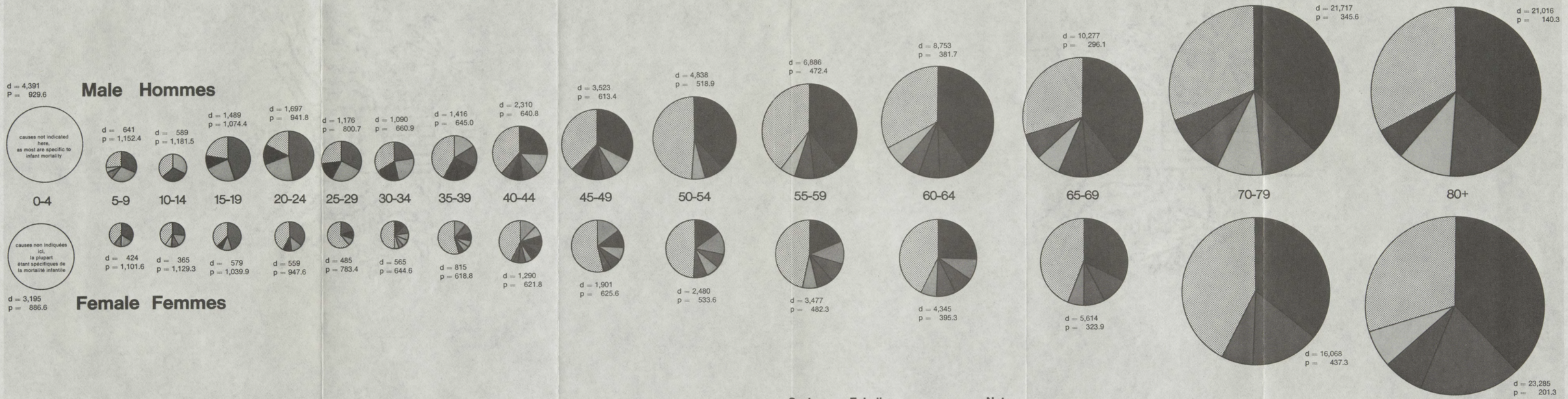
c) The fact that suicide disappears from the chart after age 45 for females and age 50 for males is not due to a decrease in incidence but merely to a decrease in importance compared to other causes.

CANADA 1971

Major causes of death for each sex and age group

Causes principales de décès pour chaque tranche d'âge et de sexe

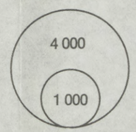
Health and Welfare Canada / Santé et Bien-être social Canada



Legend Légende

- Motor vehicle accidents / Accidents de véhicule à moteur — AE 138
- All other accidents / Autres accidents — AE 139-146
- Suicide — AE 147
- Respiratory diseases / Maladies respiratoires — A 89-96
- Cirrhosis of liver / Cirrhose du foie — A 102
- Lung cancer / Cancer du poumon — A 51
- Breast cancer / Cancer du sein — A 54
- Gastro-intestinal cancer / Cancer gastro-intestinal — A 46-49
- Cancer of the uterus and ovary / Cancer de l'utérus et de l'ovaire — A 55, 56, 58D
- Leukemia / Leucémie — A 59
- Coronary heart disease / Maladies coronariennes — A 83
- Cerebrovascular accident (stroke) / Maladies cérébrovasculaires (congestion cérébrale) — A 85
- Other arteriosclerotic diseases / Autres formes d'artériosclérose — A 86
- All other causes (each causing less than 5% of deaths within each sex and age group) / Toutes les autres causes (responsables individuellement de moins de 5% des décès dans chaque tranche d'âge et de sexe)

Scale (number of deaths) **Echelle** (nombre de décès)



d: number of deaths by sex and age
nombre de décès suivant l'âge et le sexe

p: population by sex and age (000's)
population suivant l'âge et le sexe (en milliers)

Notes

1) — In each circle major causes of death are arranged in decreasing order of magnitude.
— Dans chaque cercle les causes principales de décès sont indiquées par ordre décroissant.

2) — The area of each circle is proportional to the number of deaths in each sex and age group. (The death rate can be calculated using the two figures under each circle).
— Les surfaces de chaque cercle sont proportionnelles aux nombres de décès de chaque tranche d'âge et de sexe. (Les taux de décès peuvent être calculés en utilisant les deux nombres figurant sous chaque cercle).

Based on:
Vital Statistics,
1971, Catalogue 84-201,
Statistics Canada

Basé sur:
La Statistique de l'Etat Civil,
1971, Catalogue 84-201,
Statistique Canada

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Senator McGovern. We have three additional distinguished witnesses. I think Dr. Cooper has convinced us to cut down on food intake, so I am going to forego lunch today and I hope these other witnesses will be willing to at least defer lunch.

I would like to call all three of them as a panel. Dr. Beverly Winikoff, Dr. Jerry Knittle, and Dr. Philip R. Lee.

If it is agreeable with the witnesses, I think we will ask each witness to open with a 10-minute statement of the matters that they regard of greatest importance and defer the questioning until all have been heard.

Let's begin with Dr. Winikoff, and then move to the other witnesses.

I do want to apologize for keeping you waiting, but I think you can see we were in a very important discussion with Dr. Cooper, and we are very anxious now to hear additional information from each of you.

STATEMENT OF DR. BEVERLY WINIKOFF, ASSISTANT DIRECTOR FOR HEALTH SCIENCES, ROCKEFELLER FOUNDATION, NEW YORK, N.Y.

Dr. Winikoff. Thank you very much for the privilege of appearing before you today. I am happy to add in whatever way I can to the discussion on nutrition and preventive health care. As a citizen and a health professional, I am very gratified to see that our Government, at the highest levels, is taking the time and effort to explore this subject, so very important for the "quality of life" of all Americans.

My name is Beverly Winikoff. I am a medical doctor and received my training at New York University Medical School and the hospitals at the University of Colorado, in Denver. I studied public health at Harvard University where I received a master's degree in public health and worked with Dr. Jean Mayer as a research fellow in nutrition.

At present, I am employed as assistant director of health sciences at the Rockefeller Foundation, where I work in the area of human nutrition and public health.

I am currently in the process of editing a book which studies the relationship between government policy and the nutritional status of populations. During the course of my work, I have had the opportunity to review both nutrition projects and nutrition literature from the United States and many other parts of the world.

I. Relationship of Health, Nutrition, and Medical Science

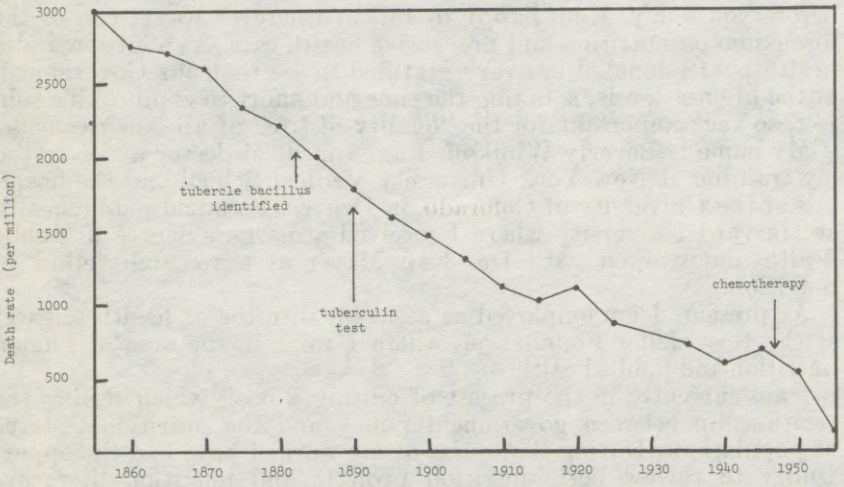
Since ancient times, it has been recognized that good nutrition is central to good health. Folk remedies for curing illness, maintaining health and increasing strength have long been associated with food items in the minds of both the public and professional healers. The expression, "We are what we eat," is a simple formulation but contains a core of truth. The internal environment of our bodies, as important to our physical well-being as its external environment, is created and maintained by the quantity and quality of the substances we con-

sume. The immune system, the blood, the fluids which bathe our tissues, as well as most tissues themselves, are dynamic systems whose functions can be markedly altered by the nutrients available to the body.

In recent years, scholars have looked at the relationship between nutrition and health in a more systematic manner. Their findings have been provocative and fascinating. Among other things, there is good evidence that the dramatic drop in mortality rates of industrializing Europe during the last century was due more to improvements in nutrition, to the availability of good diets, than to advances in science, to breakthroughs in preventive and curative medicine, or to availability of hospitals and health care.

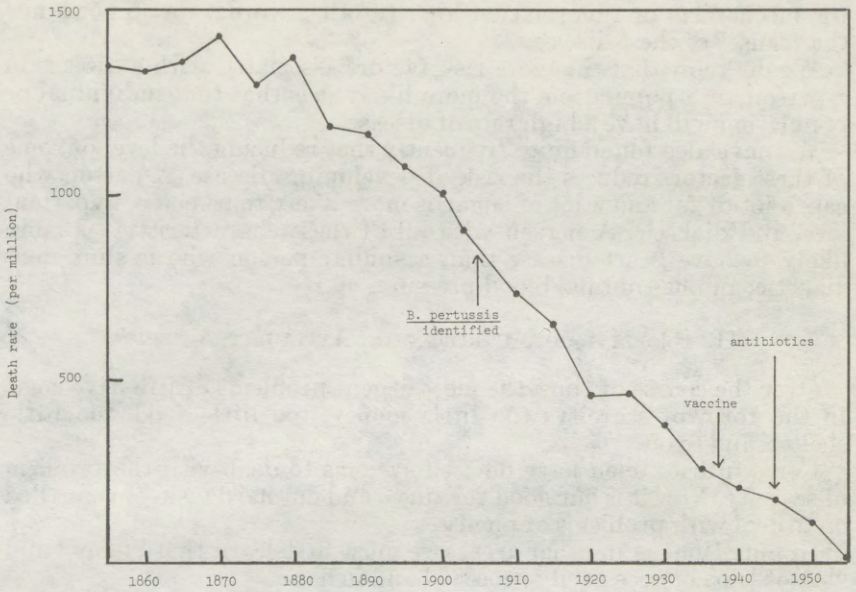
This pattern has been shown in early statistics in New York City, and it seems likely that it could be demonstrated in developing parts of the world today.

In fact, it is strikingly apparent that technical medical advances had little or no impact on the decline in death rates from major killing diseases such as tuberculosis, diphtheria, scarlet fever, and measles. At the same time, the modern increase in life expectancy, of which medical science has been so proud, has come, by and large, from decreased infant mortality—and represents virtually no gain at all in the life expectancy of those who survive the first few years of life.



Mean annual death rate from respiratory tuberculosis, England and Wales. Showing that medical advances produced virtually no change in the existing fall in death rates.

Source: Edward H. Kass, "Infectious Diseases and Social Change," *J. Inf. Dis.* 123(1): 110–114, January 1971.



Mean annual death rate from whooping cough in children under 15 years of age, England and Wales. Showing that medical advances produced virtually no change in the existing fall in death rates.

Source: Edward H. Kass, "Infectious Diseases and Social Change," *J. Inf. Dis.* 123(1): 110–114, January 1971.

Thus, it appears that better living conditions—including housing, sanitation, nutrition, and so forth—are largely responsible for improvements, to date, in the overall longevity of Western populations.

It has become clear, in fact, that diseases are not simply caused by outside influences, but have a complex history determined by an interaction between the body's inner environment and the stresses of the outer environment. This seems to be the case not only for the older scourages of mankind, diseases, by and large of infectious origin, but also for the diseases which plague modern industrial society: heart disease, cancer, diabetes, stroke, and the chronic debilitating diseases. Arteriosclerotic disease, diabetes, hypertension, and cancer together account for close to two-thirds of all deaths in the United States today. Heart disease alone killed over one-third of all the people who died in this country in 1973. The medical bill to our Nation is staggering and the price in disability, time lost from work, and productive lives cut short is even higher.

We have found a host of nutritional factors which are intimately related to each other and to the rates of certain of these serious, common, and often fatal, diseases.

Some of the most frequently implicated dietary factors in relation to those major killers are obesity, overconsumption of animal fats, overconsumption of sugar, overconsumption of salt, and underconsumption of crude dietary fiber.

The key to assessing our knowledge in this area at this point is the epidemiological concept of risk. We have been able to understand quite clearly that certain patterns of eating are closely related to certain statistical levels of disease in populations. We do not, however, know

the mechanism of this relationship: In other words, we do not know the "cause" of these diseases.

We do know that the more risk factors associated with a disease in a person, or a population, the more likely it is that that individual or population will have a high rate of disease.

We have also found quite frequently that reducing the level of some of these factors reduces the risk of developing disease. A person who eats a lot of fat and a lot of sugar is more likely to be obese, hypertensive, and diabetic. A person with all of these characteristics is more likely to have heart disease than a similar person who is slim, nondiabetic, and has normal blood pressure.

II. Problem of Nutrition in Affluent America

Over the course of time, the most urgent problems of life have come in the form of scarcity: too little money, too little food, too little shelter, and so on.

For centuries, men have devised systems to deal with the problem of scarcity. Now it is our good fortune—and our hard task—to be called on to deal with problems of plenty.

In nutrition, as in other areas, we must first learn that "more" and "better" do not necessarily proceed hand in hand.

A. OBESITY

With increasing affluence, we have also increased our body weights. Obesity is probably the most common and one of the most serious nutritional problems affecting the American public today.

Over 30 percent of all men between 50–59 are 20 percent overweight, and fully 60 percent are over 10 percent overweight. About one-third of the population is overweight to a degree which has been shown to diminish life expectancy. For unknown reasons, in the United States, this type of malnutrition is a more common burden among the poor than among the more wealthy.

Obesity has the effect of increasing blood cholesterol, blood pressure and blood glucose levels. Through these effects, it is an important risk factor for coronary disease.

Reduction in obesity improve the condition of hypertensives and diabetics, and thereby reduces the risk of heart disease and stroke. Data from the Framingham study examined by Ashley and Kannel in 1973 indicate that each 10 percent reduction in weight in men 35–55 years old would result in about a 20 percent decrease in incidence of coronary disease.

Conversely, each 10 percent increase in weight would result in a 30 percent increase in coronary disease.

In light of the fact that close to 700,000 Americans die of coronary disease every year, the staggering implications of these figures become apparent: if a 20 percent decrease in incidence did occur throughout the population and were reflected in a 20 percent decrease in overall mortality, about 140,000 lives would be saved per year. Since at least one-half the coronary deaths—about one-third of a million—occur before reaching a hospital, prevention is not only cheaper, but clearly more effective than cure.

The medical aspects of the problem of obesity are complex. Its causes are not well understood, although it is clear that the mechanism is an imbalance between consumption of calories and utilization of calories.

In other words, obesity represents a situation in which more food is eaten than is needed for body fuel. The role of heredity and the role of environment remain to be clarified further. It seems that both are involved, and, while we have little control of heredity, we can change our environment.

It now appears that fatness in later life may be determined by feeding practices during childhood. It is clear that children who become fat have a very much higher than average likelihood of being fat adults.

Obesity in children seems also to be associated with early onset of diabetic tendencies—one of the important risk factors for premature death. Yet, while it is notoriously difficult to make a fat adult into a thin one, it may not be so difficult to prevent a thin child from becoming a fat one.

What should be said, then, about the most frequent American pattern of infant nutrition? Most of our babies are artificially fed from birth, and solid foods are introduced early. Such feeding patterns result in babies which grow bigger, faster, and fatter than breast-fed babies.

Are we, then, producing the next generation of obese in their cradles? Are we leaving our children a legacy of heart disease, diabetes, stroke, and hypertension to be evidenced 50 years from now?

When we talk about reducing risk factors we must think not only of getting today's fat people to be thin, but of making sure that tomorrow's people never get fat in the first place.

B. CHANGING DIETARY PATTERNS: FAT, SUGAR, FIBER

In general, as Americans have become more affluent, the overall pattern of our adult diets has changed as well. We have increased our consumption of fats, particularly of animal origin, and of sugar, and decreased our consumption of dietary fiber. These alterations in dietary pattern have been implicated in increased risk of heart disease, diabetes, stroke, and possibly several forms of cancer as well. Thus, in living the better life we are, ironically, exposing ourselves to greater health risks.

1. Fats

Steak, ice cream, hamburger, butter, cream, all of these, when substituted for foods of vegetable origin in the American diet, increase the risk of ill-health.

Yet, we Americans identify "eating well" with eating foods of animal origin. It is true that these foods are excellent sources of protein, minerals and vitamins. It is also true that restricted access to animal food makes many populations poorly nourished.

But with too much animal food we may be poorly nourished as well. In addition to increasing blood cholesterol and the risk of heart disease, high levels of meat consumption are associated with high rates of colon cancer and fat consumption is associated with breast cancer on a population basis.

More research is needed to understand this association, but it is clearly possible that diet alters the metabolism of potential carcinogens or alters the body's mechanism for defending against malignant change.

2. Sugar

We also seem determined to satisfy a national sweet tooth. We eat sugar in almost every prepared food we buy, and in almost every snack we consume. The growth in the fast-food industry has increased the consumption of sugar in hidden quantities because we do not really know what we are eating in many precooked foods.

Excess sugar consumption leads to dental caries—a large item in the American dental bill—and to increased risk of adult-onset diabetes, which, in turn, increases the risk of premature death. There is some evidence that high sugar consumption tends to raise blood pressure, and of course, it may also be associated with obesity and all the risks of the condition.

3. Fiber

Related in an interesting way to increased consumption of fats and sugars is a decrease in consumption of dietary fiber. This fiber is found in relatively less processed foods, primarily in grains, fruits, and vegetables, in association with complex, unrefined, carbohydrates.

Fiber is not absorbed by the human body, but increases the bulk of contents in the intestinal tract. On a population basis, the decrease in fiber consumption is related to higher rates of inflammatory diseases of the colon—such as diverticulitis—cancers of the colon and rectum, appendicitis, and hemorrhoids, as well as to arteriosclerosis and diabetes.

The presence of fiber in the diet may be a protective factor in the prevention of the diseases listed above.

Moreover, the decrease in fiber consumption may be directly related to the simultaneous increase in consumption of sugars and fats. The basic pattern of Western dietary change has been a switch from bulky foods of low caloric density and more indigestible fiber to refined food with relatively high caloric density, such as the "pure" calories from sugars and fats.

Since low-bulk, low-fiber diets are easier to chew and swallow, give less satisfaction per calorie eaten, and are very pleasing to the American palate, this diet pattern may easily lead to overconsumption of food and, hence, overweight.

C. SALT

Another aspect of the American diet is high level of salt consumption. Increased salt intake is very strongly correlated with increased blood pressure, and increasd blood pressure, in turn, is highly correlated with death from heart disease and stroke.

While there are effective medicines for lowering high blood pressure, there is no cure for this problem. Medicines must be taken daily and health workers have found that it is exceedingly difficult to identify all those who suffer from high blood pressure, diagnose, treat, and stabilize their condition in a systematic way. How much better it would be if we could prevent the development of hypertension in the first place.

D. DIET IN PREGNANCY

Finally, it is important to note one further area in which nutrition is of central importance to health. It now seems certain that the nutrition of mothers affects the future health of their children in ways not suspected only a few years ago. Poor diet during pregnancy results in a larger number of small babies, and small babies are the babies who die, disproportionately, early in life.

Those who study health care in this country have long lamented our poor showing in infant mortality statistics. In fact, in the United States, we have two kinds of infant mortality. We have the infant mortality of white babies which is comparable to that in many other industrialized Western nations. But we also have an infant mortality rate of nonwhite babies, and this mortality rate, while it has improved markedly in the last decade, remains more than 1½ times the mortality rate for white babies.

Nutritional evidence compiled recently suggests very strongly that most of the difference in these mortality rates can be accounted for by the larger numbers of low-birth-weight babies born to nonwhite mothers.

Rush, Davis, and Susser estimated that if nonwhite mothers produced small babies as infrequently as white mothers, the two infant mortality rates would be almost the same.

It has been shown in some populations that simply feeding mothers more calories when they are pregnant will reduce the incidence of small babies by up to 50 percent. The suggestion then, is that a forward-looking nutrition intervention strategy could reduce a large proportion of the difference in white and nonwhite infant mortality rates simply by feeding mothers better.

Not to pursue such a program adds to the burden of life for the poor among whom these mothers of low-birth-weight babies are largely to be found.

III. Government Activity

A. POLICY

What actions, then, can our Government take to modify the research, health delivery, and education systems, in order to promote nutritional health?

Real attention to the problem of poor nutrition requires political leadership at the highest level of Government and extensive involvement in all sectors of Government activity, including, but not restricted to research, health delivery, and education. The nutrition of people is not affected only by what scientists know or by what doctors tell them, or even by what they, themselves, understand.

It is affected by decisions in the area of agricultural policy, in economic and tax policy, in export and import policy, as well as by decisions in almost every other area of activity with which the Government is concerned.

Nutrition is a complex subject which involves decisions of food production, transportation, processing, marketing, consumer choice, income, and education, as well as food availability and palatability.

Because nutrition involves so many areas of life and because it impinges on so many areas of production and consumption, many

groups have very strong interests either in maintaining or in changing the aspects of Government policy that bear on nutrition. For this reason nutrition is not simply a scientific issue: it is also a political issue and an economic issue.

This, I think, must be clearly recognized. And for this reason, also, I believe, it is imperative to have some person or group within the Government to look at the nutritional implications of various Government actions and proposed Government programs.

We need to know, for an obvious example, whose diet will change and in what way if food sales abroad are increased or decreased.

Other, even seemingly unrelated decisions on tariffs, taxes, or land use policy, could also have impacts on nutrition.

We have reached a level of sophistication at which our Government should be able to take nutritional implications into account when deciding on policy positions. If, in nutritional terms, we knew exactly what we were doing and to whom, we might, on occasion, choose to do things differently.

B. RESEARCH

Of course, there are still many areas in which further research is critically needed. And researchers, like others, tend to follow Sutton's law and go where the money is. I do not say this cynically, but merely note that when money is available for specified purposes, talented researchers will be found to undertake the work.

Several areas require deeper investigation:

1. We need to know more about the way risk factors are related to the causation of our common killing diseases.

2. We need to know more about the way in which changes in diet affect our overall health, and perhaps even our behavior.

3. We need to know, preferably beforehand, but certainly by monitoring and surveillance, what the effects are of food additives, preservatives, coloring, sweeteners, and a host of things which we eat every day and are unable to monitor for ourselves.

At a more basic level, we need to know more about:

1. The human requirements of diets as a whole,

2. The interactions of nutrient and nonnutrient substances in the diet,

3. The variability of requirements between individuals and within individuals.

We also need to learn what both the lay public and the professionals must understand in order to make the best use of existing scientific knowledge.

Some of the great untapped resources in our search for nutritional information can be found within current activities, such as food stamps, the WIC program, and school feeding programs. It strikes me as a real research tragedy that we are not, at present, using these opportunities to glean more operational information about diet change as well as about the nutritional and health results of these different types of programs. We have a potential goldmine of information but have been lagging in efforts to build evaluation and monitoring into this existing network of Government efforts.

These data plus the volumes of statistics collected in previous Government surveys and private projects need to be used more effectively,

thoroughly, and systematically. We can learn a lot more from what we already have in hand.

C. HEALTH DELIVERY SYSTEM

It is clear that the health delivery system has a major responsibility to use scientific knowledge toward the promotion of better diets for Americans. Obviously, professionals themselves need to learn about nutrition in order to communicate accurate information. For this reason, of course, professional education should include greater inputs from nutritional science.

In order to spend time on nutrition in patient care, however, health professionals need to be given good reasons for doing so. Incentives can be related to:

1. The organization of health services themselves,
2. The prestige accorded to nutritional information—currently quite low within the medical profession, and,
3. The economic reward for using professional time to impart nutritional information.

The health care system could function to improve the nutrition of pregnant women in poor communities by offering nutrition and food services in an integrated way together with all prenatal care programs.

In addition, such programs and all obstetrical programs must include greater emphasis on and encouragement of breast feeding, since there is no commercial advocate for this traditional and superior mode of nourishing the young. All multiservice medical facilities should offer special nutrition services and physicians should learn, from medical school on, to make use of referrals to these services as they would to other specialists.

In addition, specialty boards within the medical profession in fields such as internal medicine, pediatrics, obstetrics, and family practice, must emphasize the importance of nutritional information in training programs and require that their diplomats display competence with such knowledge.

Emphasis by these prestigious boards would help to enhance the stature of nutritional information within the medical profession itself.

On the economic side, it should be possible to structure a system of compensation in which the professional who spends time with a patient in efforts at disease prevention, including diet change, receives reimbursement more closely equivalent to the fees of those who cure the already-sick by prying, poking, testing, and cutting into them.

In other words, we have to build some incentives for the professionals into our system of preventive care, just as we must build incentives for health-promoting behavior into the marketplace for our consumers.

D. EDUCATION

This brings us to the topic of public education in nutrition. I do believe that people should know about nutrition and their health, of course. But I also believe that people should be able to act, without undue obstacles, in accordance with the information that they learn. New knowledge must result in new behaviors if public education is to have real impact.

The problem of education for health, as it has been practiced, is that it has been education in isolation, not to say oblivion, of the real pressures, expectations, and norms of society which mold and constrain individual behavior. I believe that it is useless, maybe cruel, to educate people and then to make it difficult for them to do what you have taught. Effective education must be accompanied by policies which make it easier, indeed likely, that an individual will change his or her lifestyle in accordance with the information being offered.

At present, we see a situation in which the opposite is the case. We offer nutrition and health education at the same time that we offer barrages of commercials for soft drinks, sweet snacks, high-fat foods, cigarettes, and alcohol. We tell people to stop smoking, and we subsidize the production of tobacco. We put candy machines in our schools and cigarette machines in our offices. The American marketplace provides easy access to sweet soft drinks, high-sugar cereals, candies, cakes, and high-fat beef, and more difficult access to foods where saturated fat has been replaced by unsaturated fat, and to lean meat products. Yet, this trend might be reversed by specific agricultural policies, pricing policies, and marketing policies.

In truth, there must be some coordination between what people are taught to do and what they can do. I do not think it is appropriate to expect the public to swim upstream against powerful currents of commercial information and socioeconomic pressures.

It has been said that since diet is a personal choice, people are to blame individually if they eat the wrong things. This is only a half-truth, in fact, and must be balanced against the awareness that almost everything conspires against the person who wants to eat differently from the average high fat, high sugar, low fiber American diet. If Government desires to help people make the right choices for better health, those choices must be made easier, not more difficult.

Let us take as an example the prevention of early obesity, so detrimental to later health. To decrease the prevalence of this problem it would help to encourage more American mothers to breast feed. We can educate the people, we can educate physicians, nurses, midwives, and other medical personnel—all of which will be necessary. But it will also be necessary to encourage the institutional arrangements whereby the working mother can nurse her child. This can be accomplished by the establishment of day-care centers at or near places of work, or by encouraging employers to offer flexible working hours for nursing women. As an area of policy this may seem far from nutrition, but as a practical matter, it is not.

This type of consideration is central to nutrition, because without providing an environment in which nutritional knowledge can be used, education is empty. In the 19th century, respected people thought the poor were dirty, diseased and degenerate because of their own bad genes, stupidity, laziness, and poor life choices. Now we realize nobody chose to be poor and sick or inherited filth and degeneracy. Education on the use of soap and water wasn't enough. People needed income, housing, food, and work. Let us not make a parallel mistake in ascribing our current nutritional problems to the ignorance either of the professionals or of the consumers. I am convinced that Americans do not choose heart disease, stroke, diabetes, cancer, and low-birth-weight babies. In addition to information, however, we must give people the

means of changing their lifestyles without, at the same time, having to do battle with an entire socioeconomic system.

Senator McGovern. Thank you very much, Dr. Winikoff, for your statement.

Dr. Knittle, we are happy to have you with us and will hear from you now.

STATEMENT OF DR. JEROME L. KNITTLE, DIRECTOR, NUTRITION LABORATORY, MOUNT SINAI HOSPITAL, NEW YORK, N.Y.

Dr. Knittle. Strictly speaking, all diseases have a nutritional component since the nutritional status of a patient will have an impact on the outcome of any medical affliction or surgical procedure. However, today I would like to focus your attention on a metabolic disorder in which nutrition plays a more obvious and integral role, both in its treatment and prevention. I have selected this disease because it represents what I feel is the future challenge of research in nutrition and differs from previous concepts of the classical nutritional diseases of the past.

Historically, research in nutrition has focused its attention on disease states in which one can identify an easily measured micro- or macro-nutrient which produces a specific acute and clearly defined disease by either its lack or overabundance. However, today we are faced with the more complex task of dealing with nutritional problems that are multifactorial in origin, require long incubation periods to develop and do not readily lend themselves to usual reductive techniques. One such example is overnutrition, which has plagued physicians since the time of Hippocrates and yet is still the most common form of malnutrition confronting physicians in the United States today. It is at once the simplest and yet most complex of disorders to treat; simple, in that, in the adult, all that is required is caloric restriction, and complex, in that cellular, metabolic, socioeconomic, cultural and psychological factors all mitigate against the maintenance of the reduced state. Attempts at producing meaningful long-term cures have by and large been impossible to achieve. No one regimen can be successfully applied to all subjects as they represent a wide spectrum of differing genetic, metabolic, morphologic and psychologic types. This has lead to a great deal of confusion in both the treatment and study of obesity since it has been difficult to precisely define the groups under treatment and/or investigation.

For example, the use of body weight alone is not a sufficient measure since total body weight is made up of a number of component parts. Thus, an individual can be overweight relative to some arbitrary standard by virtue of increases in bony structure, musculature or fat tissue. This is of more than academic interest since recommendations for the daily intake of calories and/or other nutrients are currently based on total body weight which includes fat. The fat component varies from one individual to another and does not partake of metabolic processes. If the fat depot is expanded or reduced, it would result in gross miscalculation of minimum needs for a host of nutrients.

At present we lack meaningful standards for normal and/or abnormal variations in body composition based on sex and age. Thus, while one can readily identify extreme degrees of excessive adiposity, one

cannot clearly define what minimum degree of adiposity constitutes a pathophysiologic state. That the truly obese state is pathological is generally agreed upon. It is associated with, and increases, the complications of a number of life-threatening conditions including among others, coronary and cerebral artery disease, diabetes mellitus, hypertension and hyperlipoproteinemia. Mortality figures indicate that obese patients have a shorter life expectancy and are subject to more surgical and obstetrical complications, including death, than their nonobese counterparts; indeed, abnormalities in the obese state have been reported in almost every bodily function.

However, despite a high degree of awareness of these dangers by both the lay and medical communities, prevalence rates continue to remain high. Recent evidence suggests that prevalence rates are on the increase and occurring in younger and younger age groups. Nutritional surveys conducted in the Nation and in the New York City area have revealed rates ranging from 10–13 percent in children. By the time adolescence is reached, rates of 20–30 percent are encountered. Similar prevalence rates have been reported for college freshmen, indicating that childhood and adolescent obesity serve as reservoirs for the development of obesity in later life.

The importance of early factors in the development of obesity in later life is further underscored by the fact that 80 percent of all overweight children remain so into adult life. It has also been demonstrated that children who are overweight at 6 months of age are on the average 9 pounds heavier at age 5 years than those who were of normal weight at 6 months.

Thus, it is becoming increasingly clear that the final stage of obesity is the result of numerous factors (metabolic, psychologic, genetic), interacting over many years. Once the overt clinical state is achieved it is exceedingly difficult to treat. This is due to the fact that the dietary and/or other interventions are instituted at a time when the morphologic, metabolic and psychologic factors which contribute to the obese state are well established.

The emphasis on weight loss alone is misplaced. Millions of dollars are spent annually by both the lay and scientific communities to provide "cures" based on more efficient modes of weight loss. The obese subject is exposed to a multitude of dietary miracles, pills and/or other procedures that are merely variations of one form or another of caloric restriction which do not alter the natural history of the disease.

Thus, the obese subject spends most of his time either losing weight or regaining it, but never achieves the ideal of losing weight and maintaining the reduced state. To attain this end he must resign himself to caloric restriction for the remainder of his life. This is a most difficult task to perform and sooner or later relapses occur.

Obviously, newer approaches to the problem are needed that will focus upon the prevention of this disorder. At present, even the results of dietary treatment of obese children are no better than that achieved in adults. This is due to the fact that one encounters bizarre feeding patterns and maladjusted mother-child interactions that are well established by the time the obese child is brought to the attention of the physician.

Our laboratory has demonstrated that aberrations from normal adipose tissue cellular development can be detected in obese children

as early as 2 years of age. Clearly, one must focus on the earliest periods of development if successful programs for the prevention of immutable obesity are to be established.

Unfortunately, too few facts and all too many "theories and myths" can be found regarding the relative importance of a variety of early nutritional interventions on the development and/or prevention of the obese state.

We need to know more about the pathogenesis of this condition and the factors that contribute to the growth and development of fat depots in man. Is there a genetic obesity? Are there obesity-prone individuals? If so, can we identify them prior to the development of the overt clinical state? One has merely to look about the room to see that biologic variation in fat content and distribution occurs in man. We need to know more about the effects early nutritional factors have on the development of obesity in the child? What is the effect of neonatal food intake, qualitative and quantitative, on subsequent adult weight?

Much confusion exists in the study of the effect of maternal nutrition on the development of obesity because we lack precise definitions and classification of the qualitative composition of weight gain during pregnancy. Merely measuring weight gain is not sufficient since weight gain can be the result of either fat, protein or water. This information is urgently needed since the effects of weight gain prior to or during pregnancy may vary drastically in terms of their effect on metabolic function and development of the fetus in women with similar weights but vastly different body compositions and metabolic function.

Another area of concern is the proportion and type of dietary fat in the maternal diet. In general, pregnant women are told to increase their caloric intake about 200 calories over their pre-pregnant intake and to ingest approximately 30 percent of calories as fat. Little is known about the metabolic consequences related to such diets.

Too few studies related to overnutrition during pregnancy have been performed. One recent study by Fisch, et al., indicates that the weight of the mother is important. They found a high positive correlation between maternal weight and weight gain during pregnancy and the development of obesity in children at age 7. It is also known that the probability of obesity occurring in a child increases remarkably if one parent is obese and even more so if both are. The degree to which this is under genetic control or modifiable by environmental factors is not presently known.

The effect of maternal food intake and weight increase on subsequent infant body weight will obviously vary depending upon the time it occurred, its duration, what the limiting or excessive nutrient is, the functional capacity of the placenta and the degree to which maternal nutrients are available to and utilized by the fetus.

We do know that metabolic factors can contribute to excessive adiposity. Infants born to diabetic mothers are heavier at birth, are relatively fatter and have a higher rate of subsequent obesity than infants of nondiabetic mothers of equal gestational age. It has been suggested that this phenomenon may be the result of long exposure of the fetus to hyperglycemic states resulting in the deposition of excessive adipose tissue. Adipose tissue cellular studies in our laboratory have also demonstrated an increased cell number in these children.

It is well known that the deposition of fat in the fetus occurs in the

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last trimester of pregnancy and is accelerated particularly in the final 37th to 40th week. In infants of birth weights between 3.0 and 3.2 kg. the difference in weight is mainly a function of the deposition of fat. Thus, a rise in blood sugar and hormones related to glucose and fat metabolism due to ingested calories by the mother could serve as an important substrate for the synthesis of fat during this critical time period. This is particularly true in obese women, many of whom have normal glucose tolerance prior to, but become class A diabetics, during the pregnant state.

The question of the effect of overnutrition during early neonatal life on subsequent obestity in adult life has recently received a great deal of attention. Vociferous advocates can be found both pro and con. As with the study of maternal nutrition, the arguments are based on retrospective studies of the general population and are filled with numerous correlations but little in the way of direct causal prospective studies.

Studies of caloric intake during infancy in America, and New York City in particular, indicate that infants are ingesting more calories and protein than the recommended dietary allowances and that the introduction of solid food is occurring at earlier and earlier ages. Do these practices and trends in infant feeding contribute to the growing prevalence of obesity in industralized Western nations? The prevention of obesity may require alterations of eating habits, especially in the earliest neonatal period. However, this postulate still remains to be proved.

Investigations of normal bottle-fed babies in the general population have revealed a wide range of intake when infants are allowed ad libitum feedings. Food intake varies and depends upon a number of factors such as total energy requirements, appetite, food composition and taste, disease states, physical activity, growth and the extent of fat deposition present as a reserve for energy needs. Thus, a normal placid infant can consume as little as 70 K calories/kg. of body weight whereas a more active child can ingest as much as 130 K calories/kg. or more.

In addition to total caloric intake and type of calories supplied, the caloric density of infant formulae appears to be critical. Thus, it appears that one can alter the degree of weight gain and adiposity in neonates by a number of manipulations of early food intake.

Finally, we need to know more about the early psychologic factors that may result in excessive intake and obesity. Are there pathologic parent/child interactions that contribute to altered feeding behavior?

Although I believe the prevention of obesity should be a major research effort in the field of nutrition, a similar case can be made for other nutritionally related disorders. These include diabetes, coronary artery disease, hypertension and alcoholism, which have three basic similarities.

1. In all these disorders one recognizes biologic variation. All eaters do not become fat, all consumers of saturated fat do not get coronary artery disease, all drinkers do not become alcoholics, et cetera. We need, therefore, to compile more data related to a wide range of individual needs rather than relying on so-called normal requirements; that is, we need to develop the concept of individual optimal nutrition.

2. They are all multifactorial, i.e., the end result of genetic, metabolic, environmental and psychologic factors. Thus, they do not

readily lend themselves to the usual reductive reasoning in which one simply changes one factor, holding the others constant. Changing one factor radically alters all the others. It is naive to argue that any one particular factor is causative or remedial in any of these disorders.

3. All have long incubation periods. Thus, the implementation of any preventive programs is difficult since it involves altering human behavior now in a relatively healthy individual for a possible future pathological event.

In summary, I would recommend the establishment of nutritional programs that concentrate on the earliest periods of human development and which will take into account the total nutritional environment while keeping in mind individual variations in response. We must not be frustrated nor pessimistic because such programs are more complicated and less dramatic than traditional research in deficiency states or the care of, for example, an acute myocardial infarction. Surely, current programs are costly and inadequate for the task and they rely on treatment after the fact. Multidisciplinary approaches must be developed that will truly encompass the efforts of a wide variety of mutually and wholeheartedly interested investigators in the field of prevention.

Recently we have witnessed a remarkable accomplishment in space exploration on the planet Mars. While viewing the television reports I was struck by the remarkable degree of coordination among such diverse disciplines as astronomy, geology, chemistry, bacteriology and engineering. It was stated in the interviews that the investigations into space were initiated in order to gain an understanding of the origins and development of our solar system so that we might better understand our own planet's past and future development. Surely, no less an integrated approach is necessary for the study of the intricate and complex interaction of nutrition on human development in order to understand the pathogenesis of related diseases and to formulate future approaches for preventive therapy.

Thank you.

Senator PERCY. You mentioned alcoholism. How do you relate alcoholism to this?

Dr. KNITTLE. One of the major factors in alcoholism is malnutrition and the lack of food intake in alcoholism may contribute to the cirrhosis which we see in alcoholism. I was using alcoholism as a form of intake since it has a biological variance. All drinkers do not become alcoholics; all eaters do not become fat, et cetera.

Senator PERCY [presiding]. Doctor, I think we are running very late on time. It is very excellent testimony.

Dr. Lee, I have read your excellent statement. It will be incorporated in full in the record. If you would like to summarize it in any way, it would have a little time, so we may have time left for questioning. I think that might be a good idea at this stage.

STATEMENT OF DR. PHILIP R. LEE, DIRECTOR, HEALTH POLICY PROGRAM SCHOOL OF MEDICINE, UNIVERSITY OF CALIFORNIA, SAN FRANCISCO, CALIF.

Dr. LEE. I will just emphasize several points.

Dr. Winikoff mentioned the importance of nutrition in the improvement of the health status of the people in Europe and the United

States in the 18th 19th and 20th centuries. That change in nutrition was not only important, it represented the most significant change in human health in 10,000 years, and it is still the single most important factor in human health.

In many developing countries, of course, they haven't reached the stage where they have an adequate basic diet. With the development of an adequate diet in the western industrialized countries, we saw dramatic declines in infectious diseases long before there were any improvements in either the diagnosis or treatment of those diseases. As a matter of fact, some of the decline began even before we had a theory of disease that bacteria were a cause of disease.

The second important point in my testimony submitted for the record relates to health-related behaviors. You discussed that with Dr. Cooper and Senator Kennedy mentioned the studies that Dr. Breslow has done. Doctor Breslow and his colleague Nedra Belloc found out that seven health-related behaviors have more impact on our health than all of the developments in medical care since the turn of the century. Of those seven behaviors, four are related to nutrition: Limiting alcohol consumption to one or two drinks a day; eating three meals a day without eating between meals; eating breakfast; and keeping our weight within a normal range. The other three behaviors are: regular physical exercise, 7 or 8 hours of sleep; and not smoking cigarettes.

For a white male age 45 who follows those seven behaviors, he will live more than 11 years longer than a 45-year-old male who follows three or less of those behaviors. All of the improvements in medical care since the turn of the century have added less than 4 years of life expectancy to men of age 45, so we can see the importance of nutritional behaviors as it relates to the health and life expectancy.

In the testimony submitted for the record, I reemphasize the points everyone has made about the relationship of nutrition to our major disease burdens today: coronary artery disease, obesity, cancer of the gastrointestinal tract, diabetes mellitus, hypertension, hyperactivity in children, anemia, osteoarthritis, alcoholism. I also stress the importance of maternal malnutrition and infants' malnutrition as probably a principal cause of the high infant mortality in the United States, because this produces low birth weight babies. The low birth weight babies in this country account for approximately two-thirds of our excess infant mortality. Programs like the WIC program, if properly carried out, providing adequate diets not only during pregnancy but between pregnancies it would have a dramatic impact on infant mortality. Adequate maternal nutrition, more than all of the pediatric intensive care units and the other things we are doing to reduce infant mortality.

I also emphasize the points that Dr. Winikoff made regarding the changes in the dietary habits of the American people during this century. We are eating much more animal fat; we are eating much more refined sugar; we are eating more calories with less food value. We are eating much less fiber. All of these things are very important with respect to the disease patterns that we now suffer from.

Finally, I discuss a series of recommendations, for the select committee in terms of the areas that the select committee should be considering: maternal and infant nutrition, the relationship of diet to coronary artery disease, cancer and other diseases. Finally, I made

recommendations relating to a series of Federal programs; the importance of nutrition surveys and surveillance and making the data available to State and local health departments in a useful form. We collect some of the information now, but it is not useful at the local level. It is on a national sample basis. We need to have it collected in a fashion that can also be useful for local programs, to meet targeted needs.

I also stressed the need, as everyone has, for expanded research, and for expanded nutritional educational programs. We get virtually all of our nutrition education through commercial channels in a food-for-profit industry, and that does not provide us with the information that people need to make an informed choice about a health-promoting diet.

Thank you.

Senator PERCY. I think your last sentence really in a sense summarizes the whole intent and purpose of this committee. We have tried to provide a forum through public hearings in the U.S. Senate to provide the technical guidance and advice that the public needs to offset the day-by-day pounding and drumming of commercials that condition us from as early as 2 or 3 years of age, to eat what we are told to eat, whether it is good for us or not.

I certainly respect very much the fact that the media have increased its attention to this area. There are now nutritional editors and journalists, not only for the major papers but also for the television networks and stations. They are increasing their coverage in a way which helps to offset the fact that we do live in a commercialized society. We believe in it, but we also feel that it doesn't always promote the best diet. The best purchases at the store are not necessarily the ones that are the most heavily advertised.

Doctor?

Dr. KNITTLE. I have an addendum to that.

I think the reason people go to either TV or nutritionists writing in magazines is that we have really not educated the doctors in the area of nutrition. There are no curricula in nutrition per se in any medical school today. Whatever nutrition is given is given usually in the first and second year that is in the preclinical years, and is given as a form of biochemistry not in the area of medicine. Practically nothing is done in the hospital setting with interns and residents. Indeed, the emphasis on treatment in hospitals does not make a suitable format for teaching nutrition, since nutrition takes into account a large area of the individuals' needs outside of the hospital.

Senator PERCY. Senator Humphrey, our witnesses have just finished their testimony, and we have not had any questioning yet.

I have a Republican policy luncheon that is going on now that I should join. So if I ask a few questions and then turn it over to you——

Senator HUMPHREY. Please go ahead.

Dr. LEE. For the sake of your good nutrition, you should go to lunch.

A good example of the point Dr. Knittle was making has to do with infant mortality. In the medical schools of the country, we are devoting tremendous resources to pediatric neonatal intensive care units to care for infants of mothers who were given inadequate nutrition counseling during their pregnancy. That is largely the fault of our neglect of nutrition counseling in health care. That, in turn, is due to the neglect of nutrition in medical education.

We are not devoting the resources to prevention, and it is a total turnaround of what we should be doing, both in terms of education and the kinds of services that we are providing.

Senator PERCY. The question was asked of Dr. Cooper by, I believe, Senator McGovern, as to whether or not nutrition is the most important component of preventive health care today. He didn't answer that in a positive, absolute way. Maybe it can't be answered in that way.

But, could I put that question to each of you? It has been said that nutrition is the most important component of preventive health care today. What is your judgment on that?

Dr. Winikoff?

Dr. WINIKOFF. Excluding accident prevention—and accidents are a major cause of preventable premature deaths of productive people in this country—I think nutrition is the single most important factor—especially if we include consumpton of alcohol.

Dr. LEE. I would say unequivocally that nutrition is the single most important factor in prevention of the killer disease in the United States. Proper nutrition is the single most important factor in adequate health for the people throughout the world. That is not to say that sanitation and health-related behavior and medical care are not important. But nutrition is the single most important factor, in my judgment.

Dr. KNITTLE. I think we have to think in terms of nutrition in two ways: one, in the strict medical sense, in terms of nutrition vis-a-vis specific disease; and nutrition as a general thing. We all eat. It is not really akin to alcoholism. We tell people to stop drinking alcohol, and we have some demonstrable success. We can't tell people to stop eating. So we are talking about an area that has more than a medical component.

But within the framework of medicine, I think it is very obvious that nutrition is a base for how an organism responds to any insult in any pathological condition. One would have to say, of course, it pervades every disease.

Senator PERCY. Several years ago we had all these breakfast cereals up before us. We found that tests on the cereals indicated that their nutritional value was really quite low. They provided bulk, but they weren't fortified.

Since then, the industry has really gone to work, as I understand it, and has fortified the cereals and reinforced them and added vitamins and so forth.

Would you want to comment on the breakfast cereal industry? Have they made progress? And are there any cautionary notices that we should put out?

Dr. WINIKOFF. I think they have made some progress in the sense of adding fortifying nutrients. However, there are obviously still problems with excessive amounts of sugar and other additives.

There is another aspect of the problem that I think should be noted: not every food has to provide 100 percent of the daily requirements of every nutrient.

The trend towards this type of product could potentially pose a problem, especially if every commercial enterprise tries to market its food as the total nutritional answer. People will then be eating hundreds and hundreds of times their total daily requirements, and no

one yet knows what problems may be associated with that dietary pattern.

I think therefore, there are two sides to the responsibility of industry: not to market nutritionally noxious products and not to use the aura of scientific nutrition to glamorize and popularize their products.

Dr. LEE. The program has been totally inadequate. For many of the cereals available that are eaten, particularly by children, the sugar content far exceeds what should be in those cereals. The refined sugars are added to the cereals. If you work at it, you can find excellent cereals. But it takes a lot of work, and the kids, of course, have been conditioned to demand the high-sugar cereals, the chocolate-coated, sugar-coated cereals. I think that the performance of industry has been far less than what it should be.

The education of the public on the matter is still seriously inadequate with respect to the importance of fiber contents in the cereals, particularly things like bran. There are good, nutritious cereals available. But others advertised more broadly, particularly to children, where the patterns get started.

Senator PERCY. I want to yield to my colleagues, and thank our witnesses very much indeed.

I have found after the committee's hearing on breakfast cereals that all our children, in particular my daughter, are much more natural foods people. They don't like all of these additives.

You would think they are all farmers. My daughter farmed at the University of California in Santa Cruz. They did organic farming, without chemicals.

My daughter also made all of our bread and cereals at home. I finally packaged up her granola and sent it out to Quaker Oats Co., gratis, with no royalty required. And they ran it through the laboratory, and they said it was pretty expensive. It contained high cost ingredients. But they have since come out with a very fine natural cereal product.

Natural cereals are not heavily advertised, I don't believe. Maybe it is because there is a very high cost involved in the contents of the cereal itself, which doesn't leave enough money for advertising.

But are those cereals, in your judgment, real progress?

Dr. WINIKOFF. No, not the so-called natural cereals. They taste good, I agree with that. But a lot of these products have a very high sugar content, which is what makes them tasty. Most all have honey, and honey is, after all, sugar.

Senator HUMPHREY. I love honey.

Dr. WINIKOFF. Many of the products have a lot of nuts and coconut and thus a high fat content. These natural cereals are very caloric, even in relation to other cereals.

I think you put your finger on one of the real problems with industry responsiveness to this type of nutrition testimony: they pick up catchwords like "natural," and then label anything that they want "natural." This sells the product because "natural" is supposed to be "good."

The implication is that the food is, as it were, endorsed by the health professionals in the country. I think this has to be very carefully watched because a lot of things slip in under "natural" which are not necessarily "good."

Senator PERCY. I will submit for evaluation a typical Percy menu.

Senator HUMPHREY. But how often do you eat at home? I am going to come back to that.

Senator PERCY. Not often enough—that is one of our problems in this life. But I always have breakfast.

Senator HUMPHREY. OK. I have to have breakfast.

Senator PERCY. Even if I come down here to a breakfast, I have breakfast at home first.

I will submit this menu for any of the witnesses who may want to comment on it. You have to be specific in this business.

I must say there is a terrific amount of guidance that is needed. If I ever felt the need for nutritional experts, I feel it now. We are wasting and squandering a lot of effort and money, and people are being misguided. It is a matter of education. We ought to do it in the schools, medical schools, and everyplace else.

Anyway you can help us with a legislative approach, taking into account the freedom of the individual to do what he really wants—he can eat himself to death if he wants to. Anything you can guide us with, we certainly would be more than appreciative.

Thank you very much for your presence today.

Thank you, Mr. Chairman.

Senator MCGOVERN. Thank you, Dr. Lee.

I want to apologize that I had to be out of the room while you were giving your statement, We have a lot of Girls' Nation and Boys' Nation people in town today and I had to make a brief appearance there.

But I know of your long-time expertise and the contribution you have made in the whole area of health, including the nutritional components.

I would just, in the interest of time—since all of you heard this long discussion with Dr. Cooper, summarize about four of the observations that I thought came out of that testimony and see if there is a general consensus on those among the three of you.

First of all, he made quite clear we need more emphasis in the medical communities on preventive medicine. That seemed to be a matter of crucial urgency in his testimony. Is that a view all of you subscribe to?

Dr. Lee?

Dr. LEE. Absolutely.

Dr. KNITTLE. Yes, I think in our testimony, the complete lack of medical school training is evident. I believe nutrition has a bona fide place in the curriculum in medical schools.

You can have all of the improvements you want in terms of cereals, in terms of eggs, et cetera, but when the real authority people go to; namely, the medical man says, "I really don't know," and you have to read it in the New York Times or Ladies' Home Journal, Vogue magazine, et cetera. Thus everyone has a new miracle diet and knows how to reduce.

If there were really miracle diets, we wouldn't need those publications.

I think people go to those areas primarily because the physician doesn't know.

Dr. WINIKOFF. I think it has to be emphasized that prevention has to be effective prevention—a lot of times money has been used in the name of prevention on things that are not preventive.

The recent article in the Sunday Times magazine section, is a good statement of the problems which will occur if prevention is promoted without sufficient forethought. The article points out how so-called preventive measures—such as annual physical exams—have mushroomed to the point where they are not as cost-effective as would be hoped.

Senator McGovern. Dr. Lee, I wonder if I ask you to just summarize from your own studies in grappling with this problem what steps you think could be taken by the medical community as a whole, and also by the Government to put some sense of urgency into nutrition education and to elevating the understanding of our people of the importance of good nutrition?

Dr. Lee. In terms of the Federal Government, there is much that can be done.

First of all, a major educational program, such as the anti-cigarette-smoking program HEW launched in the late 1960's. In that comparison, antismoking signs were posted on the postal trucks. This caused a great deal of controversy, but I think they were quite effective. Second, a large-scale nutrition education program in cooperation with local health departments, State health departments, schools and voluntary agencies should be carried out. Third, the expansion of nutrition programs like the WIC program, which are fundamental to correcting the most basic problem we have got in terms of nutrition is feasible; fourth, the incentives for the development of nutrition education programs within health professional schools and within public schools should produce significant results. We have seen, with Federal support, a very rapid expansion of the developments of family medicine in the medical schools. Without those Federal incentives, and without that leadership, there probably wouldn't be a half dozen medical schools in the country that had departments of family practice or family medicine. Virtually all of them now have such units, thanks to that leadership.

Finally, we should reimburse for nutrition counseling, in medicare and medicaid. A nutritionist doesn't get paid under medicare for nutritional counseling.

Those are the kinds of steps that could be taken, and they require national leadership and some financial support.

Senator McGovern. Let me ask you this, Doctor.

Are the graduates that are coming out of our medical schools now, that is the doctors that are going to go out and practice and deal with patients, are they properly trained in your judgment on the importance of nutrition in overall human development?

Dr. Lee. Absolutely not. They know more about heart transplants than they do about basic nutrition.

The technology has so taken hold of medicine, has sort of obsessed us all, and we instruct students in all kinds of technological advances. But in very basic things, like what is an adequate diet we do not do an adequate job. I would guess 90 percent of the graduates of our medical schools couldn't describe an adequate, nutritious diet that was appropriate for people at various stages of life.

Senator McGovern. If we were just to lay aside the humanitarian considerations for the moment and look at the fact we are paying a medical bill in this country of something over $100 billion a year, would

you have any idea how much of that might be eliminated if we had a population that generally had good nutritional habits?

Dr. LEE. Well, a significant portion of it.

If we were healthier, we would live longer, but—we will develop the diseases at 75 or 80, but we will have 65 or 70 healthy years instead of developing the diseases when we are 30, 40, or 45.

Dr. Breslow showed we would add 11 years to the life expectancy of white males aged 45, healthy years, not sick years, with proper personal behaviors.

I would guess we would move the diseases to a later time in life. I doubt we would markedly reduce the cost of medical care. At best, a 20-percent reduction might be possible. That is a very gross estimate of what the cost savings might be.

But the benefits in terms of the economy—set aside people feeling better or being healthier, its contributions to the economy would more than triple the savings in medical care costs.

Senator MCGOVERN. There is so much concern today about the cost of a comprehensive national health insurance program, and I think it is a legitimate concern, but if we could take some of the steps that you have been talking about, to insure the health of the people by preventive care, by good nutrition, that would be one way to reduce that bill very substantially, would it not?

Dr. LEE. Absolutely. And it would contribute more to the health and well-being of the people than our investment in the medical care, even though the investment in the medical care is absolutely essential. When people get sick, they need excellent care. We don't want to deny people care. But it would make a greater contribution than the medical care itself makes to improvements in health.

Senator MCGOVERN. I just want to introduce one more item and then I will yield to Senator Humphrey.

The Georgetown University medical bulletin of last November has collected a number of interesting proverbs on nutrition. They have here an old Chinese proverb, "He that takes medicine and neglects to diet himself wastes the skill of the physician."

And then, "In eating, a third of the stomach should be filled with food, a third with drink, and the rest left empty."

An English proverb, "Feed sparingly, and defy the physician."

Scottish proverb, "Light supper makes long life."

And finally an Italian proverb, "He that eats but one dish seldom needs the doctor."

I thought we needed a little philosophy here today.

Senator Humphrey.

Senator HUMPHREY. That is about the best medical advice I have heard so far, these proverbs.

Just on two very characteristic and yet commonplace problems. Senator McGovern just read "Light supper leads to long life." Isn't it a fact our life style has changed, so that we have a heavy meal in the evening?

Before I came to Washington, I always thought supper was around 6 o'clock. But something happened here, we don't have any suppers. They have dinners, and then you have an hour of drinking before your dinner. So you really don't, on this social circuit here, have a meal around here until around 9 or 9:30.

Of course that curses the life of most of us in public life. It is really a serious health problem. And plus the fact that many times the food is not any good anyhow.

I would like to ask you this question: What kind of a diet would you suggest for those who eat out? I gather that a larger number of Americans are eating out all of the time. There are more and more people eating at McDonald's, Burger Chef and Burger King, and they are eating Big Macs and the Whoppers. And the kids want a milk shake or french fries. Then there is the pizza parlor and fish and chips.

How can you have a proper diet if you are doing that all of the time? I mean it isn't like my Mom, who was home cooking, making bread and biscuits. I thought we had a pretty good diet at home simply because mother didn't know how to make all of those fancy dishes.

I never heard about additives. We had our own garden and our own vegetables. Mother made the bread, and we bought our fresh meat. We knew what we were getting until I got to the big city.

What do you do for the person who is obese, who eats out, is a middle-income office worker.

What kind of a diet would you suggest, and how do you get these companies to have any kind of a diet? I mean look at the menu, and sometimes you would be better off if you asked for poison.

Dr. KNITTLE. I will take a whirl at it, because I think you are pushing the emphasis too much on the server of the food.

I daresay if you went to the Department of HEW cafeteria, where I have eaten, you will find a display there that if you eat the whole thing, you know, it would as you say poison you.

Senator HUMPHREY. I was giving a dramatic emphasis.

Dr. KNITTLE. If you ate everything your mother put on the table you may have become obese—the point I am trying to make is I think there is a certain amount of responsibility in the individual.

Senator HUMPHREY. Right. But how do we know? For example, I haven't eaten yet today, I had to grab a hurried breakfast, my life does not permit anything normal and regular, I suppose I will have dinner tonight at 11 o'clock.

When I go to eat, what am I supposed to eat?

Dr. KNITTLE. I would have to know a number of things about you, Senator, I think this is a very important point. Namely, you can't make a menu for 200 million people. It is a very individual kind of thing.

Senator HUMPHREY. But aren't there some basics you can suggest?

Dr. KNITTLE. If you want to get a certain amount of protein, a certain amount of vitamins, a certain amount of carbohydrate and fat. There is an argument on what the carbohydrate source should be. But the fact remains it is an educational program, it is an educational program not in just telling people what they should do or not do. I am taking care of people who are 400 pounds, and they know more about calories than you and I, and yet they can't maintain their diet.

The problem is we don't know enough about behavioral problems in terms of why is it that when you go on the circuit and a man comes out with the chicken in cream sauce, why you can't just eat half of the chicken and none of the cream sauce, because you know this is *x*

number of calories and I have already taken in x number of calories today and I know what my energy expenditures are.

It is really individualization.

Senator HUMPHREY. We are not communicating. I don't disagree with you at all. I am just saying I want to go down to the Senate dining room, I am Hubert Humphrey. I am supposed to know enough about how to select a meal. I haven't the slightest idea of what to eat.

Dr. KNITTLE. That is what I am saying, what I would have to do in terms of the medical aspect, I would want to know a little more about Senator Hubert Humphrey's intake and what is excessive to him. I daresay Senator McGovern can eat more calories than you and I. Everyone has a different level of consumption.

Senator HUMPHREY. But aren't there any norms?

Dr. KNITTLE. There are no hard and fast rules, and that is the point that upsets me this morning in listening to the testimony, is that it is not such a simple thing.

There are individual variations. That is what I tried to bring out in my testimony, namely, that it is not as simple as just saying we are going to go to every McDonald's and give a certain number of calories.

If you ate the best of food, but had 200 or more calories per day more than your particular metabolic processes need, you would indeed get fat.

Senator HUMPHREY. Of course. We are not communicating again.

Dr. KNITTLE. You would have to live within your own capacity.

Senator HUMPHREY. But you don't know. What does an 8-ounce steak mean in calories? It isn't on the menu. You have the price, but not the calories. What does it mean if you get tunafish salad?

Dr. KNITTLE. I think that is fine. I think when you go to the supermarket these things are clearly marked.

Senator HUMPHREY. But we are not going to the supermarket. We are going to restaurants, where most people go.

Dr. KNITTLE. If you had a menu that told you how many calories you wanted to eat, I think it would still be an exceedingly difficult thing for an obese person. I have seen it happen over and over again, with calorie counters, having people go home and weigh food. What I am trying to say is that is information, that information should be available, but the important thing is how people should deal with it.

As I said in my testimony, I think that begins early in life. I think, for example, when you were a child, it was your mother who fed you and set the example, so we have to get to the individual who does the feeding and think in terms of the family concept of eating at home and we have to get into the area of eating out.

But just giving numbers per se is not going to solve your problem.

Senator HUMPHREY. I am perfectly aware of the fact that there are no simple answers and all of us respond differently.

Our children are all different. You can have the family, they all have the same diet and you have different weights, they react differently to food. We know that.

But there has to be some norm. There have to be certain things that you can get guidance on. When there are more and more people eating out, in what we call commercial feeding establishments, it isn't just a matter of the cereal manufacturer doing a better job for you. It becomes a matter in the trade itself, in the commercial restaurants and

cafes, cooperating with the individual since nutrition is no longer home based like it was. Most people are not eating their meals at home. They are eating them out of a bucket or a cafeteria, or they are eating them on the run. It is a fact.

That is one of the cultural changes that has taken place.

Now, getting back to the children, Dr. Lee—by the way, I asked this question earlier not so much about obesity, but about people who are on the run, the kind of professional and semiprofessional.

Why do they have a disproportionate amount of heart attacks, and all of the digestive disorders? It is well acknowledged, they say success lends itself to this kind of thing. I don't think it is success at all, but your habits.

I know that when I get back home to Minnesota, where I am working out of my home instead of out of this office, where I have some organized life style, I feel 100 percent better.

When I get back down here the only reason I eat is for fuel. The comfort or joy of eating is out, because first of all you never have time for it. A meal ought to be more than just calories, carbohydrates or fats.

A man of my age knows that much. It is not a question of only what you eat, it is how you eat it, and the environment in which you eat, and so forth.

But the other things are somewhat helpful, knowing what the intake is, the calories, and knowing what is a reasonably good diet for example if you have hypertension.

Dr. LEE. Could I make a comment about that? If you feel 100 percent better when you are home, it must be something sensational.

Senator HUMPHREY. I generally feel very good. And I still violate every single known rule, I really do.

I know you have to be like an athlete, you have to be in training if you are going to be in public life. But the abuse in public life that I have known is the diets. You are literally living on the run all of the time. I figured if you could get it so you could just swallow it in one bite how much time you would save and hopefully it would digest.

That is about the way the average person lives. Take a look at the U.S. Senate here. They are in session frequently way after 7 o'clock many nights.

What you frequently do is eat somewhere where you cannot control your diet, and then go home and get yourself something late at night which also is hard on you.

These are the practical problems of a particular breed called politicians. I know something about that since I have been at this business a long, long time. I compensate for it by glands. I figure it is just the way you are. I mean some people can't stand tension. It is the way you are, really. It is the makeup of your body.

I want to get back to children. Dr. Lee, what is wrong with this Government? I have been listening to all of this testimony from Government officials about how important it is to give proper dietary attention to the mother, during the state of pregnancy, and in the first few years after birth. And yet we have a major department of this Government that is a lawbreaker, we have to take it to court all of the time. We just finished a court case again.

We have to take the Secretary of Agriculture to court to force him to obey the law.

And here stands Dr. Cooper, whom I admire greatly, who is the health adviser to this Government, and that Secretary of Agriculture sits over there and refuses to do anything about that program.

We have at least a million people that are waiting to get into that program.

Do you believe that the WIC program, properly administered, can make a significant contribution to the health standards of this country?

Dr. LEE. Absolutely. I said earlier that in terms of decreasing the infant mortality rate, that proper nutrition could do more than any other single thing that we are now doing in terms of prenatal and infant care.

It is absolutely essential that the program be properly administered, that there be strong leadership, at the Federal level. If the Department of Agriculture is incapable of providing that kind of leadership, Congress should consider transferring the program to the Department of HEW, where hopefully there would be more enthusiasm and more vigor in carrying out the program, and a higher priority associated with that program in comparison with the way funds are spent for all kinds of other things.

Senator HUMPHREY. The reason we didn't do that is a very practical one. The budget for HEW is so large, with medicare and social security and everything in it, that if you put WIC over there, it is apt to be slashed to pieces.

I am not being particularly angry at the administration for it. We haven't put nearly the emphasis on these things that we ought to.

I felt that, while I have been a strong proponent of the medicare, in fact the first bill I introduced in Congress was on May 17, 1949, a bill to provide hospital and nursing home care for persons aged 65 and over, under the terms of social security. May 17 was Norway's Independence Day, and I did it in honor of my grandmother.

It took about 15 years to get it, but we got it. Now we have medicare. I have often thought as we approach the whole subject of national health care, we ought to have kiddiecare. The place to start is right there with the child.

Now, the first element there is with the mother. But soon the child goes to school. And now we are putting children in school at an earlier age, not only kindergarten, but nursery school. And it is in those early ages that they learn.

I have been told that a child learns most of what they learn in the first 10 or 12 years of their life.

What can we do with the school system to really get nutrition education in there where it really counts?

We have got bills in Congress. I would appreciate your counsel.

Dr. KNITTLE. Basically I would like to address it before preschool, because basically your first socialization in life is with your parent, your mother, in the feeding situation.

Now if that individual comes with certain concepts about how a child is to be fed, I think those are the kinds of things that eventually will hold true, even if one gets to preschool or nursery school.

We have seen children at age 2 who are grossly obese for example. I think the educational program has to come into perspective. At the

present time when a woman is pregnant with a child, she goes to an obstetrician and gets weighed and she is told you are to gain so much or to lose so much. This weight gain, as I said, is pure weight, we don't know anything about the different composition of whether it is fat, protein, all water, for that matter.

The first time she really gets any information relative to how to feed her child is after the birth of the child, when the pediatrician comes in, if she gets it at all at that time.

In most institutions all that happens is they are handed certain forms that come from various companies which tell them one formula or another, and this is what you feed them.

So I think we have to get to the mother at the time she is pregnant, when at that time she is most concerned with the care of her child. Especially in lower economic areas, where Mount Sinai actually services, you have to really identify who it is that is going to feed the child.

For example, many of the children who are born in our hospital are born of teenage mothers, who then go out to work and there is a surrogate mother, usually the grandmother is the one that is taking care of the child. So you can educate the mothers as much as you want, without having identified who the feeder is in the family.

So that is an important concept to keep in mind. Identify who is the feeder in terms of the feeding and get that information, prior to the delivery of the child.

Once the child is born, the habit continues.

Senator HUMPHREY. Doesn't that go back to the training and education of the doctors?

Dr. KNITTLE. It goes back to the training of doctors about the importance of this, making them aware of the fact of what nutritional inputs early in life will have in terms of later life.

It goes back to the educational system and the public school system we need to get to the teenage girl, get her prepared and thinking in terms of what good nutrition is for her and her child.

One of the problems we have with obese adolescents is, it is a very difficult thing to treat. By 13 or 14, if you are obese, it is almost as difficult to treat as when you are an adult. However, these children have a deep concern as to what their children are going to be. I think if we get some inputs there in terms of training them, talking to them about how they are going to feed, so they can break this pathological interaction that has been going on for a long time.

Senator HUMPHREY. I recognize that there are always limits to what you can teach, or what people will absorb and apply, as Senator Hatfield said earlier today, and Senator Percy, and others.

But I have always believed there was some improvement if you have a concentrated effort. Education is essentially repetition and osmosis. Most people learn only by steeping them in it. This business of thinking everybody will learn if they get the message is wrong. I have been a teacher too long. This is exactly what the propagandists in the totalitarian society knows, and a good teacher knows. You repeat it in a hundred different ways. This is why scriptural lessons are generally considered to be highly educational, because they are repetition.

We have to find some way not only to take it into the educational structure, but in our private enterprise system.

I come back, if we want to maintain the system, I come back to radio and television again. It seems to me there could be some effort through the great corporations of this country. They must have a social consciousness, if they are going to survive in our system, to bring them to understand that they can still have a soap opera in the afternoon and have something else besides the problem of who is running off with whose wife. They could inject in there a little bit about a wife who is cooking better, providing a better lunch than the other one.

It has to be done some way. Education is not a frontal attack. Many times it is indirect as well as direct.

I get back to the responsibility of the media. I am not talking about the printed media, because they have to buy the paper, and the Government doesn't license them. I am talking about the electronic media. They can't get on the air without a Federal license.

If we have a Federal objective and if we are saying that the most important thing in the world is a life that is livable and enjoyable, with the pursuit of happiness and the freedom to make some choices, then if the Government licenses a television or a radio station, I think it has a right to suggest that sometime during the day they should be interested in health.

What do you think about that? Am I being dictatorial?

Dr. KNITTLE. I agree wholeheartedly with that, but I would like to take it one step further; namely, I would not want to see programs where somebody gets up, whether it happens to be me or anyone else in the area of nutrition, and starts telling people how to eat or even have commercials.

But I think this information should be made available to the American public.

Senator HUMPHREY. Right, so they can make choices.

Dr. KNITTLE. Exactly. Before you can do that on a high powered level, you are going to have to develop expertise throughout the country, within either the medical profession or the nutritionists, to provide the information, when you tell these people where to go, because you are not going to be able to get all the information across on television.

But I agree with you, I was struck by the fact that most of the good commercials that have to do with nutrition do appear sometime about 2 a.m.

Senator HUMPHREY. I believe it was you, Dr. Winikoff, that said in order to spend time on nutrition and patient care, our health professionals need to be given good reasons for doing so. Then you laid out that the prestige accorded to nutritional information is currently quite low within the medical profession and that is one of the reasons it is not emphasized.

Dr. WINIKOFF. I think that is true. All preventive care has had relatively low prestige in medicine, because the high technology fields are the high prestige fields.

Senator HUMPHREY. How do you get to the deans of medical schools and the prestigious leaders in the medical profession? How do you get them to do what you think ought to be done? I always get a little frustrated when we get fine witnesses telling us what we can do about a problem, and the people who are the movers and shakers who really

design and administer or set the policy, say, "Goodby, we will go our own ways."

Dr. WINIKOFF. As in all policy matters, you have to work with both the carrot and the stick: you can offer money and you can pass laws. Those are probably the two basic ways you can affect the medical schools.

I think the Government clearly has the ability to do both, and probably should be more specific in directing medical schools to produce the kinds of people that will fulfill desired policy goals in the health area.

Dr. LEE. The money that the Federal Government gives to the medical schools, Senator, is for biomedical research, which emphasizes technology and for education that emphasizes subspecialization. It doesn't emphasize primary care, it doesn't emphasize prevention. The Federal Government gives a token amount of money for the development of family practice programs, and other primary care programs.

Virtually no money is provided for the development of preventive programs or nutrition education. The Federal Government itself, for many years, has made it this way. We are now beginning to see we ought to do it differently.

Senator HUMPHREY. That is our problem in Congress, isn't it? We make the laws.

Dr. LEE. But it is the kind of information Congress has been given, the kind of enthusiastic support of biomedical research is the answer to sum up our major health problems. We are all in favor of that. But I think we are beginning to see we ought to move in other directions as well.

One other comment about TV and the other mass media. When this committee began its work almost a decade ago there were probably only a handful of people in the country who thought there was hunger in America. This committe turned that around. The committee is now beginning a process that will turn the public around in terms of thinking about nutrition and health, not just hunger and poverty.

These hearings are of singular importance in terms of what can happen in this country in educating the people about the importance of nutrition in health and disease.

I can't think of a more important thing than these hearings to have taken place to begin that process.

Senator HUMPHREY. I guess what I am concerned about is what I have seen in race relations.

For example in the 1950's I worked with the Advertising Council, because I was a strong civil rights proponent. And I said to them why don't you have ads with black people in them? We know they are consumers, and they are going to be bigger consumers. I remember sitting down with the representatives of the Advertising Council in the early 1950's, and I said you know this is for the future, new markets. The old customers can only take in so much, eat so much, wear so much, and drive so many cars. There are new people out there, why don't you get them in the picture, and get them on TV?

It took a few years, but you seldom see an ad today in which you don't see a black person, because there is a large black middle class, an ever-increasing number, thank goodness, who are moving into better income levels.

There still is a tremendous need for greater progress. But it is to the advantage, it seems to me, of the private enterprise system, that is always worried about Government regulations and Government taxes to start to emphasize those who are the conveyors or distributors of food products the kind of nutritional information you as professionals can develop.

If you just get up and give a lecture about how you take care of your health, people would turn it off in nothing flat.

I know children who say to their mothers—and I have heard it said in my own family—Mommie, you ought not to smoke, because you are going to die if you smoke.

Let me tell you something, I don't get elected to office by adults only. I found out that the best way to get elected is to stand out and talk to the kids and say tell mother and father I will be downtown on the corner of 7th and Nicolette at 12:30, will you be sure to take that message home to your mother today?

I stand in front of schools as the little kids come out and tell them that.

You want to know something? I tested it. I told a sharp newspaper reporter who didn't believe this, I said all right, come down to the corner of 7th and Nicolette with me on the day I told the mothers to come. And here come the parents, and they say Johnnie told me I had to come down and see you, and I have to report back to him tonight.

Kids are the media, that is the way you get through. Adults have already made up their minds, most of them are hopeless by the time they get beyond 21 years of age.

Dr. KNITTLE. I think that is borne out by the fact that children determine the cereals that are brought into the home.

Senator HUMPHREY. That is why the Lord said a little child shall lead them.

Dr. KNITTLE. I would like to add one thing. I think Dr. Cooper alluded to this.

At the present time in order to be licensed as a physician, I don't think you have to know anything about nutrition in terms of testing. There is something called the Board of Nutrition, which really has no power whatever, it makes no difference whether you are a member of that or not. I would therefore recommend adding nutritional requirements to the national boards.

Another area is in terms of money. I think we have listened today to everybody talk about obesity. I think this is the general consensus, that obesity is one of the major nutrition problems in the United States today.

Last year an obesity center, or 2 years ago, an obesity center was set up in the United States at something like $124,000 per annum, whereas you have something like 11 centers dedicated to hyperlipoproteinemia each of them getting something on the order of a million dollars.

So I think money also will help in terms of directing where the research goes.

Senator HUMPHREY. Let's go eat.

Senator MCGOVERN. I think it is clear that all of this bad diet over the years has left Senator Humphrey without any energy, and it is time to put this hearing to an end.

Did you have something else you wanted to say, Dr. Winikoff?

Dr. WINIKOFF. I don't want to keep people from their food. I just wanted to add to Senator Humphrey's comment about the fact that educational messages are transmitted in a lot of subtle ways.

We really must pay attention to the messages we are offering to young children in school in both the quality and types of food offered in the school lunch programs, and in the availability of snack and soft drink machines in the school buildings.

We can very easily undo the good nutrition messages taught in the classroom by what is actually practiced in the schools. Both these things have to be coordinated.

Senator HUMPHREY. Spell that out a little more for me.

Dr. WINIKOFF. A lot of the school lunches that are served are not balanced, they are unattractive and soggy, the food has been sitting out and has lost some nutritive value. The choices may be high in saturated fats and not, in sum, an excellent diet.

In addition, we allow in our schools soft drink machines and candy machines, thus encouraging students to eat these snacks. All of this is a nutritional message we are delivering. The teacher may say, "Don't," but the school says "Do."

Senator HUMPHREY. So you are saying in the preparation of the school lunch there ought to be for those who prepare it at least some nutritional education?

Dr. WINIKOFF. Yes, and classroom teaching could easily be combined with the school lunch.

Dr. LEE. It is necessary to get nutrition education out of home economics and into the mainstream of education. It should be part of the basic education.

Senator HUMPHREY. Yes, that is my point.

Senator MCGOVERN. Thank you very much. We appreciate your patience and excellent testimony.

[The prepared statement of Dr. Lee follows:]

STATEMENT OF DR. PHILIP R. LEE, DIRECTOR, HEALTH POLICY PROGRAM, SCHOOL OF MEDICINE, UNIVERSITY OF CALIFORNIA, SAN FRANCISCO, CALIF.

Mr. Chairman, members of the Select Committee on Nutrition and Human Needs, I am pleased to have the opportunity to discuss with you a number of problems related to nutrition and health. Increasingly, it is becoming apparent that nutritional diseases are still among the most important health problems in the United States.

As a physician I am concerned about the number of people who suffer from cardiovascular diseases, particularly hypertension and arteriosclerotic heart disease; I am concerned about the growing number of patients who consult physicians because of diabetes mellitus; I am concerned with the large number of men and women who continue to develop cancer of the colon year after year; I am concerned about the millions who have difficulty dealing with the problem of obesity; I am concerned about the individuals who are suffering lifelong disabilities because of malnutrition during gestation and early infancy; I am concerned about the many old people whose lives are limited because of osteoporosis; and, I am concerned because of the growing problem of alcoholism in our society.

The prevalence of nutrition related diseases such as atherosclerosis, diabetes mellitus, obesity, osteoporosis, colon cancer and alcoholism, as well as the existence of malnutrition among pregnant women, the aged, and poor children particularly, clearly underline the need for the Select Committee on Nutrition and Human Needs to extend its area of concern.

I know that too many people in this country, particularly the poor and the aged, don't have enough money to purchase an adequate diet. I know that the aged and the poor who need nutrition counseling to better manage their health

problems are often denied these services because nutrition services are not reimbursed by their private health insurance or by Medicare or Medicaid. I know also that all of us get most of our information about food and nutrition from food advertising, which promotes food and profit—food which is high in fat and refined sugars; food that has too much salt, provides too few nutrients for the calories consumed, and contains untold amounts of food additives whose effects we know too little about.

NUTRITION AND THE DECLINE IN INFECTIOUS DISEASES

We know that good nutrition means more than just preventing a deficiency disease. Improvement in human nutrition was the single most important factor in the decline of infectious diseases as the major killers in Europe and the United States in the 19th and 20th Centuries. This change represented the most significant and dramatic change in man's health in the past 10,000 years.

It is widely assumed that improvements in medical care, particularly immunization and antibiotic therapy, accounted for much of this improvement. No so. Except for smallpox, diphtheria and tetanus immunization, these measures did not become important until the mid-1930's. Today they are vitally important for the prevention of half a dozen diseases and the treatment of individual patients with infectious diseases, but most of the decline in mortality from infectious diseases preceded their discovery and use.

Professor Thomas McKeown of the University of Birmingham, England, has provided substantial evidence to support this view. He summarized the reasons for the marked improvement of human health in England and Wales since the 18th century:

"This interpretation of the modern advance in health and rise and eventual control of population puts the emphasis on the following: increased food supplies from the early eighteenth century; limitation of numbers and removal of adverse influences in the environment by improved hygiene from the late nineteenth century; and specific medical measures (immunization and therapy) from the second quarter of the twentieth century. The contribution of the last influence to the total decline of mortality was relatively small and the improvement in human health therefore was due predominantly to a change in reproductive behavior and to modification of the environment by provision of food and protection from physical hazards. It should also be noted that only two of the four major influences were introduced in order to improve health; the reasons for increasing food supplies and limiting numbers were only indirectly related to this objective."

In the United States it is likely that the same forces have been at work. The age-adjusted death rate declined steadily after the turn of the twentieth century until it was briefly interrupted by the flue epidemic in 1918–19. In the mid-1930's the impact of modern medical care began to be seen, and for about twenty years the age-adjusted death rate declined at two percent per year, instead of the previous one percent. Between 1955–68 there was little if any decline, but since 1970 the age-adjusted death rate seems to be falling again at about two percent per year.

U.S. DISEASE BURDEN

The decline in mortality from infectious disease has had an enormous impact on the health status of Americans. The most dramatic changes in this century have been the sharp decline in infant mortality and a large gain in life expectancy from birth. However, life expectancy from the age of 25 has increased little for males and only modestly for females. Life expectancy at 45 has increased less than 5 years for U.S. males and less than 10 years for females since the turn of the century.

Why has life expectancy increased so little for adults, particularly adult males in the United States? The answer may be found in personal behavior or life style. Some of our behaviors are health promoting, others disease producing.

In California, Nedra Belloc of the California Department of Health and Dr. Lester Breslow, Dean of the UCLA School of Public Health, have found seven health-related behaviors in a study of 7,000 adults in Alameda County. The behaviors related to good health were: Moderate drinking, not more than one or two alcoholic drinks per day; no cigarette smoking; seven to eight hours of sleep per night; eating regularly and not between meals; eating breakfast; keeping a normal weight, neither being overweight or underweight; and, moderate regular exercise.

At every age from 20 up to 75 years, the health of persons with seven good habits was better than that of persons with six; health of the latter better than

those with five, and so on consistently with four, three and two or fewer good habits.

Life expectancy (average number of years of life remaining) at age 45 for men in the zero to three good health behavior group was 21.6 years compared with 33.1 years for those in the six to seven good health practices group. The magnitude of this 11.5 year difference is better understood if we consider that life expectancy for white men aged 45 in the United States increased by only 3.6 years from 1900 to 1973. It should be noted that four of the seven health promoting behaviors are related to nutrition.

Quite another pattern of behavior is evident when we look at arteriosclerosis, the most important cause of death of Americans. Coronary artery disease, the most important killer in the United States, is associated with a number of risk factors related to life style. Coronary artery disease is commonly associated with a sedentary life style, a high fat diet, cigarette smoking, high blood pressure and emotional stress. The recent Framingham studies demonstrated that relative or absolute hypercholesterolemia is the single most important risk factor for the development of myocardial infarction in man. A plasma cholesterol concentration of 250 to 350 milligram percent, for example, was found to carry a two-fold to five-fold greater risk of coronary disease than did a cholesterol level of below 220 milligrams percent.

The factors in our modern industrial society that contribute to the high morbidity and mortality from coronary artery disease have been vividly described by Blackburn:

"Modern man in industrial society is an animal which, shortly after maturation, is confined to a system of special cages, in one of which, a mobile steel and plastic cage, he is exposed for one or two hours daily to complex decisions, frustration and danger, in an atmosphere high in carbon monoxide, while transported to and from other cages. In other cages, under constant temperature environments, the animal's physical activity is strictly constrained to many hours of sitting and a few moments daily of standing, with short, level walks, all of very low energy expenditure. The industrialized species of man is habitually overfed with animal and grain chow which usually include 20 percent of all calories from saturated fats, 20 percent from refined carbohydrates, and 10 percent from fermented spirits, plus varying concentrations of herbicides, pesticides, hormones, antibiotics, oxidizing agents, and radioactive isotopes. Man is systematically conditioned to self-administer 20 potent doses of nicotine, and five of caffeine alkaloids daily. He is also trained to lie motionless in a darkened cage for three hours and watch a cathode ray tube which continuously presents ambiguous information and repeated suggestions for unhygienic, purposeless activity. He is rewarded to the degree that he pursues this goal-less activity during the day.

"Exposed to such an environment for half his life span, nearly all the animals develop largely irreparable lesions in the vascular system, and about half of the male animals experience severe damage to cardiac muscle. If the animal survives the dramatic onset of acute arterial insufficiency to the heart, it is returned as soon as possible to the same cages and systems."

Physicians and patients are generally aware of the risk factors in heart disease and particularly the importance of life style and stress in relation to coronary artery disease. Insufficient attention, however, has been paid to nutritional factors, particularly the role of saturated fats. Americans consume about 40 percent of their calories as fat. Diets containing this much fat in animals impair the capacity of tissues to convert saturated to unsaturated fatty acids because the desaturating enymes are repressed under these conditions.

Recent studies have demonstrated the role of polyunsaturated fats in lowering and of saturated fats in raising serum cholesterol. In contrast to the marked effect of saturated and unsaturated fatty acids on serum cholesterol levels, numerous studies have now demonstrated that dietary cholesterol alone has a relatively small effect on the concentration of cholesterol in the blood.

What does this have to do with myocardial infarction? Studies in Finland have demonstrated that patients who were transferred from saturated fat to polyunsaturated fat diets had less than half the incidence of myocardial infarctions as did those on saturated fats. The Diet Heart Study of the National Heart and Lung Institute indicates that polyunsaturated fat diets are practical and effective in lowering cholesterol in man.

Coronary artery disease and myocardial infarction are not the only problems associated with overnutrition. Current estimates indicate that one-fourth to one-

third of the American adult population and ten percent of American children are obese. Nutrition is only one of the factors in the etiology of obesity; others include genetic factors, socioeconomic status, cultural patterns, stress and physical activity.

Recent studies have demonstrated the importance of obesity in infancy and childhood as a determinant of adult obesity. Both the number of fat cells (adipocytes) and the size of these cells determine the fat content of the body. The number of adipocytes stabilizes relatively early in life, certainly before adulthood. The number of adipocytes increases in obese infants compared to those of normal weight. It is too early to determine how effectively this knowledge can be applied in the prevention of obesity.

Undernutrition, as well as overnutrition, causes serious health problems. Early protein-calorie undernutrition in children can result in a decreased number of brain cells, reduced myelination and other biochemical changes which may be permanent. Mental function and behavior may be modified as a result of these changes. Nutritional deficiencies during pregnancy and lactation can also permanently affect the development of the brain. How widespread this problem is in the United States is currently a matter of dispute. The consequences are so serious, however, that we should have as a matter of the highest priority the prevention of malnutrition in pregnancy, infancy and childhood.

A number of diseases that are not the direct cause of death but contribute significantly to mortality, morbidity, and disability, such as hypertension, alcoholism, and diabetes mellitis, are related to what we eat. Intestinal cancer is also related to what we eat. Cancer of the colon and rectum will strike about 100,000 Americans this year and almost 50,000 will die from the disease. More people in the United States will develop cancer of the colon and rectum than any other cancer except nonmelanoma skin cancers. Possible dietary factors include the role of highly processed foods in relation to slower transit time and increased exposure of the intestinal tract to carcinogens, the relationship between the amount of meat eaten and cancer of the colon and the relation to lack of fiber in the diets of countries where colon cancer is prevalent and the high fiber content of diets where it is uncommon.

Gastric cancer, like cancer of the colon, varies widely from one country to another. In Japan the mortality rate is considerably higher than in the United States. Japanese who move to the United States experience a slight decline and their children a very significant decline in gastric cancer. Gastric cancer appears to be more common in people who consume a good deal of smoked fish, pickled vegetables and dry salted fish.

We have much to learn about the relationship of diet and gastrointestinal cancer, but the evidence is sufficient to warrant careful and detailed epidemiological studies.

The role of nutrition as a determinant of health status is broad and complex and inadequately researched. To stay alive, man requires food as a source of energy and essential nutrients. If a person lacks sufficient calories, he is hungry. If he lacks one or more of the essential nutrients, he is malnourished. Carried to an extreme, either hunger or deficiency of essential nutrients is fatal. In milder, chronic forms, both of these conditions are common in the United States.

The era of narrow interpretation of the role of nutrition solely in terms of meeting essential nutrient requirements is past. The science of nutrition is concerned with the effects of food intake on the internal ecology of the organism and the external manifestation of well-being. Deficiencies, excesses, or imbalances of nutrients affect the system adversely at many points with far reaching consequences. When the classical definition of nutrition is expanded to include vulnerability to malnutrition of all kinds—excesses imbalances, and deficiencies—as well as vulnerability of individuals and groups for whom physiological and social factors predispose to nutritional problems, then a framework for identifying groups in greatest need for assistance has been established:

We are concerned about overnourished and malnourished adult Americans who eat a diet high in fats, refined carbohydrates, salt, and calories. We know that too much fat leads to diseases of the heart, our number one killer. We know that too much salt is related to hypertension, a precursor of cerebrovascular accidents, which kills 10 percent of all Americans. We know that refined carbohydrates, particularly sugar, are implicated in dental caries, the most prevalent chronic disease, and one which produces profound dietary difficulties in later life with the loss of teeth. We know that a high calorie diet causes obesity, a problem suffered by many adult Americans, and one that carries life threatening consequences.

We are concerned about undernourished and malnourished poor Americans because they lack sufficient funds to purchase foods supplying a consistently adequate diet and suffer highly disproportionate rates of malnourishment and disease.

We are concerned about malnourished pregnant women who suffer from anemia, toxemia, have a greater rate of fetal accidents, and produce a disproportionate number of low birth weight babies. "It has been fairly well established that the nutritional status of the mother at the time of conception is as important for the outcome of pregnancy as is the diet during the period of gesation." Maternal nutrition programs must emphasize interconceptual nutrition and develop long term food habits that result in adequate nutrition before, during and in between pregnancies.

We are concerned about low birth weight babies. The causal relationship between poor maternal nutrition and high infant mortality is unclear but the relationship of high infant mortality with low income and minority status suggests an association. More clearcut is the relationship between low birth weight babies and maternal nutrition.

The United States is trailing behind fourteen other nations in the prevention of infant mortality. Analysts at the National Institute of Child Health and Human Development are convinced that a key reason for our dismal showing in this area is our high incidence of low birth weight infants—babies who are born too soon, or too small, to cope with the demands of life outside the womb. Of the more than 3 million children born in the United States each year, 7.6 percent, or about 240 thousand, will weigh less than 5 and a half pounds at birth. More than 40 thousand of these low birth weight infants will die in their first month of life, thereby contributing 70 percent of the 53 thousand infant deaths which occur annually. And the 200 thousand low birth weight babies who survive beyond infancy will suffer a disproportionate incidence of handicaps in later life.

Not surprisingly, the women who are most at risk of giving birth to small babies are the very young, the poor, and the black—the same women who have always had the greatest difficulty in obtaining adequate medical, emotional, and economic support during their pregnancies. Of the more than 600 thousand infants born to teenage mothers each year, about 61 thousand or 10 percent, will be of low birth weight. Of the more than 500 thousand infants born to black mothers each year, about 75 thousand, or 13 percent, will be of low birth weight. And of the 171 thousand infants born to black teenage mothers, about 25 thousand, or 15 percent, will be of low birth weight!

Obviously, the infants born in these categories are likely to have more than enough disadvantages imposed on them by the larger society; they do not need the additional handicap of low birth weight threatening them at the very outset of their lives. If we are to reduce the incidence of low birth weight, nutritional intervention programs aimed at high-risk mothers must become part of our system of prenatal care. Research funded by the National Institute of Child Health and Human Development indicates that there is a definite connection between maternal malnutrition and low birth weight.

Several studies have shown that careful nutritional guidance and supplementation can improve the outcome of pregnancy for women who are most at risk of delivering low birth weight infants. One study sponsored by the NICHD showed that daily food supplements had a favorable effect on the birth weight of infants born to two categories of high-risk mothers in Harlem—women who smoked and women of less than 110 pounds prepregnant weight. A Canadian study showed that when nutritional counseling and food supplements were given to pregnant outpatients at a public hospital, their odds of delivering low birth weight babies dropped to equal those of more affluent women attending private hospitals. Similarly, a recent study involving pregnant teenagers in the United States showed that a careful program of prenatal care and nutritional guidance, aimed at ensuring that each patient continued gaining weight at an appropriate rate throughout her pregnancy, was sufficient to reduce the incidence of low birth weight from 18 percent to 0 percent.

Given the present rate of death and disability among infants born in this country, it seems that we can hardly afford to ignore any reasonable opportunity for prevention. And nutritional programs aimed at pregnant women represent more than an opportunity; they represent a national obligation to the youngest and most vulnerable members of our society.

Livingston, Calloway, et al. in their study "U.S. Poverty Impact on Brain Development" developed estimates of a "level of nutritional intake at which human brain development is in unambiguous jeopardy." Applying this conser-

vative criteria to data from the earlier nutrition surveys, the authors state that "nearly sixty percent of all women living below poverty in the United States are evidently consuming calories at such a low level that brain development in their unborn children will likely be deficient. . . . Of children between the ages of one and four years, the surveys show that from 18 to 24 percent are in jeopardy for brain development. . . ." The fraction of undernourished children in both surveys decreases significantly when the group below poverty is compared with either of the other two income levels.

We are concerned about poorly nourished children because they fail to learn in school, fail to develop to their potential, suffer from anemia and dental caries, resist infection poorly, and lay the pattern for later adult chronic disease.

We are concerned about malnourished elderly Americans because they are more vulnerable to acute and chronic disease, suffer from debilitation, chronic brain syndrome, anemia, obesity, osteoporosis, and emaciation.

We are concerned about other Americans who suffer from alcoholism, a disease that may begin and end in malnourishment.

The chronic conditions that afflict and eventually kill most Americans have profound relationships to nutritional status. Our individual nutritional status has a direct relationship to how well our brains and bodies develop, our ability to cope with infection, our physical and mental stamina and performance, and our success in preventing or limiting chronic disease.

U.S. NUTRITIONAL STATUS—WHAT WE HAVE LEARNED FROM SURVEYS

Since the recognition of widespread hunger and malnutrition in this country in the mid-1960s, several national studies have documented the seriousness and extent of the problem. I speak specifically of the Ten State Nutrition Survey, the Study of Nutritional Status of Pre-School Children, and the Health and Nutrition Examination Survey. The more noteworthy findings include:

1. Malnutrition is directly related to low-income and minority status.
2. Adolescents and the elderly show markedly high rates of nutritional deficiencies.
3. Among the poor, the problem is more one of lack of sufficient quantity of food than of nutritional quality.
4. Low hemoglobin and substandard iron intakes are widespread and correlate strongly with low socio-economic and minority status. The HANES states that about 95 percent of the pre-school children and childbearing women studies exhibited substandard iron intakes.
5. A large proportion of Americans have calcium intakes below standards. Particularly vulnerable groups include the poor, minority peoples, women of childbearing age, and the elderly.
6. A substantial proportion of Americans have substandard intakes of vitamin A, vitamin C, riboflavin and calories.
7. Obesity is most prevalent among adult women in lower socio-economic groups, particularly black women. In some groups more than 50 percent of the adult women are obese.

WHAT AMERICANS EAT

A clue to the etiology of the chronic disease burden of the United States lies in what we eat. The USDA Household Consumption Survey found that half of the households studied had diets that failed to meet the Recommended Dietary Allowance for one or more nutrients. Calcium, vitamin A, and vitamin C were the nutrients most often below the allowances.

Even more important is the dramatic change in the average intake patterns for Americans during this century. We eat fewer fresh vegetables and fruits, fewer whole grains, cereals, and dried legumes than did our ancestors. We eat more protein, fat (43 percent of our total calories), sugar and sweeteners (125 pounds per American annually), and salt (about 10 times what the body requires daily). Over 50 percent of our total intake is in processed foods. Over one-third of our meals are eaten outside of the home, based on convenience foods or on automated methods of quantity cooking. Manufacturers added over 1 billion pounds of additives to our food last year. Per capita consumption of meat totaled approximately 180 pounds in 1975; chicken was about 40.5 pounds; milk about 543 pounds (252 quarts). We ate 276 eggs per person last year. What this all adds up to is a diet high in meat, fat, refined sugar additives, and calories. It is low in several essential nutrients and low in fiber.

RECOMMENDATIONS FOR THE SELECT COMMITTEE

What should be the concerns of the Select Committee on Nutrition and Human Needs in relation to the evidence indicating the importance of proper nutrition in human health and of under-nutrition, over-nutrition and malnutrition in relation to the present burden of disease in America?

As a matter of first priority I believe the committee should thoroughly explore the relationship of nutrition during pregnancy and early life to the later health and performance of the individual. This inquiry should consider the impact of undernutrition on brain development and behavior as well as the relationship of overnutrition in infancy and childhood to the subsequent development of obesity.

The relationship of diet to cancers of the gastro-intestinal tract needs to be thoroughly explored and the American people fully informed of your findings. Is the suggestive evidence about the high meat content of our diet and cancer of the colon significant? Is the problem too much meat and fat or not enough fiber? What about the role of diet in other intestinal cancers?

The relationship of nutritional status in coronary artery disease, diabetes mellitus, osteoporosis, and hypertension needs to be explored fully.

The problems of obesity, its importance in relation to health and its role as a factor in many chronic diseases should be explored.

This committee has played a vital role in informing the American public about the problems of undernutrition and malnutrition, particularly among the poor. It has also played the key role in affecting the policies of the U.S. government in dealing with other problems. That job is not done, but we have made substantial progress in the past decade. The task ahead, however, will be even more difficult because it affects all Americans and the way they eat.

While these studies are underway by the Committee there are other actions that should also be considered.

RECOMMENDATIONS RELATED TO FEDERAL PROGRAMS

1. The federal government should adopt a continuing surveillance of the nutritional status of Americans. Monitoring should include identification and assessment of nutritional problems, their extent and location. Trends of American eating habits should be monitored and researchd for their long term health consequences. The American public must be more fully informed about the health hazards of chronic malnourishment. Congress and state legislatures must be informed about effective points of intervention to formulate appropriate legislation. State and local health departments should be provided the information in a form that is useful at the state and local level.

2. A hard look at the federal government's food assistance programs is in order. Some observers suggest that only half of the Americans eligible for food stamps actually receive them. Other critics state that various administrative policies—hours of operation, inconvenient location, payment-for-value-received formula—act as disincentives for participation by those people in greatest need. The bulk of the evidence suggests that poor Americans are wise consumers, purchasing a high nutrient per calorie diet. But they require financial assistance in supplying a consistently adequate diet to their families.

3. Higher priority must be given to nutrition services in health care. Nutrition education and dietary counseling by nutritionists and dietitians should be reimbursable under Medicaid, Medicare, and private health insurance. Nutritionists and dietitians must participate in community health programs, in health planning through the Health Systems Agencies and in health care in group practices, Health Maintenance Organizations, hospitals and other health care institutions.

4. Research should be supported in the behavioral or lifestyle components of diet selection, and how to influence these important health determinants. Biomedical research on the relationship of nutrition to optimal health status, as well as the prevention and treatment of dietary related disease, must be expanded. Of particular concern is the relationship of dietary fat to elevated blood lipids and cardiovascular disease and the relationship of diet to intestinal cancer.

5. Activities in researching and monitoring food additives should be upgraded. We have doubts about the safety and wholesomeness of our food. What happens to the nutrient value of food when agricultural practices change, when food is processed, packaged, transported, and stored? What are the long term health consequences of eating food altered by preservatives, coloring agents, emulsifiers, fortifiers, stabilizers, flavors, hormones, pesticides, ripeners, and other additives?

6. Finally, the federal government must begin an active national campaign of nutrition education in cooperation with state and local health departments, voluntary agencies, health care institutions and the health professions. The work of the Select Committee can trigger such a sustained national effort.

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Senator McGovern. We will be back in session at 10 o'clock tomorrow morning.

[Thereupon, at 1:50 p.m. the hearing was recessed, to reconvene at 10 a.m., Wednesday, July 28.]

DIET RELATED TO KILLER DISEASES

WEDNESDAY, JULY 28, 1976

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

The Select Committee met at 10 a.m., pursuant to notice in room 224, Russell Senate Office Building, Hon. George McGovern (chairman of the committee) presiding.

Present: Senators McGovern, Humphrey, Percy, Dole, Bellmon, and Taft.

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

Senator MCGOVERN. I'd like to welcome to the second day of these hearings on nutrition as it relates to disease and health, Dr. Gori of the National Cancer Institute; Dr. Ernst Wynder, American Health Foundation; Dr. Mark Hegsted, Harvard University; Dr. Jerry Wogan, Massachusetts Institute of Technology; and Dr. Dave Kritchevsky, Wistar Institute, Philadelphia, Pa.

Cigarette smoking is related to 30 percent of the cases of cancer. Now there is strong preliminary evidence that an imbalanced diet contributes to at least another 30 percent of the cancer cases.

This morning we will narrow our investigation into the relationship between diet and cancer.

Today's hearing will elucidate the need for a more comprehensive examination of the links between diet and cancer and the role diet can play in preventing the occurrence of this lethal disease.

The horrors of cancer are known to everyone. It is the second biggest killer in the United States and our most dreaded disease.

Therapy still proves to be an ineffective solution in most cases of cancer. Even early detection and intensive chemotherapy or radiation treatment barely improve the survival chances from many cancers. However, cancer is not totally unavoidable. It is not an inevitable consequence of life.

Many striking correlations have been found between diet and cancer. Positive correlations have been found between high fat consumption and breast cancer and colon cancer; between a lack of fiber and cancer of the lower intestinal tract.

These findings alone illustrate the potential of a "prudent diet" for controlling the growth of cancer at its etiologic root. Correlation is not causation, but causation need not be proven before action is warranted.

The United States is preeminent in its scientific and medical expertise. We must avail ourselves of this valuable resource in a total commitment to reducing the incidence of cancer in the country.

It is to that goal that this morning's hearing is dedicated.

In view of our hearing experience yesterday, which lasted until 1:40, I think if we are going to stay on schedule it will require that each witness limit their opening testimony to about 10 minutes. I'll ask the members of the committee to do the same.

With that understanding, I am happy to call our first witness, Dr. Gori of the National Cancer Institute.

STATEMENT OF DR. GIO B. GORI, DEPUTY DIRECTOR, NATIONAL CANCER INSTITUTE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. GORI. Thank you, Mr. Chairman.

To summarize, I may have to impose on you with some lecturing this morning.

Senator MCGOVERN. You can if you wish, Dr. Gori, read your statement as far as time permits. There should be some flexibility allowed here.

Dr. GORI. I will try to stick to your request this morning. If you have any questions I will be glad to answer them at any time during my presentation.

Senator MCGOVERN. Members of the committee should feel free to break in from time to time.

Dr. GORI. I'd like to frame the disease called cancer a little bit within the other diseases that plague our society. Today tuberculosis, influenza, pneumonia and smallpox and a number of other diseases have been conquered greatly due to improved prevention—vaccines, better sanitation of water, food, et cetera.

People live longer and by living longer expose themselves to develop those diseases of a chronic nature such as heart disease and cancer that we have seen rising dramatically in the last 30 years.

Nutrition is coming of age. Only a few years ago it would have raised some eyebrows to have said that nutrition itself may be responsible for cancer or cardiovascular diseases. The evidence we have today makes this statement not only a possibility but a certainty.

I'd like to get into the details of this now. Most of the information comes from epidemiologic studies, namely studying the experience of different cancers in different populations. For example, Japanese migrants to the United States and Hawaii, in particular, change their original experience for colon and stomach cancer to the experience in the United States. Stomach cancer is very high in Japan and low in the United States. Colon cancer is low in Japan and high in the United States. Within two generations, the experience of these immigrants to the United States changes from the experience in Japan to the experience in the United States. This same trend is noted for breast cancer.

This is true for a number of other migrant populations such as Polish migrants to the United States and for migrants in different countries such as migrant groups to Cali, Colombia. These studies indicate that a change in dietary habits is followed with a change in cancer incidence.

Senator BELLMON. Are you saying that the incidence of other forms of cancer goes up when immigrants come to this country? You mentioned stomach cancer going down.

Dr. GORI. Yes, some go up and some go down, meaning that they are doing something good in their dietary habits and something bad. We'll give you some details on that later.

There are differences between geographic locations in the world for certain types of cancer. For instance, breast cancer is very high in the United States and if you go to Miyagi, which is a locality in Japan, it is very low. The same is true for prostate cancer.

Senator MCGOVERN. Later on, Dr. Gori, are you going to tell us which dietary elements contribute to the phenomena?

Dr. GORI. Yes. I will touch on that briefly. To reiterate, stomach cancer incidence in Japan is very high, compared to the United States. By and large, stomach cancer is a disease of the poor which correlates with a low dietary intake of vitamin A and protein, and a high intake of carbohydrates, starch in particular.

In essence, it is correlated with the diet of the poor in many countries.

People could argue that there are other things which change when migrant populations go from one place to another; for instance, the environment. The environment is not likely to be responsible for the observed changes in cancer incidence. Indeed, the pollution levels in Japan are very similar to the pollution that we have in this country, if not worse. Another strong element of evidence comes from observations of smokers. Smokers are known to ingest large quantities of carcinogens. Carcinogenic substances in cigarette smoke are very similar to what is present in the environment. If these carcinogenic substances are responsible for producing certain forms of cancers, like colon cancer and breast cancer, we should observe an excess of these cancers in smokers because again they take in so much of these carcinogens. This is not observed indicating that these types of carcinogens are not likely to affect certain forms of cancer such as colon cancer, stomach cancer, breast cancer.

The difference in benzoapyrene ingestion between smokers and nonsmokers in the Los Angeles area is 330 versus 17 micrograms per year. In those cancers believed to be dietary dependent, we don't see any significant increase in cancer for smokers in spite of this enormous intake of carcinogen.

An indication that people who were exposed to DDT 30 years ago—crop dusters and factory workers—do not have an increased cancer incidence. This probably indicates that DDT at the levels used and experienced by these people was not a prime risk factor for cancer.

Also, we have studies with human users of sweeteners like saccharin and cyclamates and they also do not show an increased experience of cancer over the nonusers.

The stomach cancer experience in Japan has changed dramatically over the last 20 years. There's been a continuing decrease of stomach cancer and an increase of colon and breast cancer. This follows the change in dietary patterns that have been introduced in Japan after the war. They have decreased their intake of starches and have increased their intake of milk, milk products, eggs, and meat. This indicates that their diet is becoming more westernized and that their old

patterns of cancer incidence—low colon and breast cancer, high stomach cancer—will reverse to that found in westernized societies—low stomach cancer and high colon cancer and high breast cancer. This is apparently happening in Japan right now.

There is also a strong correlation between dietary fat intake and incidence of breast cancer and colon cancer. As the dietary intake of fat increases, you have an almost linear increase in the incidence of breast and colon cancer.

I want to emphasize that this is a very strong correlation, but that correlation does not mean causation. I don't think anyone should go out and say that food causes cancer. We all have to eat food. What we can say is not that food causes cancer, but that certain consumption levels or nutrient imbalances in the diet may be predisposing and eventually lead to the development of cancer. The effect may be direct or indirect as through metabolites of nutrients.

Senator BELLMON. You use the term dietary fat. Do you differentiate between animal and vegetable fats?

Dr. GORI. There is a strong correlation both with saturated fats and unsaturated fats. We are studying this now.

In the United States the number of cancer cases a year that appear to be related to diet are estimated to be 40 percent of the total incidence for males and about 60 percent of the total incidence for females. The forms of cancer that appear to be dependent on nutrition as shown by epidemiologic studies include: Stomach, liver, breast, prostate, large intestine, small intestine, and colon. There are other forms of cancer for which evidence is being collected, but as yet, strong evidence is not available.

Again, I want to emphasize we are not saying that there is a direct relationship between diet and cancer. We do have strong clues that dietary factors play a preponderant role in the development of these tumors.

It would seem to be desirable to put some priority on our research and action to see what is in our diet that eventually leads to the formation of cancers. We constantly hear about dietary excesses and deficiencies of nutrients. First we need to define what is normal nutrition and what people should eat in the first place.

To define this, we need to develop information that is valid on a general statistical level for the average American, but we must also develop information that can be useful for the individual citizen. It should be emphasized that we don't need any major breakthrough in basic research. Nutrition science has developed essentially the basic knowledge that is necessary to achieve this goal; namely, trying to find out what people should eat. Now the emphasis should be turned to the application of the knowledge that is available.

We need to engage in detailed and extensive biometric studies that will pinpoint what the individual differences are among the various people that make up our population, the various conditions that impact upon them. For instance, we are different in terms of body size, sex, age, metabolic conditions, and all this influences our nutritional requirements. We are different in terms of behavioral factors. Some of us are very active and some a little slower. This requires, of course, different nutritional inputs.

Another element is the environment. Some live in conditions that require more calories than others. People that live in Alaska during

the winter obviously have different requirements than people that may live in Florida. All these elements need to be put together in a coordinated form requiring a comprehensive approach to the study of the population. This will allow us to come up with useful, practical suggestions which then could be translated into educating our people.

Education is important, but it's also important to teach and distribute the right information. Besides trying to define what people should eat and what normal nutrition is, it is important that we develop methods to assess the nutritional status of individuals. Today, most methods can only be operated in very sophisticated settings at major hospital centers. Again, the basic information needed to develop these tests is available and the emphasis should be on application of this information.

It is important also to develop tests for assessing nutritional status which can be performed in the field without technical difficulties and, therefore, could be applied to the analysis of the nutritional conditions of the population in general.

This obviously has significance to the individual so that we may better approach his nutritional needs and also in terms of defining food policy. We hear testimony that people are hungry, but we have not defined what they are hungry for. If we can define the nutritional requirements properly, then we may be able to develop an enlightened and rational approach to a food policy that will meet the nutritional requirements in these populations.

We must also know what the nutritional value of food is. The Department of Agriculture has been conducting research in this area, but still needs additional support to now develop this information in greater detail.

We don't want to indicate that the evidence we have gives a clear causative link between nutrition and cancer. As I said before, nutrition is not like smoking. We can all do without cigarettes, but we must eat. The evidence that we have indicates that nutritional imbalances in our diet, either excesses or deficiencies, may cause metabolic disturbances over a period of many years that eventually favors the appearance of certain cancers. It is obvious that more research must be applied to this problem area to determine how to reverse this chain of events.

Many factors may be involved in the causation of cancer and nutrition is one of them. It appears that by modifying nutritional factors, we may be able to influence the frightful high cancer incidence that is experienced in this country.

We also need to do research on other carcinogens that may be present in the diet, such as food additives, colorants and other intentional or unintentional carcinogens. However, the evidence we have today for the link between nutrition and cancer does not point to particular carcinogens, but rather to the influence of diet itself.

Therefore, I personally feel that greater emphasis should be placed on studying those nutritional/dietary elements that may be causative of, or conducive to, cancer development.

Besides the aspects of nutrition in the etiology of cancer, nutrition is obviously important to the cancer patient. Many cancer patients lose their appetite. Food tastes bad to the cancer patient and this in turn becomes a vicious cycle. He loses weight and loses his capacity to cope with disease or with the aggressive forms of therapy that are used

today—surgery, chemotherapy, radiotherapy. Therefore, we need and we have initiated research to see whether this process can be reversed through various approaches.

Perhaps we can modify his perception so that food again tastes good or we can change the taste of the food itself so that it can again be ingested. We can also try behavioral approaches to persuade the patient to ingest more. For patients that cannot ingest food or cannot digest it, such as patients with cancer of the head and neck, cancer of the gastrointestinal tract, then we have to develop other techniques like gastric feeding or total parenteral intravenous nutrition. To use these techniques effectively, we need to know the nutritional requirements of cancer patients.

Again, the basic information and knowledge is available. Extensive clinical trials must be conducted to prove these techniques and transform them for use in the average hospital. There may be four or five hospitals in the country today that routinely use these procedures. Eventually the ambulatory patient may be treated in his home.

This is a particularly crucial program with respect to children as children are finicky by nature. When they are sick, particularly with cancer, food intake is a real and serious problem. We are therefore addressing specific attention to the problems of the pediatric patient.

We have in the diet, nutrition, and cancer program at the Cancer Institute six major goals. We're trying to assess the role of nutrition in the causation of cancer and in the prevention of cancer. To do this, we will have to define what we should eat in the first place; what is normal for us to eat: and what is desirable, according to our body build, our behavioral characteristics, and our environmental characteristics.

The nutritive value of foods must be defined and methods developed to assess individual nutritional status. We must study the potential of nutrition in helping the patient to survive the aggressive cancer therapies we are using today. Lastly, we need to develop educational methods that transfer this knowledge to the different levels where it will be used. We heard yesterday how little physicians know of nutrition, but this is not surprising and not entirely their fault.

Today, we cannot provide the physician with a body of information that is useful to him in confronting a cancer patient. We don't have to provide a cookbook that the physician can look in, but we should provide him with a textbook to derive useful information for application to the individual.

The same is true for the nurses, the dietitians, the schools, and others that teach nutritional education to the population at large. The educational problem cannot be solved very rapidly.

Our nutritional practices today are the heritage of thousands of years of food tradition. To break this tradition, we must modify our food practices relative to traditional foods, traditional preparation, and traditional tastes.

We heard yesterday of the problems of the unborn child when the mother does not have the proper nutrition. Potential nutritional problems start in utero and continue throughout life. Under natural conditions a child is likely to be attached to his mother's breast for a long time and eats rather small amounts of food very frequently, which perhaps may determine the size of his stomach and the reflexes which

he's used in order to consider himself satisfied. The experience of the bottle fed infant is considerably different.

The other problem with children, especially teenagers, is advertising and its relationship to proper nutritional intake. Agricultural practices may also have to change as new information is developed.

Current economic patterns may clash with some of the data from ongoing research projects. This process will require time and good will from a variety of people.

We must develop some long-range goals. I believe that valid information presented in the proper way can persuade our society to turn to more healthy food habits such as decreased caloric intake particularly of fat and sugar and increased fiber intake.

Thank you very much.

Senator McGovern. Thank you, Dr. Gori. There's one statement in your prepared testimony that I found very striking and I think it summarizes a major point that needs to be called to the attention of the committee and needs to be underscored in our hearing record.

I want to make sure that I understand the full implications of it. You note in your statement that diet is an important factor in the causation of various forms of cancer; that it is correlated to more than half of all cancers in women and at least one-third of all cancers in men. I think that's an incredible statement.

Are you not telling us, in effect, that bad eating habits are a more important cause of cancers, based on the present evidence, than cigarette smoking?

Dr. Gori. For males, they are probably equivalent. For females, you're right, sir. The dietary component is far more important than anything else since females smoke less than males. That's the only thing that allows us to make that statement.

Senator McGovern. Well, Dr. Gori, before we go on to the next witnesses I would like to just make some preliminary observations about what I think we have already learned and then perhaps the other members would like to comment. We have seen that eating more is not necessarily eating better. This committee has looked at the problem of hunger in the United States and underconsumption and I think Dr. Lee was correct yesterday when he said that our investigations and our hearings have played a central role in alerting the Nation to the fact that there are millions of Americans who are hungry who don't get enough to eat. However, Dr. Cooper, the Government's leading health official, confirmed yesterday that 6 out of 10 of the leading causes of death in the United States are related to bad eating habits; not necessarily too little to eat; in some cases too much; in other cases the wrong kinds of food.

I think it's time for a major initiative in the United States to eliminate bad eating habits and to make this the highest possible national priority. I have been impressed in watching the Olympic games the last few days with the way the countries have been able to improve the whole physical tone of their populace by sustained physical training. There's no reason why the same thing couldn't be done in terms of improving our eating habits, but I'd like to suggest in a couple minutes five or six possible steps that we might take to improve our eating habits and then get the reaction of the members.

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Senator PERCY. Mr. Chairman, are we going into the question period now with Dr. Gori?

Senator MCGOVERN. No.

Senator PERCY. I would like my colleagues also to have a chance to make any comments.

Senator MCGOVERN. Of course. I don't intend to dominate the hearings, Senator Percy. Everyone will be heard.

Senator PERCY. I just wanted to know what the procedure of the Chair would be.

Senator MCGOVERN. The procedure is that each member of the committee is going to have 10 minutes to question the witnesses on the first time around.

Senator PERCY. And you're taking yours now?

Senator MCGOVERN. No. This is merely a series of observations that I would like to make to the doctors, for any comment that any of them would care to make in their testimony.

We need, first of all, a more comprehensive and specific nutrition surveillance system. I think we have been so negligent in this area that we really don't even know the eating habits of large numbers of Americans. Second: A nutrition education program from the first grade through medical school. Third: Increased emphasis by the medical community and the Government on preventive health care and the creation of a nutritional profile or examination so that an individual will know what is best for him or for her to eat. Four: Greater coordination by the different governmental agencies in the area of nutrition and health with a centralized office and greater emphasis on health in our food and agricultural policy. Five: Greater research in the area of human nutrition from the effects of additives. And finally, prevention made an integral part of any health insurance program we undertake.

Dr. Gori, if you'd care to just comment on those general observations, those are all the questions I'd like to direct at this time. If other members of the panel have additional comments we would be glad to take those now before we proceed with the other witnesses.

Dr. GORI. I believe the first point you made was surveillance, Senator.

Senator MCGOVERN. Yes.

Dr. GORI. Yes, this is an important issue and should be expanded. Some of the efforts done so far have been by necessity imperfect, because we do not know precisely what individuals should eat. As I indicated before, we have the basic knowledge but not the precise method to assess nutritional status of individuals in the field. Asking people what they eat will not provide us with very reliable information. This is a well-known fact in many of the studies that have been conducted.

The development of these methods will not require a great deal of time, maybe 2 years with proper support. These methods would be applicable to field studies and should allow us to conduct meaningful surveys.

In the matter of education, I believe that was your second point, Senator——

Senator MCGOVERN. From the first grade on through medical school.

Dr. GORI. It's very important. We heard about it yesterday. I would like to suggest that to educate, we need some education to give. The information that we have is preliminary and needs to be developed to

allow precise nutritional prescriptions for the individual that presents himself to us rather than recommendations for the general population.

In other terms, it does little help to the physician to know that the average American should eat 60–65 grams of protein a day. The average American does not exist. Individual Americans vary from newborns to old people, very active, very slow, different sexes, different metabolic patterns, different environments. This can be put together in a meaningful way by analyzing the population. This will require a substantial effort to see how individuals respond to nutritional needs.

This comes to the third point that you made, the definition of what we should eat. This will also have to account for individual requirements. Today we have general statements that we can make about a nutrition and food policy for the general population. It's going to be much more difficult to individualize this information and apply it to every person that presents himself to a physician or nutritionist.

Senator McGovern. I take it under that point, Dr. Gori, that you have no question at all there's a need for much greater emphasis on preventive medicine, regardless of how we eventually arrive at this system. There needs to be a shift in the direction of more concern on the part of the whole medical community and the Government in the amount of resources that we are investing in preventive medicine.

Dr. Gori. There's no question. Medicine has two priorities in my opinion. One is to maintain health. The other is to cure disease. And people that are sick today obviously need to be taken care of and I don't advocate spending less to find cures and to find ways of managing the patient. If we look toward our children and the future of this country, it is obvious that we must pay attention to prevention without thinking of the economic implications that health care will have if we let it go unchecked as we have done so far.

We should study those elements that seem to be correlated with the development of disease. We heard about diet and nutrition yesterday. Other factors associated with disease are smoking and consumption of alcohol.

Research in etiology should be viewed as an investment in the future. We should not expect rapid results from our investment in prevention. Diseases that seem to be dependent on nutrition need several decades to develop, and only after several decades can we expect to see a decline in these diseases assuming that we start today with preventive measures.

Senator McGovern. Senator Percy.

Senator Percy. I have one question I'd like to put to the panel, but I defer to Senator Taft and Senator Bellmon first.

Senator Taft. Thank you very much, Senator.

The only thing it seems to me that hasn't been covered is the areas of cancer which are not affected by nutritional aspects. I assume there are quite a few. How about leukemia and cancer of the bone and muscular tissues? Is there any evidence that they are affected by nutritional factors?

Dr. Gori. We would obviously like to have an answer for all of them, Senator, but we have to admit for some we don't know what the actual situation would be. Certainly for lung cancer there's uncontrovertible evidence that smoking is a factor. For a number of other

cancers smoking may also be an important factor, particularly when coupled with a nutrient imbalance or alcohol consumption. This is particularly true of cancers of the upper alimentary tract, cancer of the kidney and of the bladder.

Besides smoking, I believe that the evidence points to nutrition as the single most important factor. Again, we don't need to smoke, but we must eat. Therefore, the situation is completely different.

Senator TAFT. What about leukemia? Is there any connection established?

Dr. GORI. Leukemia, there are several theories linking it to generic disorders, some linking it to exposure to X-rays and radiation in general, some linking it to exposure to chemicals. There is some evidence that there may be a dietary component in the development of leukemias, too. I would hesitate, though, to put all these theories now in a hard frame. I would consider them still very soft at this particular time and say we don't know what causes leukemia in man. We have a lot of evidence of what causes it in animals, but in man it's a different story.

Senator TAFT. Thank you.

Senator BELLMON. Dr. Gori, I'm a little confused now. Are you telling us that the state of the art or that the medical profession now has available knowledge adequate to advise an individual as to how to eat or how to live and in this way cut down on the incidence of cancer, or are you asking us for support so that you can conduct the research and gather this kind of information?

Dr. GORI. The evidence that is available to the physician today is general. We can rapidly develop more specific information that every physician could use in dealing with an individual patient. Today the physician can make some prudent recommendations, but there's little that we know about micronutrient requirements, vitamin requirements and those fine-tuned elements of nutrition that appear so necessary in the maintenance of health or in the lack or excesses in the appearance of disease.

Therefore, if any support is forthcoming, this is something of what it will buy: Better information for the physician so that he can apply it to the individual patient that comes to his office.

Senator BELLMON. Well, if you were to advise a 50-year-old male blue collar worker today as to his diet, what would you tell him?

Dr. GORI. Senator Humphrey yesterday was expressing a question like that about himself going down to the Senate cafeteria, and the answer was vague. I would have to know more about this man—first of all his history. I would like to know what he likes to eat so that we don't have to hit him with a prescription that he's not going to like. In general, this person is probably overweight so one would recommend reduction in caloric intake. Consequently, the person should reduce fat intake because of the caloric density of fat. Then the person should cut down on his sugar and starch consumption items, which lack bulk. In addition, the person should eat more bulky foods like vegetables and fruits so he will meet his needs and feel satisfied.

Perhaps he will want to eat more after, but if he keeps eating this kind of food he can eat four meals a day and very likely maintain an optimal weight. The person should not smoke, drink moderately if at all. I'll tell him also not to worry, because that may be part of the problem.

Senator BELLMON. So the state of the art is that you could get some very definite advice.

Dr. GORI. General advice could be given but I would have to know, as a physician would have to know, more about his nutritional status in terms of his energy, amino acid, vitamin, and mineral balances. Knowledge in this area is very important in maintaining an individual's health. All these elements of health need to be developed in greater depth and, as I said before, we have the basic information that is necessary. We just need to conduct those extensive biometric studies that would allow us to apply them to individual Americans rather than to the average American.

Senator BELLMON. Well, this sounds like quite a different approach than some kind of a national nutrition education program. You're talking more on the basis of a 1-on-1 relationship between the physician and an individual patient.

Dr. GORI. Well, you have that relationship, of course, as well as you have a global relationship to the Nation. The two obviously need different information and a different approach. Globally I think we can make recommendations today far easier than we can make them at the individual level. As we said before, I can make the same prescription for the general population that we would make for your hypothetical blue-collar worker 50 years old.

Senator BELLMON. I see Dr. Wynder there apparently disagreeing. Did you have a different opinion?

Dr. WYNDER. No. I nearly always agree with my colleague, but if I have any differences I would like to say them in my formal comments.

Senator BELLMON. I have no more questions. Thank you.

Senator PERCY. Mr. Chairman, I felt your summary of yesterday was very helpful. I would like to add six sentences which describe the points made yesterday that were rather interesting to me. Also, I'd like to ask just one question.

The first observation, a very important one, is that the Nation's highest ranking health officer confirmed without any equivocation that 6 of the 10 killer diseases are connected to diet: Heart disease, stroke, cancer, diabetes, arteriosclerosis, and cirrhosis of the liver.

Second, nutrition is one of the most important, if not the most important component of preventive health care today.

Third, nutritional deficiency diseases are a minor problem in this country today. Primarily, our nutritional problems are those associated with overconsumption. I think that came as a rather shock and surprise to me. If anyone has any observation on that during the course of your comments today, we would appreciate it.

Fourth, the American people know very little about nutrition. The average American diet is not conducive to good health. As a general rule, Americans should eat less, reduce fat, cholesterol and sugar consumption.

Fifth, the medical profession knows very little about nutrition and doesn't emphasize it in its medical schools. Today's medical school graduates know more about heart transplants than basic nutrition.

Finally, nutrition education is needed to help every citizen understand what is good nutrition in order to take greater personal responsibility for health.

Now that doesn't do full justice to yesterday's hearing, but I think, supplemented by the comments of our chairman, these observations

give a fair insight to those with us today who were not here yesterday.

With respect to our hearing today on cancer, I'd like to pose one question. I'm going to make a couple of observations to see whether or not they are accurate in the judgment of our panel.

As much as 90 percent of cancer is said authoritatively to be attributed to environmental causes, many of them manmade. Diet is linked to more than a half of all cancers in women and at least one-third of all cancers in men. Diets with too many fatty refined foods and lacking in high fiber ingredients are implicated in colon cancer. A diet built around starch is linked to gastric cancers. There's a correlation between heavy alcohol consumption combined with cigarette smoking and cancer of the esophagus. A high fat diet is connected to breast cancer. Smoking is linked to lung cancer.

My question, Dr. Gori and any of the other panel members who would care to comment, is simply this: How much cancer can be prevented by changes in bad smoking, drinking and eating habits? How should the American people change their dietary habits to minimize the risk of cancer? What would be the best low cancer risk diet? Either answer that now or in the course of your testimony which we are interested to hear.

Dr. GORI. Well, first, there's a point of modification I'd like to point out that in our interactions with the environment we have really three portals of communication. We have the gastrointestinal tract. We have the lungs. We have our skin. Those are our surfaces or interfaces through which we communicate with the environment.

If we calculate the surface of these three portals of the intestinal tract, of the lung and of the skin, and the relative number of molecules that over a lifetime come in contact with the surfaces, the chances of interaction is approximately 1 for the skin 1,000 for the lung, 1 million for the gastrointestinal tract. In other terms, we have a thousand times more chances to interact with the environment through our lungs than we have with the skin and a million times more to our gastrointestinal tract than we have with the skin.

Now these are rough estimates, but please keep in mind so that you're not surprised when you say or when somebody says the diet plays a preponderant role in the condition of the disease, it is the major way that we have to get in contact with the environment, the world outside of us.

As for opportunities for prevention, smoking of course is well known to cause lung cancer. If everybody stopped smoking today, we would not conquer lung cancer immediately. It would take about 10 years, but in 10 years we could expect to reduce lung cancer to at least 90 percent of what it is today. Approximately 80,000 cases a year would be saved in these 10 years.

As far as the dietary related cancers, we have said that one-third of all cancers in male and about one-half of all cancers in females are related to diet.

We have 138,000 new cases in males and 201,000 new cases for females related to diet. This is the ultimate potential for prevention. Whether we can achieve that and how much time will be required, is an open question. Any beneficial modification that we could make to our diet should show a decline in these figures 5 to 10 years after the measures are adopted.

Senator PERCY. Dr. Wynder, do you want to comment?

Dr. WYNDER. I can comment on it in my general presentation.

Senator MCGOVERN. I'd like to urge my colleagues, if we can, to go back to the format we agreed on here at the beginning. I'm sorry I interrupted it myself just briefly, but we really do need to hear from the other doctors. It was my hope that most of the questions could be reserved until all the doctors have had a chance to make a brief opening statement.

Senator Humphrey, do you have anything you want to say at this time?

Senator HUMPHREY. No. I think I would like to hear the witnesses, and then we'll have a good deal of evidence on which to base our questions. I'd like to withhold my questions until then.

Senator MCGOVERN. Is that agreeable with you, Senator Percy?

Senator PERCY. Yes, sir.

[The prepared statement of Dr. Gori follows:]

STATEMENT OF DR. GIO B. GORI, DEPUTY DIRECTOR, NATIONAL CANCER INSTITUTE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman, gentlemen of the select committee, nutrition science is coming of age. For years the experimental difficulties in this field have discouraged scientists, who found other subjects more interesting and, apparently, more fitting to human health.

Indeed until a few years ago, the role of nutrition in disease was recognized only for certain specific deficiency syndromes, such as beri-beri, scurvy and rickets, for which rapid nutritional therapies were found. Until recently, many eyebrows would have been raised by suggesting that an imbalance of normal dietary components could lead to cancer and cardiovascular diseases.

Today the accumulation of epidemiologic and laboratory evidence in man and animals makes this notion not only possible but certain.

The surge of knowledge in this field over the last years makes it possible to think of a coordinated effort of research and action to accelerate the application of this understanding in the maintenance of human health and in the prevention and cure of disease.

The National Cancer Institute has developed a Diet, Nutrition and Cancer Program (DNCP), that puts together the best scientific minds in a national forum on nutrition and cancer, where priorities of immediate benefit to the population are identified; the program stimulates the necessary laboratory activities and conducts those field and clinical studies that are necessary to define human application of scientific knowledge, which present logistic and organizational difficulties beyond the reach of isolated scientists. This program has been organized entirely with the advice and help of some 200 scientists around the country, who provide the necessary scientific input and will help monitor the results (Figure 1).

DIET, NUTRITION AND CANCER PROGRAM

RESEARCH GENERATION FLOW

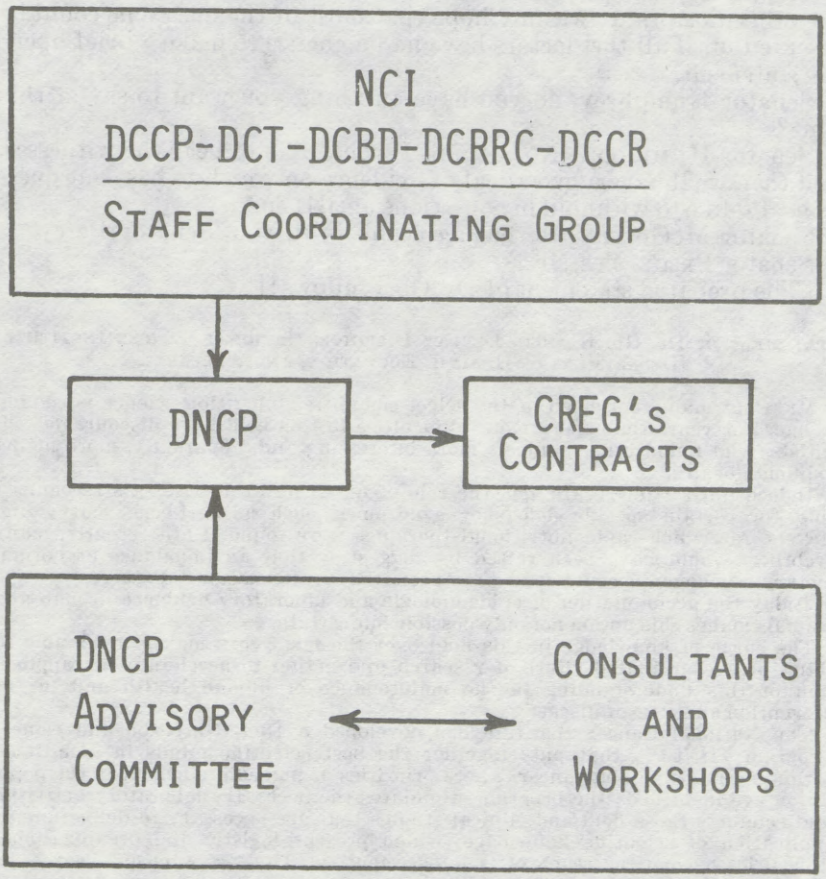


FIGURE 1

Before we present in more detail the structure and goals of this program, it is desirable to analyze briefly the major elements of evidence linking nutrition and cancer.

In this context, nutrition is significant in two ways. First, certain dietary habits have been shown to correlate very strongly with the incidence of certain forms of cancer, and second, the chances of successful therapy in the cancer patient are significantly dependent on the nutritional conditions of the patient.

Epidemiologic and laboratory data suggests that diet is an important factor in the causation of various forms of cancer, and that it is correlated to more than half of all cancers in women and at least one-third of all cancers in men.

Some of the best evidence comes from migrant populations, which rapidly change their original cancer experience to that common to the population of the host country. Colon and breast cancer are low, while stomach cancer is high in the Japanese population. The reverse is true in the United States. Within two or three generations Japanese migrants to the United States show a shift of cancer incidence patterns from those common in Japan to those prevalent in the United States (Figures 2 and 3). The same is true for stomach and colon cancer for Polish migrants to the United States. These shifts take a few generations because dietary habits learned in the country of origin are slowly changed in the process of acculturation to the American way of life.

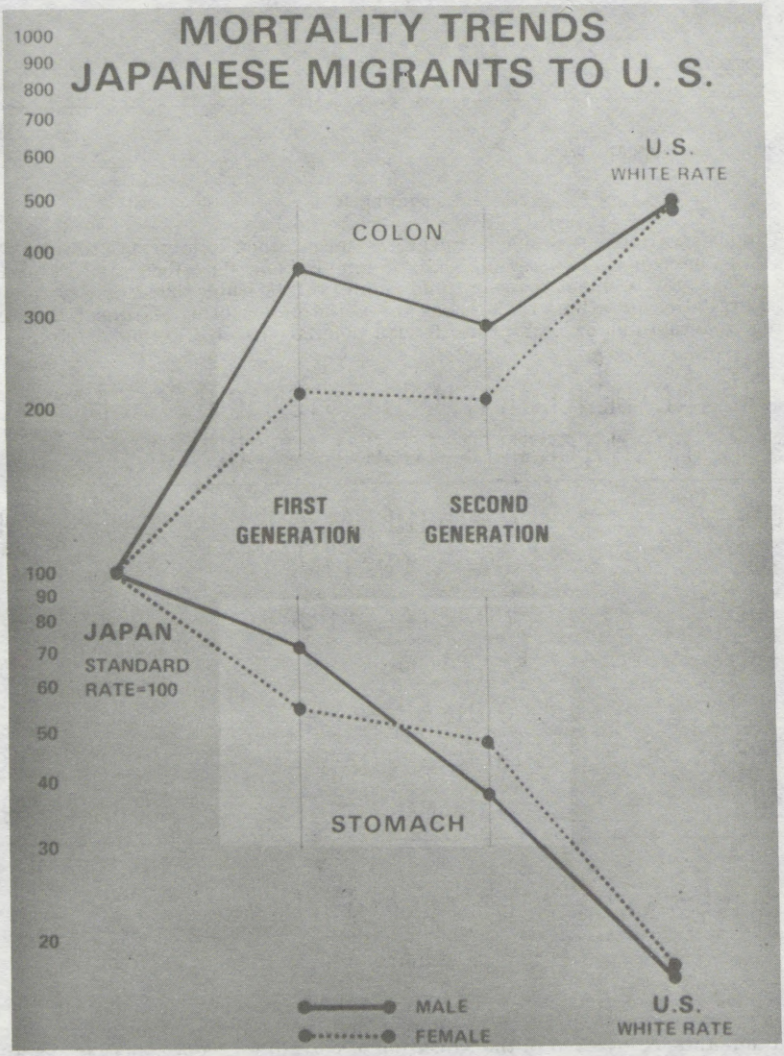


FIGURE 2

NUTRITION IN THE U. S. AND JAPAN

Nutrient	Unit	U. S.	Japan	% Difference
FOOD ENERGY	CAL	3300	2273	69
PROTEIN	G	99	84	5
FAT	G	155	52	34
CARBOHYDRATE	G	385	351	91
CALCIUM	G	0.95	0.55	58
VITAMIN A	IU	8100	2043	25
RIBOFLAVIN	M	2.32	117	99

Source: Hirayama, 1975.

Figure 3

The observations on stomach cancer are not confined to migrants to the United States. The cancer registry in Cali, Colombia, has described similar marked differences for stomach cancer among migrants within that country (Figure 4). Parallel observations for breast cancer and other forms of cancer have been noted in Israel among immigrant Jewish populations of different origin.

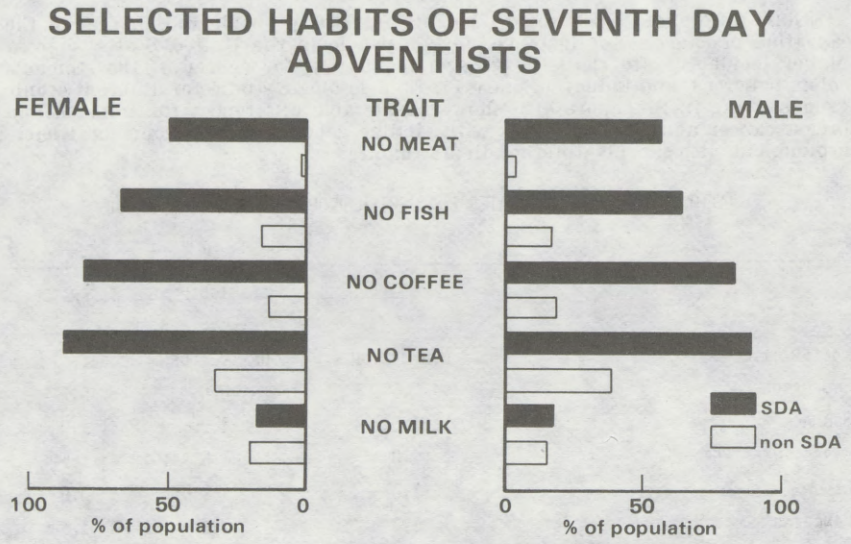
INCIDENCE RATIO OF STOMACH CANCER
FOR MIGRANTS TO CALI, COLUMBIA

Female	Birthplace	Male
100	CALI (NATIVE)	100
96	COASTAL AREAS	33
156	ANTIOQUIA	166
140	CAUCA	224
205	MAGDALENA	224
349	NARIÑO	290

Source: Correa et al., 1970.

Figure 4

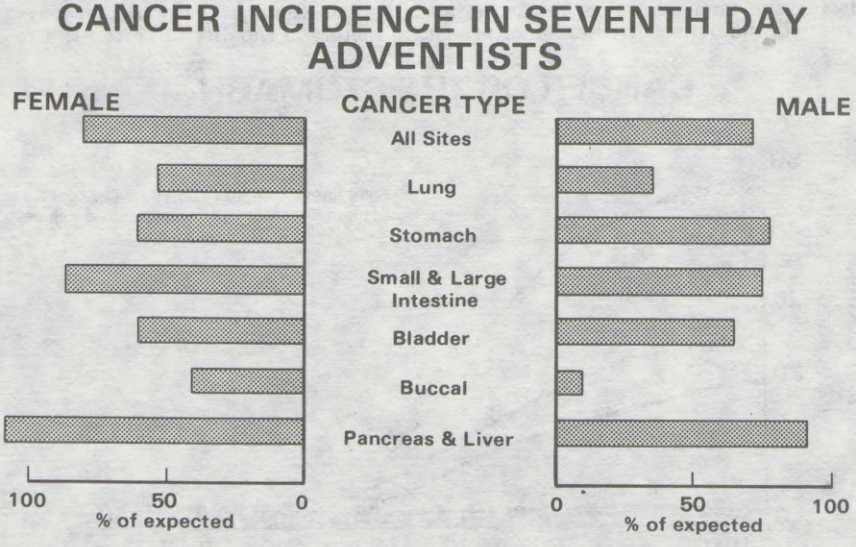
One could argue that the environment of different countries could explain the observed differences; however, the notion that diet, and not other environmental contaminants, is involved in the causation of certain forms of cancer is sustained by the strong differences of cancer incidence among populations that live in the same environment and that differ principally because of dietary intake (Figure 5).



Source: Wynder, 1959.

FIGURE 5

This is true of the Mormon populations in Utah as compared to the non-Mormon Utah population, and for the Seventh Day Adventist population in California, as compared to the other populations living in the same environment (Figure 6). Existing data document that mortality rates among Seventh Day Adventists are substantially less than the general population rates for cancer sites related to nutrition. Mormons in Utah are reported to have lower rates of stomach and colon cancer than non-Mormons, and female Mormons experience lower rates of breast, uterine, and other cancers than their non-Mormon counterparts.



SOURCE: Lemon, et AL; 1964.

FIGURE 6

Ethnic differences also provide insights into the probable role of diet in the causation of cancer. For instance, Jewish people in the United States show a higher incidence rate than the general population for cancer of the stomach, colon, pancreas, and kidney (Figure 7). Epidemiologic studies of different ethnic groups living in Singapore also show considerable differences for stomach and breast cancer among populations with similar genetic and environmental background, but with sharply different dietary habits.

RATIO OF CANCER DEATH RATES FOR JEWISH PEOPLE IN NEW YORK CITY

	Religion		
		Jewish	
Cancer Site	Non-Jewish	Native Born	Foreign Born
Esophagus	1.0	0.4	0.7
Stomach	1.0	1.2	1.0
Large Intestine	1.0	1.5	1.5
Liver	1.0	1.2	0.9
Pancreas	1.0	1.6	1.3
Breast	1.0	2.0	1.2
Prostate	1.0	0.7	0.6
Bladder	1.0	0.7	0.9
Kidney	1.0	1.8	1.7
Leukemia	1.0	2.1	1.2

Source: MacMahon, 1955.

Figure 7

Other studies that reinforce the link of nutrition and certain forms of cancer have noted changes of cancer rates within a specified period of time. The sharp decrease of stomach cancer incidence in the United States over the last 20 years points to the likely introduction of protective factors in the diet (Figure 8). The

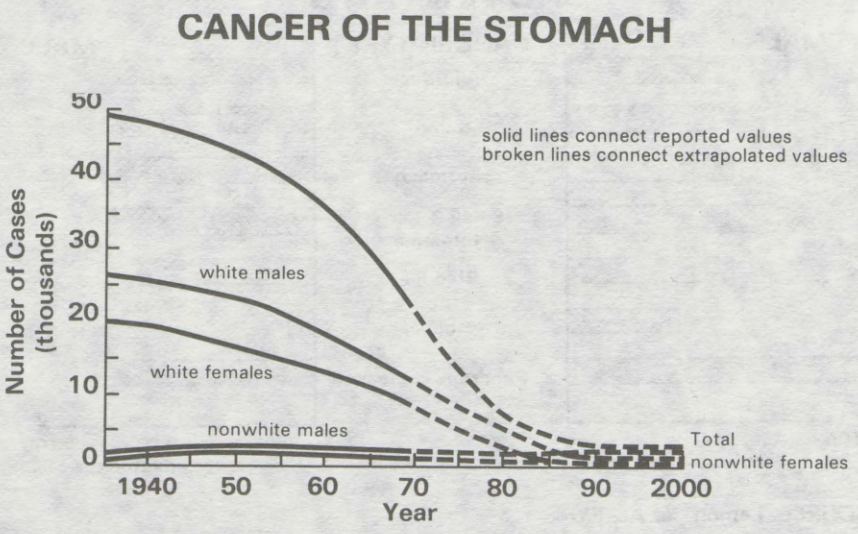


Figure 8

same phenomenon is being observed in Japan where stomach cancer rates have begun to fall during the last 10 years; however, in the same country, an increasing introduction of western dietary habits appears to correlate with an increased incidence of cancer of the colon and breast, which are common in western societies (Figure 9).

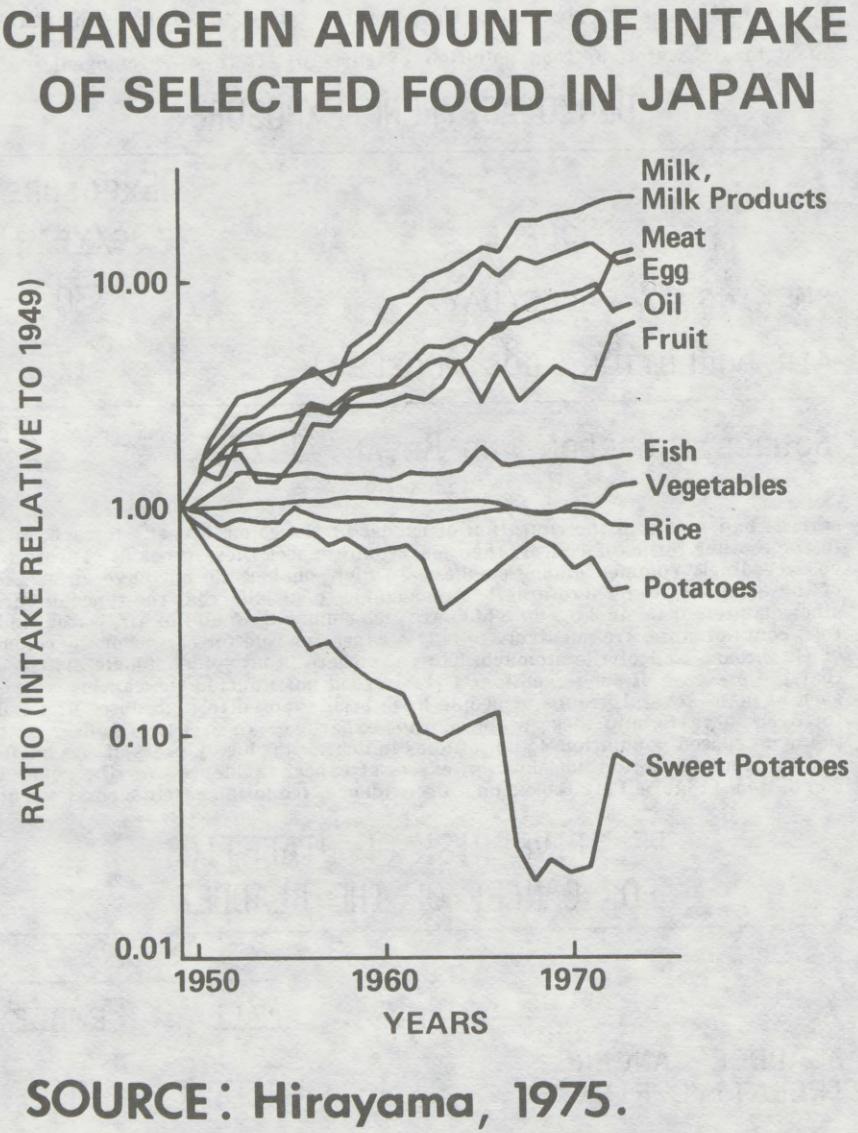


FIGURE 9

All this evidence is reinforced because many of these coincidences have been found to hold not for cancer alone, but for a variety of other diseases as well, notably cardiovascular diseases. This indicates that some common nutritional imbalance is at play and that the solution of this problem is likely to have a beneficial impact not for cancer alone, but also for a variety of nutrition dependent diseases.

Several elements reinforce the evidence that diet, and not other factors, is involved in the causation of certain forms of cancer. The general pollution and food contamination is similar in Japan and in the United States, therefore, it is not likely to be responsible for the cancer incidence differences between these countries, nor for the shifting of patterns of incidence observed in migrant populations.

Also, within a given population, smokers are exposed to enormous quantities of carcinogenetic substances similar to, but far in excess of, what is normally found in air, water, or food pollution (Figure 10). If these carcinogenic sub-

BENZO[A]PYRENE EXPOSURE

SOURCE	EXPOSURE (µG/YEAR)
SMOKING (2 PACKS/DAY)	330
AIR POLLUTION (LOS ANGELES)	17

SOURCE: GORDON AND BRYAN, 1973.

FIGURE 10

stances had a role in the causation of cancer of the colon, breast, stomach, and to some other forms of cancer, then one would expect these types of cancers to be exceedingly common among smokers. In fact, smokers do not have an excess of these cancers and, therefore, it is reasonable to surmise that the types of carcinogens present in smoke, and which are also commonly found in air, water, and food contaminants, are not likely to play a causative role for cancer of the colon, of the breast, and of the stomach. Thus far there is no epidemiologic evidence that the presence of such agents at DDT in food has affected the cancer experience in man. Several groups of people have been exposed to high doses of DDT for over 30 years, and these people do not experience an excess of cancer over the non-exposed population. Other studies indicate that heavy users of saccharin and cyclamates also do not show an excess of cancer incidence over the general population (Figure 11). Based on this evidence, potential carcinogens present

RELATIVE RISK OF DIABETICS FOR CANCER OF THE BLADDER

	SEX	
	MALE	FEMALE
BLADDER CANCER (RELATIVE RISK)	1.00	0.97
SACCHARIN INTAKE (MG/KG)		
DIABETIC	1.26	0.72
NON-DIABETIC	0.09	0.30

SOURCE: ARMSTRONG AND DOLL, 1975.

FIGURE 11

in the environment or as food contaminants do not appear likely to play a significant role in the relationship of nutrition and certain forms of cancer, particularly colon, stomach, and breast cancer. Rather, it is plausible that nutritional deficiencies and/or excesses influence metabolic processes that, after many years of insult, result in the appearance of certain forms of cancer.

We may now examine which dietary components have been correlated with certain forms of cancer by the epidemiologic studies. Gastric cancer has been found to be negatively correlated with raw vegetables and milk intake. In Japan the consumption of milk and milk products increased more than 20 times from 1949 to 1971 and a decrease of stomach cancer has followed and still proceeds. Other studies incriminate Japanese style pickled vegetables and dried salt fish, important constituents of the Japanese diet, in the incidence of gastric cancer (Figure 12). Other studies indicate that a diet built almost exclusively on starch, such

SELECTED HIGH RISK FOODS
FOR JAPANESE MIGRANTS FOR STOMACH CANCER

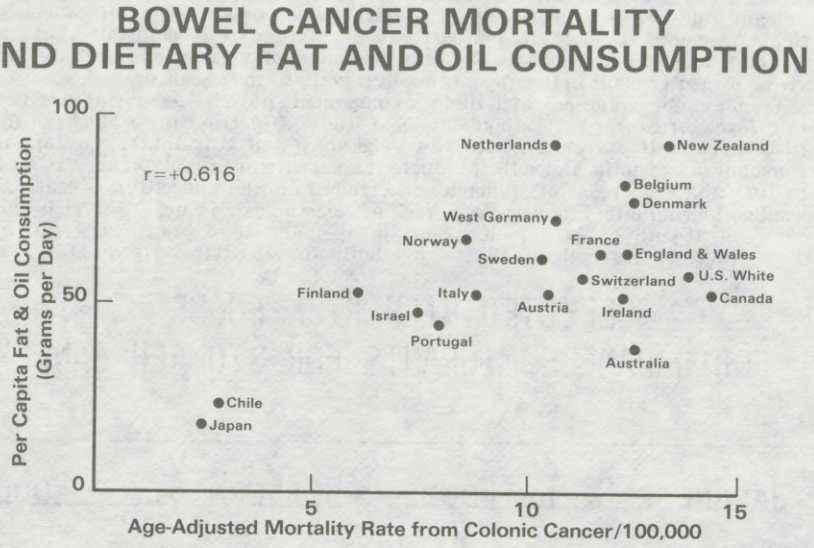
JAPANESE STYLE FOODS	WESTERN STYLE FOODS
DRIED FISH	COFFEE
SALTED FISH	CANDY
SHOYU	CHERRIES
PICKLED J. RADISH	BUTTER
SAKE	BEER

SOURCE: HAENSZEL, 1972.

FIGURE 12

as eaten by poor populations around the world in particular by low income Japanese or low income Colombians, may also relate to the onset of gastric cancer, notoriously a disease of the poor, as shown by negative correlations between stomach cancer and social status in various studies.

A world wide correlation exists between colon cancer and fat consumption (Figure 13). The difference between high incidence of colon cancer in the United



Source: Wynder, 1975.

FIGURE 13

States and low incidence in Japan are consistent with the differences of fat intake between the two countries. Also the greater incidence of colonic cancer in Japanese migrants to the United States reflects an increase of fat intake from their native habits to western dietary habits. And colon cancer seems to be increasing in Japan, a finding consistent with an increasing westernization of its diet and an increased intake of fat. Colon cancer has also been shown to correlate highly with the consumption of meat, even though it is not clear whether the meat itself or its fat content is the real correlating factor. Mortality rates from colonic cancer is high in the United States, Scotland, and Canada, which are high meat consuming countries; other populations such as in Japan and Chile, where meat consumption is low, experience also a low incidence of colon cancer. Seventh Day Adventists and Mormons have a restricted fat and meat intake when compared to other populations living in the same district and, as indicated, they suffer considerably less from some forms of cancer, notably breast and colon. Other observations have postulated that a low fiber intake in western countries may be responsible for a high incidence of colon cancer. Indeed the Japanese diet is high in fiber content, and several observations indicate that African populations with high fiber intake in their diet experience, like the Japanese, a low incidence of colon cancer. The same appears true for the Seventh Day Adventists.

If we consider alcohol as an abnormal dietary component, it is also clear that its excessive consumption is a very significant causative factor, particularly for cancers of the upper alimentary tract.

It is important to note that laboratory work in animals parallels and strongly confirms the results of epidemiologic studies in man. Various manipulations of nutritional components of the diet have been tested in animals for their effect on cancer development.

Of all dietary modifications, caloric restriction has had the most regular influence on tumor formation. With few exceptions, caloric restriction generally inhibits tumor formation. In mice, a decreased incidence of spontaneous neoplasms of the breast are noted with caloric restriction. Furthermore, even within a group of animals being fed identical diets, the incidence of tumors tends to be consistently greater in heavier rats than in lean rats.

Both the amount of fat in the diet as well as the saturation of the fat tends to influence tumor incidence. Increased amounts of fat in animal diets have resulted in an increased incidence of certain tumors—notably breast tumors—and the tumors have also occurred earlier in the life of the animal. Furthermore, animals consuming a diet containing polyunsaturated fat, compared to a group consum-

ing saturated fat, had a higher incidence of colonic tumors. Amino acids, the component parts of protein, have also been noted to influence cancer development in animals. Low levels or even deficiencies of certain amino acids seem to have a therapeutic effect on cancer.

Chemicals such as polycyclic hydrocarbons, many of which are carcinogenic, have been found to be moderated by administration of vitamin A. In hamsters, administration of vitamin A appears to inhibit the induction of cancer of the stomach and cervix which is otherwise caused by carcinogenic hydrocarbon compounds.

One current and plausible theory about the role of dietary fats in the causation of certain forms of cancer suggests that an excessive fat intake modifies the metabolism of cholesterol, bile acids, and neutral steroids in the intestine, as well as the metabolism and secretion of steroid hormones in circulation (Figure 14). On one side, the bile acids secreted in the intestine could be degraded by the

PROPOSED RELATIONSHIP BETWEEN FAT AND CANCER OF THE LARGE INTESTINE AND COLON

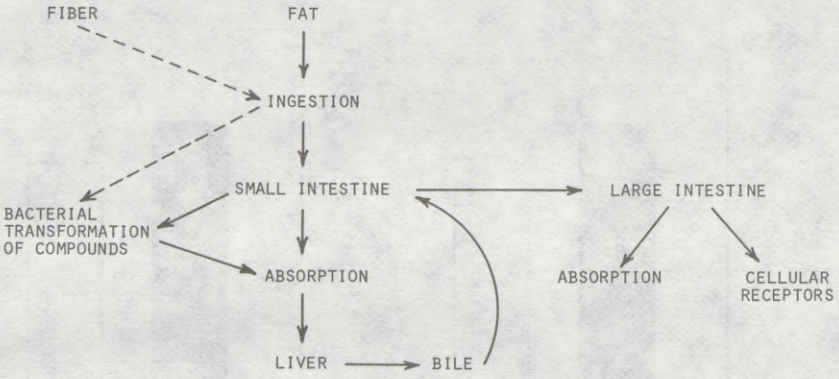


FIGURE 14

bacteria growing in the intestine to form carcinogenic substances that may initiate colon cancer. This process of degradation and transformation of bile acids could be modulated by the presence of fiber in the diet, which is known to effect the composition of bacterial and chemical conditions in the intestine, or by other conditions, such as the absence of antioxidants. On the other hand, the altered metabolism of steroid hormones could impose unnatural burdens on cellular receptors of specific target tissues, such as uterus or breast, again to initiate cancer at those sites.

It is important to stress that correlation of diet and dietary components with certain forms of cancer does not mean an exclusive link to causation. It is likely that diet imbalances, perhaps coupled with other environmental hazards, may provide a continuous low level insult that over a period of many years would weaken the natural defenses of an organism, and produce the metabolic changes necessary to the appearance of certain forms of cancer. In other words, many factors may be necessary in cancer causation, but the modification of one alone of these contributing factors—e.g., diet—may be sufficient to stop or retard the chain of causative events. Because of the apparent influence of diet and nutrition in the causation of a large proportion of human cancers, it seems reasonable that we should investigate the precise circumstances of this interaction, with the ultimate goal of modifying nutrition and diet so as to reduce the incidence of disease.

In summary, even though the necessity of time has prevented consideration of all significant details, the role of nutrition in cancer causation is strongly supported by epidemiologic studies and by studies in animals. Present knowledge provides provoking clues regarding those dietary factors that may be responsible.

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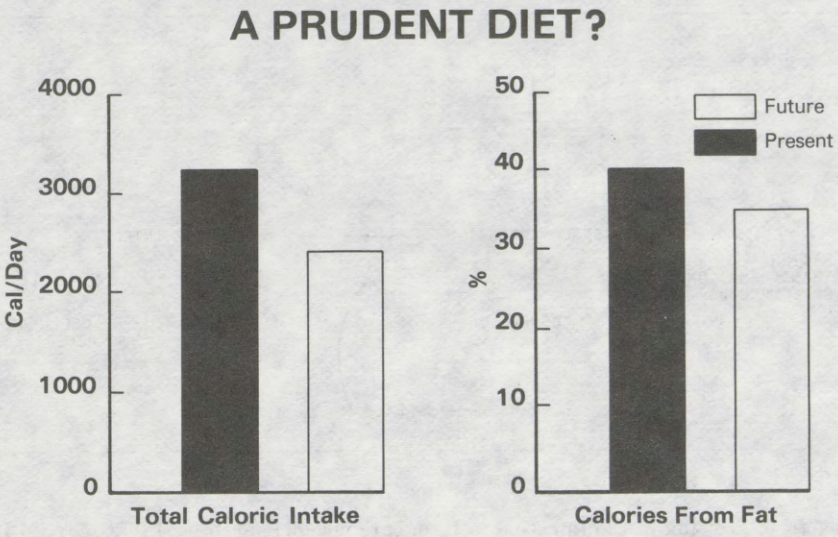
principally fat and meat intake, excessive caloric intake, and the hormonal and metabolic factors effected by nutrition.

The evidence strongly indicates that dietary components and not entrained contaminants are the probable responsible factors. All this, however, does not exclude that other factors may act synergistically with diet to enhance the basic role of nutrition imbalances in the etiology of certain forms of cancer, notably colon, stomach, and breast cancers.

If, as it appears, dietary imbalances are important in these multifactorial causative events, then it is important to study and to determine what should be a desirable dietary intake, and the proportions of the various necessary nutrients that are likely to maintain health, and not likely to produce those chronic insults that lead to disease and to cancer in particular (Figure 15). This, of course, does not mean that possible carcinogenic factors other than nutritional imbalances should not be investigated ; it simply means that the study of nutritional influences should receive priority because, at least for certain common and important forms of cancer, they are the only probable causative factors for which convincing evidence has been found in man.



Source: Wynder, 1975.

FIGURE 15

In order to be of practical use, the definition of desirable dietary intake should not aim at some generalized statistical level, but should be formulated in such terms as to be applicable to the greatly varying requirements of individuals. This demands consideration of somatic factors such as body build, age, sex, etc., behavioral factors such as individual activity characteristics, and environmental factors such as climatic or occupational conditions.

Also it is necessary to develop methods to assess the nutritional status of individuals in a more objective and simple way than it is now possible (Figure 16). When this information becomes available, then it will be possible for the health professions, for educators, and for those in charge of global food policies, to make intelligent nutritional decisions that may effect the individual patient, the nutrition awareness of a given population, and the regulatory, manufacturing, and distribution policies of food resources. Today, many of these decisions cannot be made rationally, because the needed scientific information is not available.

CRITERIA FOR EVALUATION OF NUTRITIONAL STATUS

• Physical evaluation	• Dietary evaluation	• Biochemical evaluation
—Health	—Food intake	—Body pools
—Disease	—Nutrient intake	—Cellular Pools
—Growth and maintenance	—Nutrient absorption	—Enzyme level and kinetics
	—Nutrient excretion	
	—Nutrient utilization	

FIGURE 16

It should be stressed that the development of this information does not require major scientific breakthroughs in nutrition science, but rather a systematic biometric effort of population surveys, and the development of methods for nutritional assessment (Figure 17).

EXAMPLES OF VARIABLES AFFECTING NUTRIENT REQUIREMENTS

INTRINSIC FACTORS	EXTRINSIC FACTORS	
	Involuntary	Voluntary
Metabolic size	Climate	Clothing
Hormonal influences	Culture	Occupation
Psychological factors	Physiological adaptations	Activity level
Disease predisposition	Disease	Acquired dietary habits
Sex and age		

FIGURE 17

A third segment necessary to complete our understanding of desirable nutrition, is the development of precise knowledge of the nutritive value of various foods. The United States Department of Agriculture has made excellent progress in this area but major gaps still need to be filled, and they need substantial support to expand these efforts. This again does not require new scientific breakthroughs, but rather the painstaking and skilled analysis of the American diet so that intelligent selections can be made for appropriate nutritional needs.

NUTRITION AND THE THERAPY OF CANCER

As we have indicated at the beginning, nutrition is also very significant to the cancer patient. Anorexia—the lack of appetite and the consequent lack of food intake—is a frequent problem in the cancer patient. As this condition continues for days, weeks, and months, the cancer patient sustains great losses of body weight, becomes malnourished, loses the capacity to counteract the complicating

factors of cancer, and becomes less able to withstand aggressive anti-cancer therapies such as radiation, surgery, or chemotherapy. The problem then is how to restore and maintain nutritional balance in the cancer patient. First, it is necessary to know why the cancer patient loses interest in food. There is evidence that taste modification occurs in the patient, whereby common foods taste bad. Studies are needed to identify the reason for this modified perception, and to develop methods for restoring normal taste patterns, or to modify traditional taste of foods so that they become palatable again. Behavioral approaches are also investigated, whereby the patient may be persuaded to increase food intake. All this of course presupposes that the patient can ingest and digest food and absorb the necessary nutrients. In many patients this is not possible. This includes head and neck cancer patients, stomach cancer patients, or those that have undergone extensive surgery of the gastrointestinal tract, or that have reached such a degree of exhaustion that conventional feeding is not permissible. For these patients intragastric or intravenous feeding is necessary, and from the initial work in this area it is apparent that dramatic results can be obtained. Most of these studies require clinical trials and, again, do not demand development of new basic knowledge, but simply a coordinated developmental effort to study subjects in adequate numbers, so that the validity of a particular approach is confirmed.

Nutritional techniques for the support of the cancer patient are routinely practiced today only in a few highly specialized centers in the country: it is necessary to reinforce the validity of these treatments and to simplify the methods so that they become routinely available to the smallest hospitals and health care facilities in the country or, better still, to the patient in his home. This again requires a substantial effort of resources and good will on the part of the medical community, and of the industry that will prepare the indispensible hardware and nutrient solutions.

Some recent experiments have suggested the intriguing possibility of using nutrition as a direct form of cancer therapy. The host and the tumor compete for the same pool of available nutrients present in the host. It is well known that the nutritional requirements of many tumors are substantially different from those of the host, and it appears that it may be possible to adjust available nutrients in the host so that the host may be fed and the tumor may be starved. Some recent evidence indicates that this approach may be feasible and studies need to be pursued to confirm the initial results.

It should again be emphasized that nutrition's role in the therapy of cancer can be investigated very rapidly because it does not require a lengthy development of basic knowledge. Practical payoffs, immediately applicable to the cancer patient, can be expected after a few years of intensive initial trials.

DIET, NUTRITION AND CANCER PROGRAM

The Diet, Nutrition and Cancer Program of the National Cancer Institute is addressing forcefully the need to acquire the knowledge necessary to prevent nutrition dependent cancers and to utilize nutritional support in cancer therapy. Because of the vast span of scientific expertise required, the program has been organized to benefit from the advice of many specialists from the universities, industry, and private and Government institutions. This program also coordinates with other Federal agencies: the National Heart and Lung Institute, the Food and Drug Administration, the United States Department of Agriculture and other Institutes within the National Institutes of Health. The principal advisory committee of the program is composed of members who rotate every two years, and who evaluate and select the major priority issues. These in turn are developed in detail by workshops of other experts who make recommendations for specific research projects. The program, therefore, provides a national forum where all relevant voices have an opportunity to be heard and where intelligent priorities can be achieved in a cooperative fashion. The research is not performed directly by the National Cancer Institute, but it is competitively assigned to the best qualified organizations in the country; the Institute merely provides the instruments for this cooperative effort. The monitoring of the research is also conducted in a cooperative fashion, particularly for those complex logistic projects such as clinical trials, where scientific individuality must be tempered by a sense of overall discipline and purpose. The major goals of the program are as follows (Figure 18):

DIET, NUTRITION AND CANCER PROGRAM GOALS

- ASSESSMENT OF THE ROLE OF NUTRITION IN THE CAUSATION AND PREVENTION OF CANCER AND DISEASE IN GENERAL
- DEFINITION OF NUTRITIONAL AND DIETARY REQUIREMENTS ACCORDING TO SOMATIC BEHAVIORAL AND ENVIRONMENTAL PARAMETERS
- DEFINITION OF NUTRIENT VALUE OF FOODS
- DEVELOPMENT OF METHODS TO ASSESS THE NUTRITIONAL STATUS OF INDIVIDUALS
- STUDY THE POTENTIAL USE OF DIET AND NUTRITION IN THE TREATMENT OF CANCER AND OTHER DISEASES
- EDUCATIONAL EFFORTS REACHING THE HEALTH PROFESSIONS AND THE POPULATION IN GENERAL

FIGURE 18

Assessment of the role of nutrition in the cause and prevention of cancer and disease in general.—This will allow the development of public health strategies for the prevention of nutrition dependent cancers, and eventually of other nutrient dependent diseases.

Definition of individual nutritional and dietary requirements according to somatic, behavioral, and environmental parameters.—This will allow prediction of what specific individuals should eat in order to maintain health, and what deficiencies or excesses or imbalances may be responsible for disease and cancer in particular. It will also provide necessary input for better methods of food production and processing.

Definition of nutrient value of foods.—This will allow the matching of diet to individual nutrient requirements. It will also have an impact on food production and processing and in the search for alternate food sources. Considerable activity in this area is sponsored by the United States Department of Agriculture.

Development of methods to assess the nutritional status of individuals.—This will allow objective definition of nutritional needs of individual populations, and thus the prescription of remedial nutrition measures. It will also provide an input to the formulation of national and global food and nutrition policies.

Study the potential use of diet and nutrition in the treatment of cancer and other diseases.—This will develop improved knowledge in the use of nutritional adjutants to therapeutic regimens such as surgery, radiotherapy, and chemotherapy. The approach will encompass the possibility of modifying taste perception in the patient, modifying the taste of foods, the development of behavioral approaches to increase food intake in the cancer patient, and the development of artificial alimentation, including total parenteral and enteral alimentation. The possibility that nutrition can be used as a direct means of cancer therapy—starve the tumor and feed the host—is also a goal of the program.

Educational efforts reaching the health professions and the population in general.—This will promote prudent dietary habits based on the epidemiologic and laboratory evidence now available, and will help the cancer patient to sustain and successfully tolerate the aggressive therapy methods now in use.

It is clear that, although the majority of these activities will be directed at the solution of the cancer problem, they will have considerable spin-offs for other nutrition dependent diseases, both in terms of prevention, and in the use of nutrition as therapeutic support.

As for achievement targets, we have indicated that clinical trials in this last area are likely to have rapid payoff and, depending on the resources applied, it is possible to think that a rational and effective nutritional support to the cancer patient could become a reality in the next few years.

Some longer time—five to ten years—would be required to conduct the necessary biometric field studies and the metabolic laboratory analysis that would define desirable dietary intakes for health maintenance. Considerable resources need to be applied for the development of methods that may objectively define nutritional status in the general population; however, it is conceivable that significant advances could be made within three to five years.

The DNCP is currently funded at nearly $5 million, covering both causative and therapeutic aspects of nutrition. Because the program is sharply targeted, some 33 contracts and solicited grants will be awarded by September 1976. The largest portion of the funds is devoted to clinical trials in recognition of the fast payoffs expected.

As the significance of nutrition in cancer is likely to receive increasing recognition, the program could rapidly and intelligently expand in the next few years.

The role of nutrition in human disease is obvious, and no other field of research seems to hold better promise for the prevention and control of cancer and other illness, and for securing and maintaining human health (Figure 19).

DIET AND CANCER INCIDENCE

Site	Incidence Related to Diet[1]	
	Male	Female
STOMACH	12,600	6,230
COLON AND RECTUM	40,080	48,960
LIVER	5,220	5,100
KIDNEY	5,520	4,560
BREAST	-	79,200
PROSTATE	50,400	-
ALL SITES	138,695	201,836
% OF TOTAL INCIDENCE	40	60

[1]ESTIMATES

SOURCE: NCI (UNPUBLISHED), 1976.

FIGURE 19

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Senator McGovern. Dr. Wynder, let's proceed to you and we will go right through the panel and then after each doctor has had a chance for an opening statement we will have questions.

STATEMENT OF DR. ERNST L. WYNDER, PRESIDENT AND MEDICAL DIRECTOR, AMERICAN HEALTH FOUNDATION, NEW YORK, N.Y.

Dr. WYNDER. Mr. Chairman, first of all, I would like to give my appreciation for the American Congress to make cancer research possible in this country for what it is. Having traveled throughout the world, I know there's no other country that's spent so much of its funds for research, basic and applied, as this country, and this has given us as scientists the opportunity to accomplish what we have in cancer research.

I am president of the American Health Foundation, a foundation that has as its basic goal that medicine should help "people die young, as late in life as possible." In other words, we should die free of disease late in life. My training is in internal medicine but my love is for preventive medicine and for epidemiology.

What I would like to do is pinpoint some of the specific points that Dr. Gori made and to tell you how we arrived at the conclusion that we have in terms of the role of environmental factors in cancer.

Some years ago when I was privileged to serve on a national task force on arteriosclerosis we ended up with the same statement you gave, that arteriosclerosis is not an inevitable consequence of aging. Today we believe the same concept to hold true for cancer. Most cancers are manmade. Let me give you one example in terms of tobacco. We have known the evidence for many years. How has society reacted? How can we react? We can react through what we call individual preventive medicine; and a great number of people have given up smoking and the lung cancer rates have decreased. But all of us suffer from what we call the illusion of immortality. We can educate people but we—most of us—believe it will not happen to us.

Therefore, I would like to make the strong plea for managerial preventive medicine, namely, to change a given product. All you have to do is look at your newspapers and you recognize how the tar and nicotine yields of U.S. cigarettes have been reduced. American industry has shown what is can do, and we have demonstrated that the lung cancer rate among those who smoke low-tar cigarettes has decreased. What we need is individual preventive medicine as well as managerial preventive medicine.

Now in respect to nutrition, what have we learned in epidemiology? In my formal text I have given you my view of food contaminants. We have read in the newspapers a great deal of all kinds of materials that we think relate to disease—DDT, cyclamates, red dye. We believe these agents have not had so far nor are they likely in the future, to have any effects on the cancer incidence in man. I urge my colleagues working in these areas to consider the cost-benefit ratio of any agent that we ban from our food.

In terms of deficiencies, a specific example relates to alcoholism. Alcoholics—maybe I should be more careful—our data show that only those that consume seven shots of whiskey a day or more, if they also smoke, have an increased risk of cancer of the mouth, larynx and esophagus. Some 50 percent of these cancers relate to heavy alcohol intake, not in our view because alcohol is carcinogenic but because alcoholism involves nutritional deficiencies. Some fascinating studies have been done to determine how this deficiency on a cellular level relates to carcinogenesis.

When we talk about nutrition, specifically we do not mean obesity. How many times does a patient say "How come I got a coronary attack, since I'm very slim?" We can be slim and yet have hyperlipidemia. In cancer, we found only two types of cancer—cancer of the uterus and cancer of the female kidney—relate to obesity. The rest of them relate to overnutrition.

What do we mean by overnutrition? Our data suggest a role for overnutrition in terms of fat and fat-related variables, possibly cholesterol. I would like to give two examples: One relates to cancer of the colon which is very common in our society. It is rare, however, in Japan and increases in the Japanese when they migrate to our country. It has a sex ratio of about 1 to 1, which suggests that whatever the etiological factor is, it must apply equally to men and women. Incidentally, the ratio of lung cancer is predominately male.

How do we go about in epidemiology to establish the evidence? First, we use logic. Logic means that if I look for a cause of lung cancer I look for something that I inhale into my lungs. If I look for a cause of colon cancer—and you really don't have to go to medical school to learn this, excepting you've got to learn logic—you look in the feces. Somewhere in the feces there has to be a carcinogen.

So having started with the logic, you next go to possible correlations. One correlation shows the larger the fat content of the diet in a given population, the higher the rate of colon cancer. As the chairman and Dr. Gori previously stressed, correlation obviously does not mean causation, but in the absence of correlation causation is highly unlikely.

Now Japan represents one of the gold mines for the epidemiologist because their rate of disease is quite different from our country and their vital statistics is excellent and their medical facilities just as good as ours.

Recently Dr. Hiriyama and I—Dr. Hiriyama is chief epidemiologist at the National Cancer Institute—prepared a monograph on cancer epidemiology in Japan and the United States. While Americans consume more calories, the major difference is in terms of total fat intake. The Japanese until recently consumed only 10 percent of total calories in fat while we are consuming more than 40 percent. We need to ask ourselves whether sedentary man is capable to metabolize that much fat in our diet.

The next slide shows you the same data for cholesterol. In 1960 the average Japanese consumed only 156 milligrams of cholesterol a day and in 1911 we already consumed 509. So our cholesterol consumption is very high compared to the Japanese. Let me again stress these are correlations and do not necessarily have causative significance.

So now one undertakes epidemiological studies. You interview several hundred colon cancer patients and several hundred control patients. What did we learn? There were in America practically no differences in terms of any factor that we studied. Particularly noteworthy we found no relation to constipation, which suggests that transit time is not important. Specifically we asked dietary questions. But we know even if I asked you what you ate yesterday and measured what you ate yesterday I would find a 25 percent quantitative error. I want to know, however, what you ate 10, 20, or 30 years ago. One limitation in epidemiology is to get a meaningful dietary history.

In Japan, where so many people ate rice, we found that people with colon cancer had a more westernized diet. Haenszel and Berg, from the

National Cancer Institute, noting colon cancer patients ate more meat, suggested that meat might contain a carcinogen. I do not draw that conclusion. But meat is an important contributor to the total fat consumption of man.

Next, in metabolic epidemiology we study human feces in the laboratory. We selected fecal material from various populations, high and low, and found that those populations that have a low rate of colon cancer have a low output of bile acids and neutral steroids while we have a high input. Again, it does not necessarily mean causation. But obviously it is an interesting association. Dr. Hill in England found the same correlation in studies that he did around the world.

Next we show—and I think this is very important—that patients with colon cancer put out more bile acid and neutral steroids metabolites than controls.

Senator HUMPHREY. What does that all mean?

Dr. WYNDER. Bile acids in our stool are derived from chloresterol. Several bile acids have been shown in an experimental study to be tumor promoting to the rat. So we have evidence derived from experimental studies that bile acids are tumor promoting. We know where bile acids come from. We have shown that the stool of patients with colon cancer can metabolize C^{14} labeled cholic acid more rapidly than controls. Furthermore, we have compared Japanese and American individuals. There is no genetic basis for these findings. It is just that diet tends to account for the amount of bile acids that we put out.

Senator MCGOVERN. Dr. Wynder, just to clarify, you're talking really about high-fat foods and you relate that to the incidence of colon cancer?

Dr. WYNDER. That's correct. What I have done is to show the interrelationship of metabolic epidemiology and experimental studies. I will later show what I think we ought to do about it.

Senator BELLMON. Are you talking now about animal fats or vegetable fats?

Dr. WYNDER. We have shown for the experimental animal the effect of saturated and unsaturated fats to be identical. This is contrary to the experience in the arteriosclerosis where the effect of saturated and unsaturated fats is different.

Let me give you as next example, breast cancer. Everybody talks about breast cancer in terms of early diagnosis and treatment.

But what do we know about prevention? Breast cancer, again, is very uncommon in Japan, statistically eight times less common. When Japanse move to this country, among second generation Japanese, the breast cancer rate goes up. How can logic help here? We know that dietary fat influences hormones as well as the constituents of the breast fluid.

The next graph shows how much less breast cancer there is in Japan. Obviously if these were the rates in our country, we would be much better off. One may suggest that the Japanese women have obviously smaller breasts. We studied breast size and found no correlation of breast size to the rate of cancer. Now again we studied epidemiologically hundreds of cases of breast cancer. We found some relationship in terms of late pregnancy, late menopause and family history, but no relation to obesity; but we could not explain the major differences in incidences between the United States and Japanese populations. So again we undertook metabolic epidemiological studies.

The other day we presented in a scientific meeting in Germany for the first time that diet has a profound influence on the production of prolactin.

The next slide shows that if I take a group of women and study their proclactin level at night——

Senator McGovern. Prolactin means what?

Dr. Wynder. Prolactin is a pituitary hormone that in animal studies has been shown to relate to breast cancer. You have to study this at night when it is principally produced. Prolactin has a half-life of 10 minutes in the blood. It happens to have a half-life of 50 hours in the breast. Thus, if you look at it only in the day you may not find plasma differences. After determining the prolactin levels at night, we put the women on a vegetarian diet. After 4 weeks on the vegetarian diet, the prolactin level decreased from 40 to 60 percent. Again we cannot call it causation, but it is a very interesting association.

Next we have shown in the experimental animal that after initiation with a carcinogen a high fat diet, both saturated and unsaturated enhances the risk for cancer. In the rat model, this effect relates principally to the ratio of prolactin over estrogen, the former increasing with a high fat diet.

Current studies also show that diet exerts an effect on breast fluid. We have found a significant amount of lipids, cholesterol, and cholesterol metabolites in the breast fluid of women on the standard American diet. We are now concerned with the question of whether the amount of lipids and cholesterol can be influenced by dietary manipulation and whether, as we expect, the breast fluid composition in Japanese women differs from that of American women. Our present hypothesis is that specific hormones are tumor promoting and that specific tumorigenic agents are yet to be identified, possibly within the breast fluid. However, it is important to stress that both factors are controlled by nutrition.

We have emphasized these various approaches to show the interrelation of animal studies, metabolic epidemiology and classical epidemiology. Next one may ask the question, what should we do about it as prudent men?

Several groups concerned in the prevention of cardiovascular diseases have recommended that for the prevention of arteriosclerosis we should have a prudent diet. The next slide shows what this prudent diet ought to be. It has fewer calories. It is low in fat and low in cholesterol. What we are suggesting is that this type of prudent diet would be prudent to adopt also for the long-term reduction of the incidence of cancer.

It may well be that even this prudent diet is not good enough for sedentary men. We need to recognize that we not only overeat but we also underexercise. It's very interesting that you and I produce all the cholesterol we need and I ask myself what does it mean. One of my heros in science is Charles Darwin. Like him, let us look at the evolution of nutrition. It's my view that primitive man ate no cholesterol, ate very little fat, and on top of this he always ran after something or ran away from something, so he expended a lot of calories. However, in our society we overeat, underexercise, and do not have the metabolic capacity to deal with these excesses.

What we are looking for here in carcinogenesis is not so much specific carcinogens but promotors, and cocarcinogens that relate to these specific cancers.

Finally, what preventive programs are involved? The last slide shows what we need to do in nutrition. We must have an interdisciplinary approach to nutritional carcinogenesis that needs to be coordinated, Mr. Chairman, by someone within the NIH or the HEW to bring together the various parameters of nutrition efforts that now go on. We need to invoke classical epidemiology through demography, case/control studies and metabolic studies, and relate these to chemistry and biology and public health.

Pasteur, to paraphrase him, said a scientist not only discovers but he also works very hard on the application of his or her discovery. How are we going to apply it? We need to apply it in part through education. You correctly put your finger on that the nutritional education needs to begin in childhood.

The question is how? Having just done under an NCI grant a study of health behavior in children, we recognize that these children don't readily listen to adults. I remember I had a little 6-year-old boy in my car and he said to me, Uncle Ernst, how old is your car? I said it's 6 years old, just as old as you are. The kid says, "That isn't very old." And I said, "What do you think is old?" He said, "12."

We need to recognize that children listen principally to their peers.

The American Health Foundation has come up with a new program. I like to mention this now because I would like to see it mandated to be part of all school systems in our country where at the present time we do practically nothing on health maintenance education.

The children called it a "know your body" program where we not only tell them about their bodies but we actually take their cholesterol, their blood pressure and their weight. We also get histories on smoking and drinking habits. Mind you, the hypertension in blacks doesn't begin with the stroke when they are 40. We see it in 8- and 10-year-olds. We found 16 percent of children in New York had cholesterol levels over 180 milligrams. If you take the cholesterol level of children in Mexico and Wisconsin, you find that those two curves do not overlap.

Next we give these children a health passport. Inside it contains the words "Know your body. Nobody takes better care of you than yourself." The children place the results of their test in the passport. By getting the information directly to the children and getting them directly involved in knowing and doing something about these risk factors, we hope we can reduce these risk factors in children.

We have malnutrition of the poor and malnutrition of the affluent. If we are going to overcome the ailments of our society, we have to do it not only through more research, funding for more research, but also by applying what we already know.

Senator McGovern. Thank you very much, Dr. Wynder for that excellent testimony. We really appreciate it.

[The prepared statement of Dr. Wynder follows:]

STATEMENT OF DR. ERNST L. WYNDER, PRESIDENT AND MEDICAL DIRECTOR, AMERICAN HEALTH FOUNDATION, NEW YORK, N.Y.

The discipline of epidemiology has presented a considerable amount of evidence that a majority of human cancers is induced by environmental factors. This evidence is based not only on specific retrospective and prospective case-control studies, but also on an array of scientific studies including: comparisons of death and incidence rates in various countries; geographic incidence differences within countries; changing rates among migrants; and time trends and varying rates among certain religious, racial and socioeconomic groups.

Recognition that diet and nutrition can exert a carcinogenic effect is a relatively recent phenomenon. Many of the differences in mortality and incidence rates can be explained best by differences in nutritional factors, whose mechanisms have since been somewhat unravelled by laboratory studies [1].

MODES OF ACTION

Carcinogenic contaminants in foods

There are a number of pathways by which nutrition could relate to human carcinogenesis. Our diet could contain specific carcinogens either as inadvertent contaminants or deliberate additives, or as naturally occurring ingredients. Materials such as the mold toxin aflatoxin have been demonstrated to relate to liver cancer in certain parts of the world, but not in the United States. Former food contaminants such as the pesticides DDT or aldrin, or the cattle growth hormone DES were banned from use on the basis of positive animal studies. Nonetheless, we know of no epidemiologic evidence that these substances have any effect on the incidence of human cancer in the concentrations currently ingested by man. While we strongly believe that we should not add materials to our environment that could be potentially carcinogenic to man, we should, in each case, consider the relative dose to which man is likely to be exposed as well as the potential benefits that a given substance may have. In any case, present epidemiological evidence shows that food contaminants and food additives do not have a measureable influence on the current incidence of cancer in the Western world.

Nutritional deficiencies

There are several instances where deficiencies have been demonstrated to contribute to the occurrence of specific types of cancers. Chronic iron deficiency has been shown to be a factor in the development of cancer in the upper alimentary tract in women, particularly through studies from Sweden [2]. A low intake of iodine is similarly related to the high rate of thyroid cancer in Colombia and Switzerland [3, 4]. Nutritional deficiencies, often associated with alcoholism, have been shown to significantly increase the chances of developing cancer of the mouth, larynx and esophagus among smokers; and, indeed, it is likely that these types of cancers would be reduced by 50% in the absence of an excessive intake of alcohol [5].

The high incidence of stomach cancer in several parts of the world may be related partially to a low intake of Vitamin C—a vitamin that prevents the interaction of nitrites and certain amides to form a potential carcinogen [6, 7]. Other nutritional deficiencies that may increase the risk of gastric cancer include a diet high in carbohydrates and relatively low in fresh fruits and vegetables. Such a situation also prevails in the lower socioeconomic groups in the United States, especially among the Blacks, who experience a higher incidence of this cancer.

Nutritional excesses

Of particular importance in the area of nutritional carcinogenesis are nutritional excesses, not necessarily caloric excesses, per se, but excesses of particular types of foods and/or food components. In our studies, obesity has been shown only to increase the risk for cancer of the endometrium and female kidney cancer [8]. Although data from the Netherlands have shown a relationship between obesity and height and breast cancer in postmenopausal women, we could not confirm this finding in American women [9]. Presented below are two

examples we believe demonstrate our concepts of the relationship between nutritional excesses, particularly in terms of dietary fat and possibly cholesterol intake, and two of the most common types of human cancer in the Western world, i.e., colon cancer and breast cancer.

Cancer of the colon

Colon cancer has the second highest death rate of all cancers in men and women in the United States [10]. The geographic distribution of large bowel cancer and changes in morbidity in migrant populations can best be understood in terms of nutritional factors, particulary dietary fat and cholesterol. For example, there exists a positive association between fat intake and the incidence of colon cancer (Figure 1). We recognize, of course, that association does not establish causation, but in the absence of such an association, causation is highly unlikely. Comparative epidemiological studies between Japan and the United States are of particular interest in showing that colon cancer, which initially was quite rare in Japan, has been increasing recently in line with the increasing fat and cholesterol consumption in that country. Colon cancer is also rapidly increasing among Japanese migrants to the United States, and again this finding is consistent with the adoption of American eating habits [11]. Additional support for this argument is found in the fact that the largest difference in dietary intake between these two countries is in the area of fat and cholesterol (Figures 2 and 3).

Studies in metabolic epidemiology, an important adjunct to studies on nutritional carcinogenesis, have shown that low risk populations for colon cancer have a relatively low output of bile acid and cholesterol metabolites in their feces, reflecting the passing of such products through the colon. (Figure 4) [12, 13]. When Americans are placed on a low-fat vegetarian diet their fecal constituents tend to become similar to those of the Japanese in terms of bile acid and neutral steroids [14]. This is important because it has been shown that vegetarians also have a lower rate of colon cancer. On the other hand, it has been shown that the stool of patients with colon cancer is particularly high in certain bile acids metabolites [15, 16] (Figure 5). In animal experiments, two bile acids have been shown to be tumor promoting [17].

Thus far, a specific carcinogen has not been identified in the colon or in feces. Various scientists, including those in our own group, speculate that a reactive metabolite of cholesterol may be formed in vivo and may represent a ubiquitous carcinogen to man [18]. Obviously, this requires much further study.

Supplementing the human data, a number of animal studies have also documented the fact that an increase in the amount of dietary fat, both saturated and unsaturated, will enhance the development of colon cancer in animals given specific carcinogens [13, 19].

In essence, these studies have shown that diet will influence the amount of bile acid and cholesterol metabolites in the gut and also affect the bacteriologic composition of the contents. Together, these may account for the greater amount of carcinogenic and tumor-promoting activity in the colon of man on a Western diet high in fat.

Breast cancer

Breast cancer, the biggest killer of all cancers in women, has a geographic distribution similar to that of colon cancer and is also associated worldwide with the consumption of a high fat diet (Figure 6). Again, the disease is relatively rare in Japan, but increases among Japanese migrants to the United States. Like colon cancer, it is relatively uncommon among Puerto Ricans who have a relatively low intake of cholesterol and fat in their diet [20, 21].

Large scale epidemiologic studies, comparing Japanese and American women, have not revealed any major epidemiologic variables, other than diet, which could account for the significant differences in the incidence of breast cancer in these two countries, particularly among postmenopausal women [22] (Figure 7).

Metabolic epidemiologic studies have clearly established that a diet high in fat influences hormonal production and the hormonal milieu [23]. Recently, for instance, we have observed that the output of the hormone prolactin is significantly reduced in American women when they were placed on a vegetarian diet (Figure 8).

In parallel animal studies, several investigators have shown that the incidence of carcinogenically-induced breast cancer is greatly enhanced when the animal is placed on a high fat diet, both saturated and unsaturated [24, 25]

(Figure 9). In the rat model, this effect related principally to the ratio of prolactin over estrogen, the former increasing with a high fat diet [26].

In our current studies of the effect diet exerts on breast fluid, we find a significant amount of lipids, cholesterol and cholesterol metabolites in women on the standard American diet [27, 28]. We are now concerned with the question of whether the amount of lipids and cholesterol can be influenced by dietary manipulation and whether, as we expect, the breast fluid composition in Japanese women differs from that of American women. Our present hypothesis is that specific hormones are tumor-promoting and that specific tumorigenic agents are yet to be identified, possibly within the breast fluid. However, it is important to stress that both factors are controlled by nutrition.

Details of this overview are contained in a series of publications, reported by our group as well as others and, in part, also in a recent issue of Cancer Research containing papers delivered in a symposium on "Nutrition and Cancer."

Overnutrition as a disease entity

If we look at man from an evolutionary point of view, it appears that modern man is not metabolically prepared to consume the excess amounts of food, fats and cholesterol that he consumes today—particularly in relation to his energy needs as a largely sedentary being. We have known for some time that certain dietary excesses play a key role in the leading cause of premature death in our country, atherosclerosis. It now appears that similar dietary excesses contribute to cancer, as well. One wonders why those who are so concerned about the danger of minute trace amounts of additives in our environment as possible carcinogenic stimuli do not exhibit the same concern over the natural products they ingest and excrete during their lives. It has been pointed out that man naturally produces and fills his need of cholesterol and, thus, bile acids without any additional consumption of dietary cholesterol. Perhaps man has this capacity because primitive man had virtually no dietary cholesterol intake. Primitive man lived largely on a vegetarian diet and appropriately metabolized the cholesterol produced internally. It appears that it is the excess related to our dietary habits which man cannot tolerate.

René Dubos aptly stated that there is malnutrition of the poor and malnutrition of the affluent. Neither of these types of malnutrition should be tolerated in our society. Both lead to premature killing diseases. Research should emphasize the "ideal" food consumption for modern man that is commensurate with his sedentary way of life. Such an "ideal" food pattern should not be reserved for adults, but should be followed in children from the moment of birth. Thus, man's ability to properly cope with "excessive or deficient intakes of nutrients" is a key problem that needs to be solved through extensive interdisciplinary and cooperative research.

Interdisciplinary approaches to carcinogenesis

Research in nutritional carcinogenesis lends itself and, indeed, requires an interdisciplinary approach. Such an approach unites the findings of basic research in nutrition with metabolic epidemiology, with classical epidemiology and with efforts in the public health action area (Figure 10).

A program in nutritional carcinogenesis is to be coordinated by the National Cancer Instiute. In our view, this program would be conducted best in research centers that have the staff and facilities to effectively and efficiently deal with the various aspects of the complex problem. Although biological and medical research does not necessarily lend itself to the same type of coordinating efforts that enabled man to reach the moon and now, also, Mars, we nevertheless feel that better future coordination will bring us more quickly to an understanding of the interaction between the environment and cancer in man. Therefore, it will permit us to recommend appropriate rational preventive actions based on sound research results.

It is obvious that nutrition needs to be integrated into our on-going health care delivery systems. In the past, nutrition has been a widely neglected area in a medical student's education. The health care delivery system itself pays minimal attention to preventive medicine procedures, in general, and to nutritional information, in particular. Indeed, we have a system that provides incentives principally for therapeutic care, but not for preventive care. The resistance to incorporating preventive medicine into our health care delivery system must be corrected.

An important element in preventive health care is what may be called "managerial preventive medicine". This refers to the manufacturing of products that are not only the best in quality but also, from a nutritional standpoint, provide the most appropriate values for man's optimal growth, well-being and health. In cooperation with the agricultural and food industries we first must determine the minimal nutritional requirements for man and, particularly, infants. Once thees are determined, we must develop the methods with which to meet these requirements. If, in conjunction with such activities, we determine that the current American diet contains an overabundance of certain nutritional factors for either infants or adults, we must, then, reduce these components through product modification. This concept has received relatively little attention in the past. It requires a closely coordinated effort between nutritionists in the scientific and medical community, government agencies and members of the food industry in order to develop an American diet that represents the best in nutritional values for the proper growth of our infants and adolescents and for the appropriate health maintenance of our adult population. This represents an area where the Select Committee on Nutrition and Human Needs can play a particularly important leading role.

Prudent diet

While these research studies will be conducted under the auspices of the National Cancer Institute and coordinated with similar studies performed under the direction of the National Heart and Lung Institute, we should ask ourselves what the prudent decision should be regarding the diet we should eat today. It has already been recognized that in order to prevent atherosclerosis and cardiovascular disease it is prudent and necessary not only to reduce our total caloric intake, but also to reduce the percentage of calories coming from fat to under 35% of total calories and to reduce the total intake of chloresterol to under 300 milligrams/day (Figure 11). As previously indicated, this reduction should be applied to adult populations as well as the very young [29, 30]. It may well be that the amount of fat and cholesterol that sedentary man can properly tolerate may be considerably below these levels. The reason for the emphasis on dietary modification early in life is that we and others have shown that hyperlipidemia and obesity are reflections of caloric excesses already rampant in our very young population [31, 32].

Therefore, as this Committee looks at Nutrition and Health in general, and Nutrition and Cancer, in particular, it should examine nutrition from a broader point of view and not just from a point of view of food contaminants—an area which has received so much attention in recent years. Much more relevant are dietary deficiencies which particularly affect our poor populations in many areas, in addition to those that possibly relate to cancer. Of further singular importance is the area of over-nutrition, a field which, as we have indicated, extends not only to cardiovascular disease, the leading cause of death in our nation, but also significantly to the pathogenesis of several types of human cancers as well.

If we are eventually successful in reducing most, if not all, of the environmental factors that increase our risk for cancer, obviously we will have to worry less about the early detection and treatment of cancer. The epidemiology of cancer clearly shows that many cancers are man-made. We should now provide the necessary incentives for better work in the area of prevention. We should furnish the necessary leadership for society to develop an environment and to manufacture products that are commensurate with man's ability to properly metabolize and detoxify agents and foods to which he is exposed. If successful, we will have reached a goal which is the ultimate of medical accomplishment, a society free of what we know to be avoidable illness and mortality, through prevention.

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Source: Carrall/Khor, 1975.

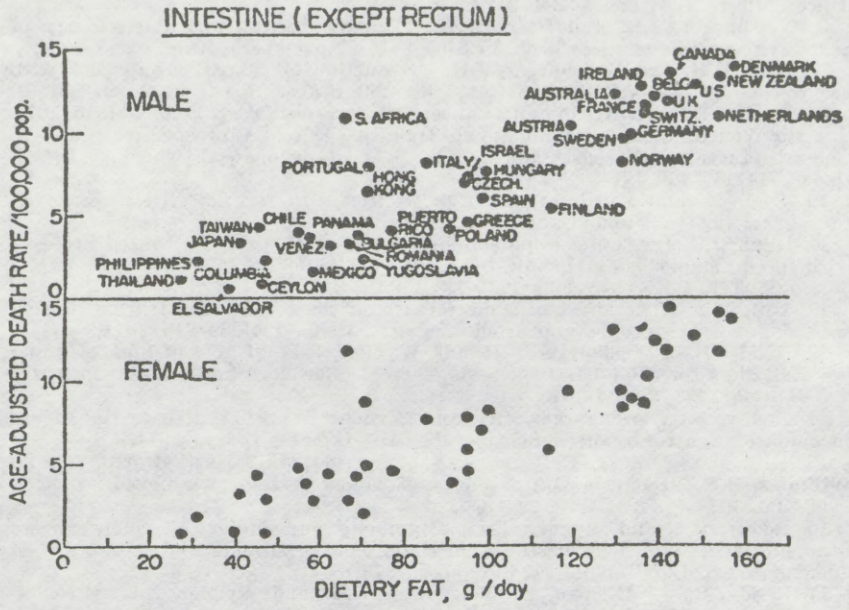
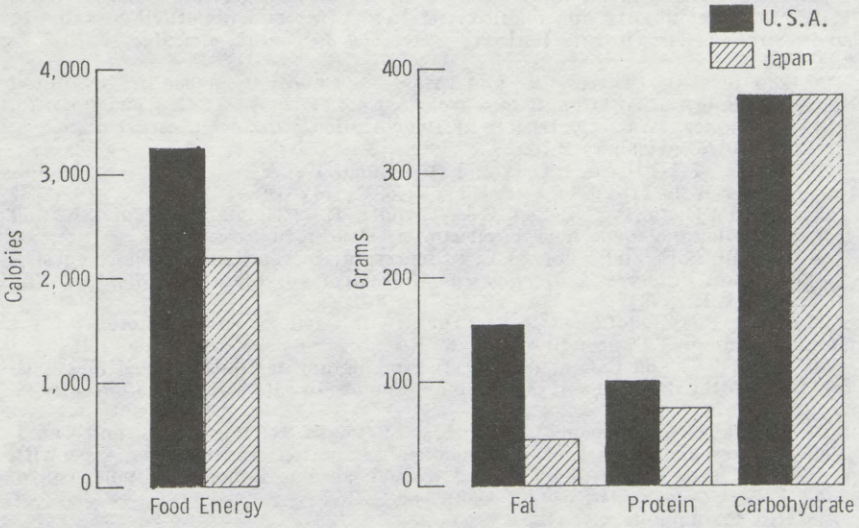


FIGURE 1.—Positive correlation between per caput consumption of dietary fat and age-adjusted mortality from cancer of the intestine (except rectum)



(From: National Nutritional Survey, Japan, 1969; National Food Situation, U.S.A., 1968)

FIGURE 2.—Comparison of per capita consumption of calories and nutrients in the U.S. and Japan

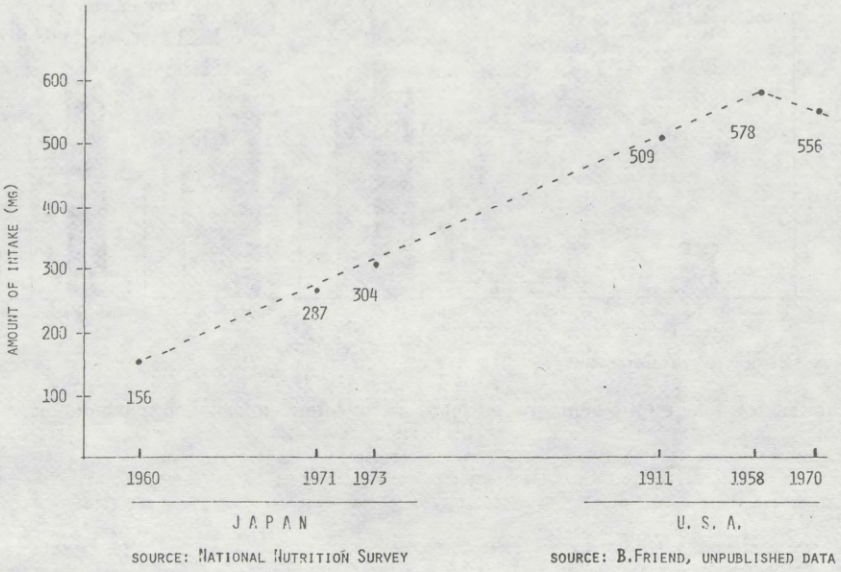


FIGURE 3.—Amount of cholesterol intake (intake per capita per day)

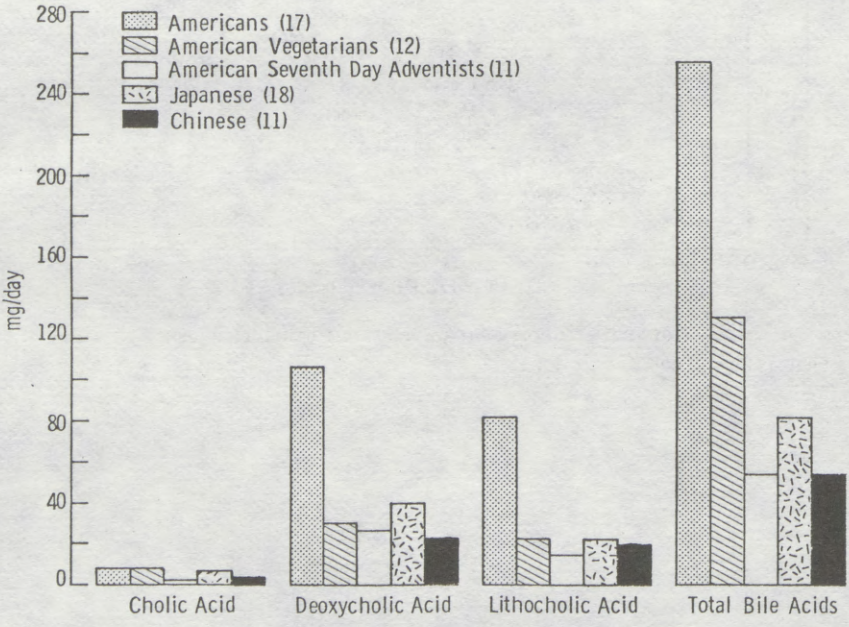


FIGURE 4.—Daily fecal bile acid excretion of various population groups

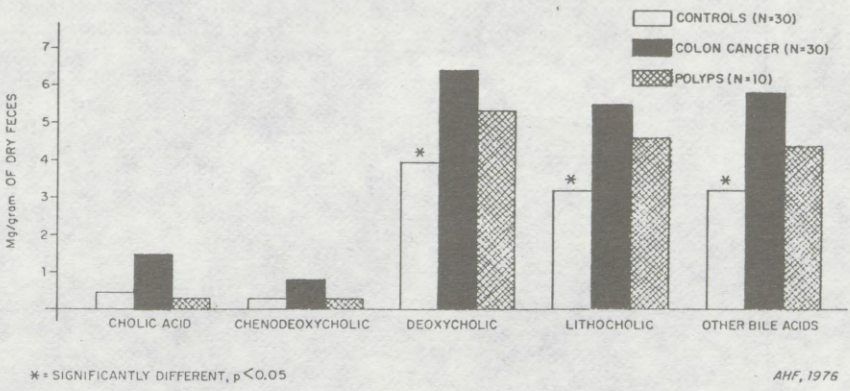


FIGURE 5.—Fecal bile acids in patients with colon cancer and patients at a high risk

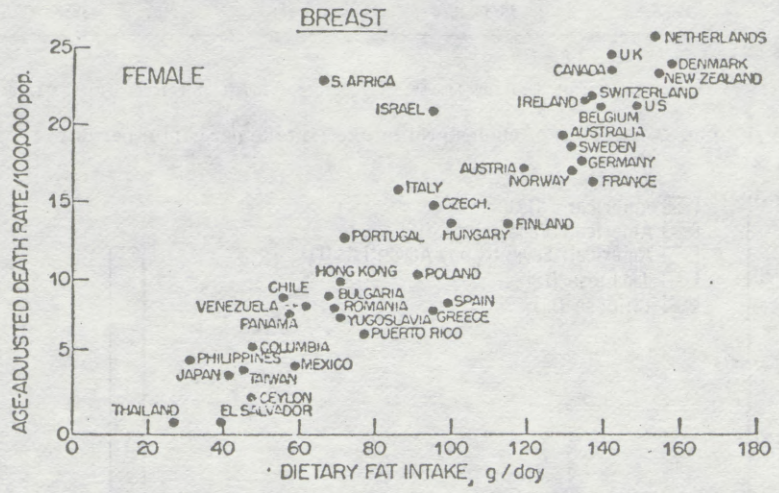


FIGURE 6.—Dietary fat in relation to tumorigenesis

Source : Carroll and Khor, 1975.

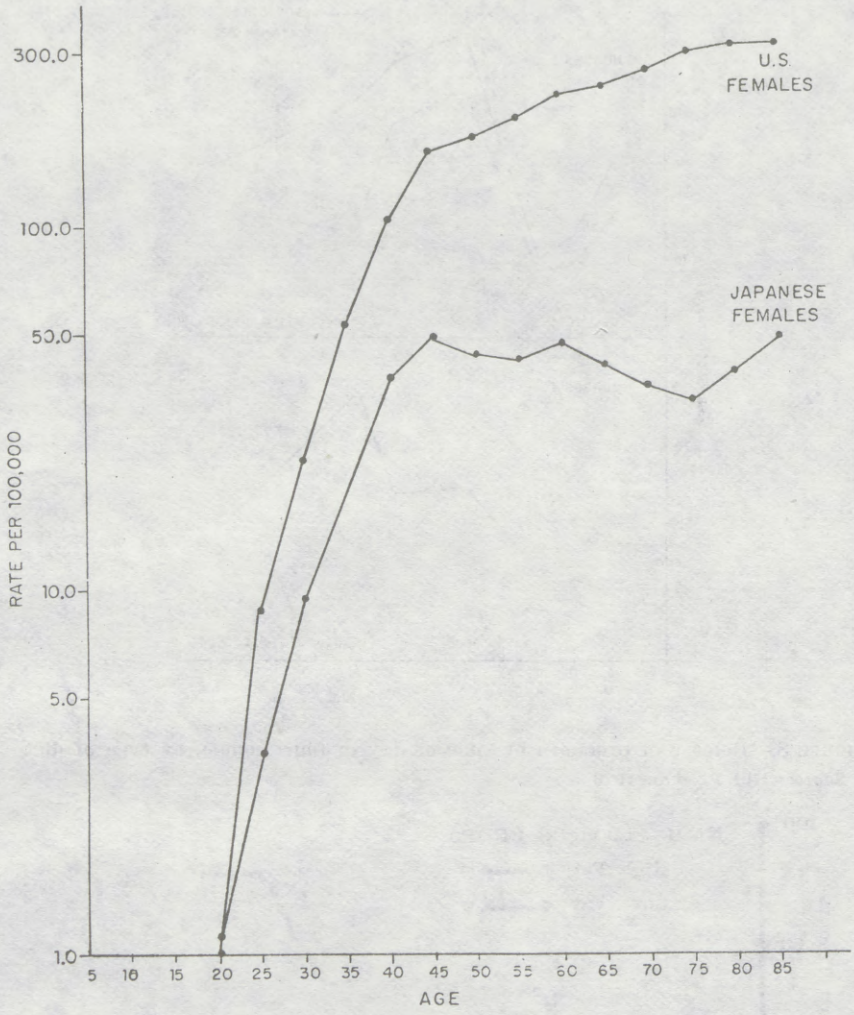


FIGURE 7.—Age-specific incidence rates for female breast cancer, U.S. (1971) and Japan (1973)

Sources : Third National Cancer Survey, Gann Monograph No. 20.

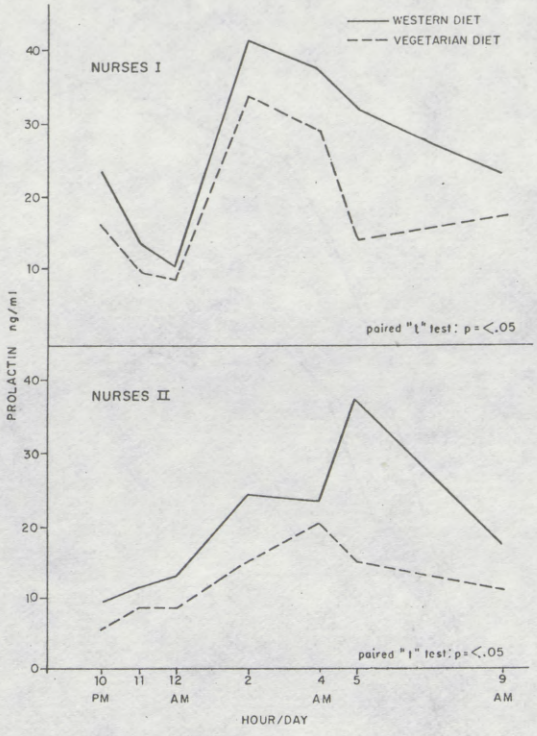


FIGURE 8.—Release of prolactin by time of day in four women, by type of diet
Source: Hill, P., et al., 1976.

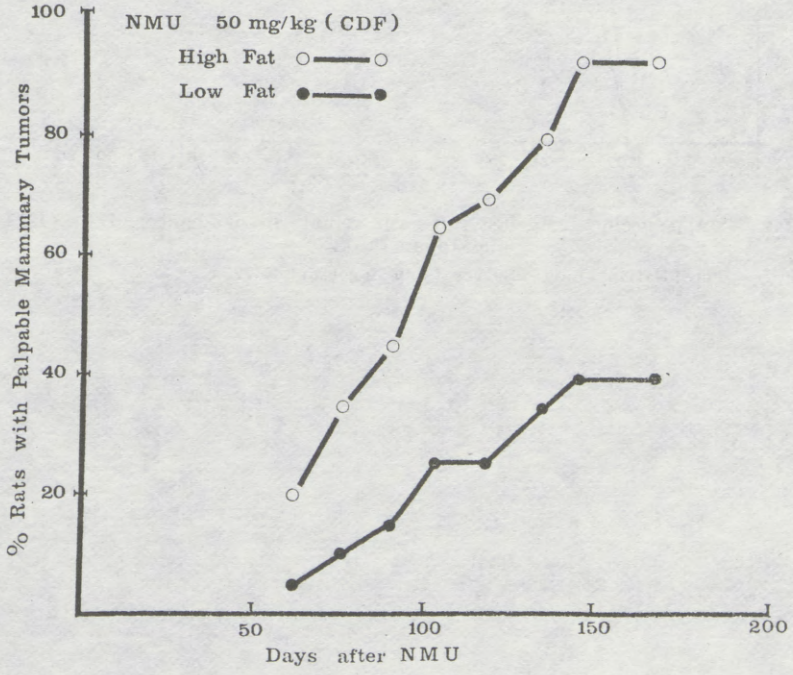


FIGURE 9

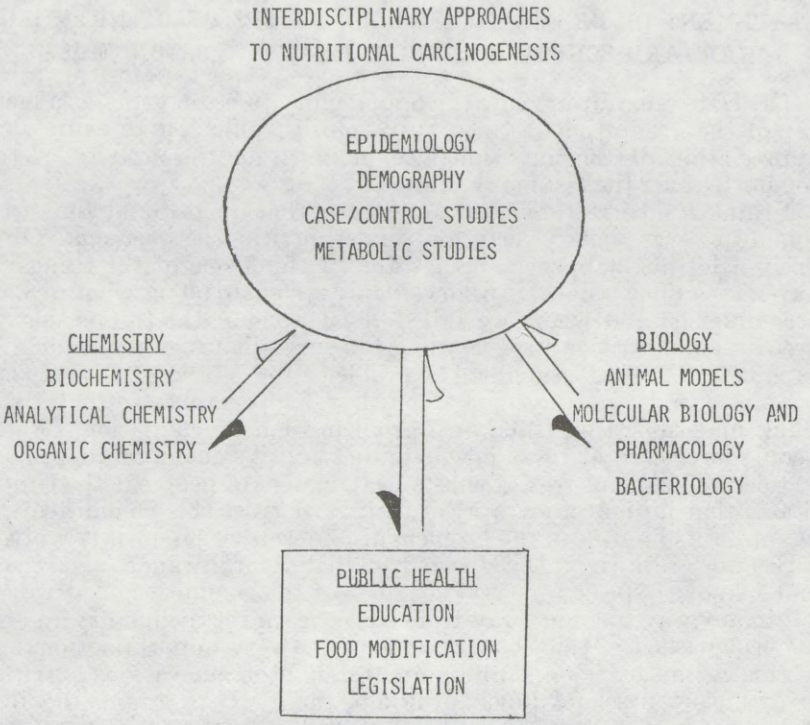


FIGURE 10

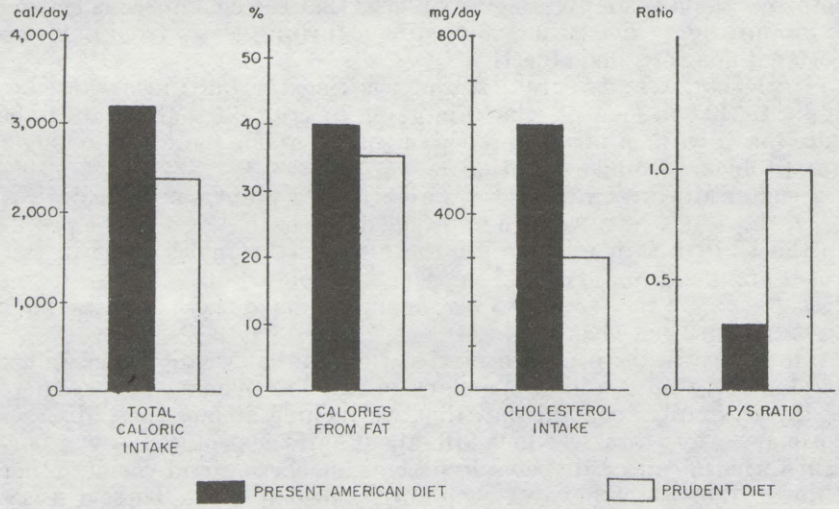


FIGURE 11.—Prudent diet and present American diet.

Senator MCGOVERN. Our next witness is Dr. Mark Hegsted of Harvard University.

STATEMENT OF DR. MARK HEGSTED, PROFESSOR OF NUTRITION, HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON, MASS.

Dr. HEGSTED. I appreciate the opportunity to be here and as a member of the group that testified years ago, I would like to express the appreciation of the nutritional community for the activity of this committee over the last many years.

I think I'm correct, Senator McGovern, that the original aim of the committee was that poverty and undernutrition be overcome. Obviously a lot has happened in that area. I think one of the things we haven't yet done is develop a surveillance system to tell us what we have accomplished and where we failed. That's one of the things that we need in our nutrition program and the surveillance system should be expanded to include the kinds of problems we're talking about today.

So that we're not misunderstood, I want to emphasize that I still think undernutrition is a worse problem than overnutrition. I think people have a right to an adequate diet and it's shameful and not to be tolerated if there are any substantial number of people in the United States that do not enjoy a good diet. So I trust this committee will maintain its interest in the problem of undernutrition until it's solved.

Senator MCGOVERN. Dr. Hegsted, on that point, I want to assure you, and I know I speak for every member of the committee, that we are not in any way turning away from our concern for the hungry and the undernourished in this country. One of the very important functions of this committee is to maintain an oversight on our various nutrition programs—the school lunch program, the WIC program, the food stamp program among others, to see that those programs that are primarily for low-income persons and children continue to function and improve. This is simply a new emphasis that the committee is getting into and should not be interpreted as a turning away from our concern with our original objective.

Dr. HEGSTED. I was sure that was true, Senator, but I also wanted to indicate that in view of what I'm going to say next that I want to be sure that I was not misunderstood or that I assume there are no longer any problems of undernutrition.

Senator MCGOVERN. I think it's well that the point was made.

Dr. HEGSTED. Now we turn to problems of the majority of the people in the United States. These are the diseases that most of us in this room are going to die of and someone has pointed out—I guess it was Ernst—it's not the fact that we are going to die of these diseases that's so important, but when we die.

Our objective is to push back that time so that we die when we are old but feel young, and my primary function or primary purpose here today is simply to point out, that we include among these diseases coronary artery disease, which kills about half the people, many important forms of cancer, diabetes, hypertension, obesity, and various other things, all of which have a strong nutrition component. These diseases will obviously become more important as we develop more efficient and effective ways of controlling the infectious disease as has already been emphasized.

The primary evidence is epidemiologic but, as Dr. Wynder has pointed out, it's not limited to that. Everywhere in the world, including affluent groups within the developing countries who eat the western type diet, people develop the same disease patterns. Although the evi-

dence is epidemiologic for most of these, I think the exception is coronary artery disease where we have clear evidence that coronary artery disease is not a primary problem in populations with a low serum cholesterol level and it's clear that diet controls cholesterol levels. We have a clear linkage between plasma serum lipids, atherosclerosis and coronary disease. One of our main aims in the next few years is to develop exactly this kind of knowledge so that we can identify high risk individuals with regard to these other diseases. This we do not yet have.

I wanted to spend a little time talking about the genetic factor because it seems to me this is a confusing factor in many people's minds. When we say genetic, many people assume that because it's genetic nothing can be done about it. Obviously nothing could be further from the truth. Approximately 10 percent of American men can eat the average American diet with impugnity as far as heart disease is concerned. The rest of us are all hypercholesteromic and the benefits to be derived from an appropriate diet are directly related to our genetic susceptibility.

It's the most susceptible individuals that have the most to gain. So the statements that we hear quite often that these are genetic diseases and therefore we can't do anything about them are exactly misleading. We need to intensify our research effort so we can identify these high risk individuals.

I think it's clear that the problems associated with excess consumption are going to be more difficult to deal with than those of underconsumption. It's not so difficult to convince people who want more food to eat and it basically is not very difficult to add nutrients to foods if we can convince ourselves or the powers that be that this is required. We have the technology to improve diets as far as essential nutrients are concerned. The problem of convincing people to eat less of the kinds of things they like to eat is going to be more difficult and we don't know how to deal with that very well.

As I think everyone has emphasized and maybe not enough, all of these diseases, heart disease, cancer, diabetes, have a complex etiology. Diet is not the sole cause, but diet is one of the causal factors and this can be modified. I'd like to suggest that the prudent diet for Americans is that we should eat less food. We should eat less meat. We should eat less fat, particularly saturated fat. We should eat less cholesterol. We should eat less sugar. We should eat more unsaturated fat, more fruits, vegetables, and cereal products, particularly those made of whole grain cereal.

All of the diseases we are talking about are correlated with the kind of diet we have now. We should move toward the kind of diet that is not associated with these things. The benefits we are going to derive from these changes can't be really calculated; I believe that people in the United States deserve the best kind of knowledge that we have available and the important question, it seems to me, is what are the risks and benefits from what we do now and what we might do based on this kind of knowledge.

We know what the risks are now and they are high. I would submit that there are no identifiable nutritional risks associated with shifting our diet in the direction that I have indicated and if that's true, then we ought to change our diet in that way.

I think recommendations of this kind will be difficult for many people, primarily because many of them will feel that these are exactly contrary to what their idea of a good diet is. We have failed to emphasize the moderate diet that Americans should consume in our own concern over undernutrition. I want to emphasize, as have others, that these associations between diet and heart disease, cancer, diabetes, et cetera do not mean that the same causal factors are involved. Certainly we should have much increased effort to identify those causal factors. We need to know what they are. We may be able to have our cake and eat it, too, so to speak. At the moment, we are a long way from identifying the causal factors, but there seems to be no alternative except to support more research to identify the actual causal factors.

Meanwhile, it seems to me Americans deserve the best advice that we have available and I think modification of the diet in the direction I have indicated is what they should be told.

Thank you.

Senator McGovern. Thank you very much, Dr. Hegsted, for your testimony.

[The prepared statement of Dr. Hegsted follows:]

STATEMENT OF DR. MARK HEGSTED, PROFESSOR OF NUTRITION, HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON, MASS.

I am unable to adequately present the evidence currently available in the time that I have. Nevertheless, I wish to stress that there is a great deal of evidence and it continues to accumulate, which strongly implicates and, in some instances, proves that the major causes of death and disability in the United States are related to the diet we eat. I include coronary artery disease which accounts for nearly half of the deaths in the United States, several of the most important forms of cancer, hypertension, diabetes, and obesity as well as other chronic diseases.

All of these diseases become increasingly important as we develop more effective and efficient means to control infectious diseases and as the population ages. It is not the fact that so many people die of these diseases that emphasizes their importance, however, but that so many people in their productive years die or are disabled by these diseases.

The primary evidence of a causal role of diet in these diseases is epidemiologic. Everywhere in the world as people and nations become affluent and adopt a Western-type diet, the prevalence of these diseases rises. The US being the most affluent has one of the worst records.

The universality of these changes in disease prevalence makes diet the item which is most likely to be the important factor. It seems less likely, for example, that increased consumption of carcinogenic materials would increase uniformly everywhere as people adopt the rich American diet pattern.

Although the evidence is primarily epidemiologic, I believe heart disease is the exception. Coronary artery disease is rare in all populations which have low levels of plasma cholesterol and other blood lipids. There is abundant evidence that plasma chloresterol and other blood lipids are determined by diet. Thus, the linkage between diet—blood lipids—atherosclerosis and heart disease is overwhelming.

It is important to emphasize that all diseases are also under genetic control. People vary in susceptibility and respond differently. A few Americans, perhaps 10–15% of the population, can consume the typical American diet with relative impunity but the great majority are not so fortunate. Nearly all of us suffer from hypercholesterolemia and atherosclerosis, and are at high risk of developing heart disease. Appropriate dietary modification will lower blood lipid levels and, of course, the susceptible individuals have the most to gain from such dietary modification.

It is important to stress that in heart disease we have the capability of measuring serum lipids and blood pressure to identify the most susceptible individuals. We greatly need methods to identify individuals at high risk of cancer, diabetes

and other chronic diseases. Such methods can only come from research and a better understanding of the nature of these diseases.

I wish to emphasize that we are now entering into a new era of nutrition. These hearings are evidence of it. Most nutrition research and most nutrition programs have been aimed at assuring that people have an adequate diet—enough food, enough protein, enough of the essential vitamins and minerals. As this Committee knows, this effort is still incomplete and must continue. Every American has a right to such a diet. Yet we must recognize that from a public health point of view, nutritional deficiency disease is a relatively minor problem. Severe deficiency disease is very rare, even among low income groups. The primary nutritional problems are those associated with over-consumption. We must not lose sight of the continuing need to explore nutrient needs and assure an adequate intake of essential nutrients; but these major health problems of the country do not involve the lack of essential nutrients, thus we need increase emphasis on the overconsumption.

It is fundamentally a rather simple problem to increase the consumption of essential nutrients. The technology exists to add nutrients to foods. Our primary job is to demonstrate the need and unfortunately we are not doing enough to demonstrate this need which does exist.

It is clear that problems associated with excess consumption are more difficult to deal with than those of underconsumption. How do we convince people that they should eat less of things they like to eat?

All of these diseases—heart disease, cancer, diabetes, obesity, etc.—clearly have a complex etiology. Diet is one of the factors, however and diet can be modified. The association of these diseases does not prove that the same factors are the causal agents. Nevertheless everything we know about these diseases indicates that it is prudent for Americans to modify their diet. Americans should eat less food but specifically less meat, less fat, especially saturated fat, less cholesterol, less sugar; they should increase their consumption of unsaturated fat, fruits, vegetables and cereals, especially whole grain cereals. Since all of the diseases I have listed relate to the consumption of our usual diet if it is prudent to shift the diet toward that diet not associated with these diseases.

The specific benefits which may be gained from this kind of dietary advance cannot be quantitated. Yet Americans deserve the best advice possible with current knowledge. These diseases are too important question then is what are the risks and benefits associated with what we do now and what are the risks and benefits associated with dietary modification. We know what the risks of current practices are and they are high. I believe that there are no identifiable nutritional risks associated with these kinds of dietary modification and the probable benefits are high.

As I have indicated, it will be difficult for many people to make these kinds of dietary changes. To some degree they appear contradictory to many peoples idea of what a good diet is. If people are to make these kinds of changes they not only need appropriate advice and education, but we need increased efforts to produce and promote such foods from the food industry and by Government agencies.

It must be emphasized that the association of these important diseases with our usual diet does not prove that the same factors are the causal agents. These causal agents must be identified and research efforts should be mobilized and supported to make this possible.

There appears to be no alternative if these diseases are to be brought under control. Meanwhile, we should provide the American consumer with the best advise for reducing risk of these diseases which we have available at this time.

Senator McGovern. We will now hear from Dr. David Kritchevsky from the Wistar Institute, Philadelphia, Pa.

STATEMENT OF DR. DAVID KRITCHEVSKY, WISTAR INSTITUTE OF ANATOMY AND BIOLOGY, PHILADELPHIA, PA.

Dr. Kritchevsky. I'd like to add my thanks to those of the other members of this panel for the opportunity to present you with some of our views, and I would like to address a little bit of time to some of the work that has given us some of the leads that we are now following.

While most of the data from man are epidemiological in nature,

animal studies can provide relatively rapid answers to complex questions. Now it's not easy to translate animal results to the human situation but these results provide important clues to further inquiry. So both types of studies are essential for a broad-based assault on the problem of cancer.

One of the first the dietary components that have been studied for its relation to cancer has been fat, which has been discussed to some extent already, and it was found that the level of fat was very important. Going from 2 to 8 percent fat will cause a great augmentation in tumor growth but going from 8 to 26 percent does not cause a much greater increase. The plateau appears to be at 16 percent fat.

Now most of these studies have been done on skin cancer and types of breast cancer. Fat in experimental animals is shown to have no effect on leukemia. Dr. Wynder has already commented on the fact that the type of fat may effect the metabolism of cholesterol, but it may affect other things such as the enzymes which in turn metabolize those substances which cause cancer. So it may have a secondary effect but a very important one.

Now the current knowledge is that the type of products of chloesterol which are excreted may yield clues to the production of colon cancer and I think we need a lot more information as to how those changes come about, but I think fat is only one component of the diet. It's the one that's been mentioned most because it's the most visible as far as total calories are concerned.

There are some suggestions that protein in the diet may have an effect, but in contrast to the effect on heart disease where there's some suggestions that animal protein may be worse than vegetable protein in cancer experiments it seems that the amount of protein is more important.

Another dietary component which is receiving a lot of attention now is fiber. Fiber is that non-nutrient portion of the diet which used to be called roughage and the epidemiological studies, mostly from Africa, would suggest that a lot of the diseases that are prevalent in the western world and not prevalent in black Africans are due to their consumption of a high fiber diet. I think this is an overstatement of the fact because actually a lot of their diet is different from our as well as their life style.

Data that Hill in England and others have got together show that the highest correlation, the highest positive correlation with colon cancer is the amount of fat in the diet and that the correlation with the lack of fiber in the diet, while still positive, is quite low. Of course, in general, populations that eat a high fat diet don't eat a high fiber diet, so it's a question of which does what. However, there's another very important aspect of fiber in the diet and that is fiber is an all-inclusive term and we are now finding out that substances that are not absorbed by us may be different from each other in chemical composition which leaves a lot of work to be done. There's a lot going on already to discern which particular component of which particular fiber does the job we're interested in.

Bran, for instance, has gotten a lot of exposure because of popular books on the subject, but there are many studies that show that as far as human cholesterol levels are concerned it has no effect whatsoever. It does increase stool bulk or transit time. So it may have an effect in one direction but not in another.

Another very important thing that is just now beginning to get attention is the total diet and the interaction of the components. Both Drs. Hegsted and Wynder have commented on the high levels of cholesterol in the diet and to most people this means high fat, high cholesterol, leading to high levels of cholesterol in the blood. Other factors in the diet can affect how much cholesterol gets into the blood and I think this is a relatively unexplored area of nutrition. It's very complex because the interaction of a number of components requires attention to be paid to more metabolic processes than the studies of any single component, but I think this problem will yield to expanded research and will permit us to get a much better picture of what the total diet does.

So that I would say that coordinated studies on diet which assess the effects of protein, fat, carbohydrates, vitamins, fiber, trace elements—not one single thing, but interaction, is something that has to be done.

In the 30 or so years since research on diet and cancer have been done, we have learned a lot more about the composition of the diet and a lot more about the mechanisms of tumor formation and growth and this knowledge, along with the genetics of cancer and chemistry of nutrition gives us a more solid base for newer research and I think all of this can only help those people interested in the aspects such as genetics and growth of tumors and the people working in the diet area.

I think that, as everybody has said, the important factor we are addressing ourselves to here, is that we need a well rounded diet, but one that is eaten in moderation. Moderation is sort of a cop-out word, but it's about the best advice that can be given and easily understood. I think that more precise data which can be gathered only through more research will give us a more accurate picture of what we can prescribe and what would be both nutritious and acceptable. I think this is another important thing, that in a free living society the diet not only has to be good for them, but it has to be good.

Senator McGovern. Thank you very much for your testimony.

[The prepared statement of Dr. Kritchevsky follows:]

STATEMENTS OF DR. DAVID KRITCHEVSKY, WISTAR INSTITUTE OF ANATOMY AND BIOLOGY, PHILADELPHIA, PA.

The role of nutrition in preventive health care is a general one. While there are many suggestions that certain dietary excesses may contribute to degenerative disease, such as heart disease, these are by no means unequivocally certain. In my view, a well-rounded diet eaten in moderation is still the soundest nutritional advice. With regard to nutrition factor in the development of cancer, I should like to address myself primarily to animal studies. While most data from man are epidemiological in nature, animal studies can provide relatively rapid answers, to complex questions. I recognize, of course, that one can not easily translate animal results to the human situation but these results provide important clues to further inquiry. The accumulating epidemiological evidence in man furnishes directions for animal experiments. Both types of study are essential for a broad based assault on the problem of cancer. The effect of dietary fat on experimental tumors has been studied for many years. In general, a few factors seem to emerge. One is that a high fat diet promotes tumors to a greater degree than does a low fat diet. There seems to be a plateau to the fat effect so that going from 2 to 8% fat will cause a great augmentation in tumor growth but going from 8 to 26% does not cause a greater increase. The plateau appears to be at 16% fat. When fed at the same level, unsaturated fat appears to promote tumor growth to a greater extent than does saturated fat.

The effect of fat has been studied mainly in skin tumors and various types of mammary tumors. However, fat seems to have no effect on leukemia or a few other types of tumor. The mechanism by which dietary fat exerts its effect has not yet been clarified. There are a number of possibilities. There is some evidence that colon cancer is related to levels of specific bile acids, a series of compounds which are derivatives of cholesterol. The type of fat could influence the rate of conversion of cholesterol to these derivatives. It could also influence the growth of the intestinal bacteria, some of which play an integral part in bile acid metabolism. Fat might also influence the conversion of cholesterol to other hormones, such as corticosteroids, which also may affect tumor growth. Finally, fat may influence the action of those enzymes which metabolize cancer inducing substances, thus exerting a secondary effect but still an important one. Our current knowledge of bile acid metabolism and of factors influencing growth of intestinal microorganisms if expanded through research and coupled with work on dietary fats should furnish important evidence concerning the mechanisms of fat action.

But fat is not the only component of the diet that is important. In rats, undernutrition seems to be associated with fewer cancers and overnutrition with more cancers. When one considers these facts they suggest fat is not the only component of the diet which must be considered. There are some data which suggest that the type of protein may affect the growth of tumors. However, the protein effect appears to be more one of restriction than of type. There is a considerable body of opinion suggesting that some aspects of cancer may be considered as an immunological problem. This means that in some cases there may be a weak immunologic response to foreign substances. Since antibodies are proteins, it is evident that alterations in dietary protein may affect synthesis of all proteins, including antibodies.

Another dietary component which is receiving considerable attention currently is fiber. This refers to the non-nutritive portion of our diet, what we normally call roughage. Epidemiological data in man suggest that colon cancer is lower in populations ingesting a high fiber diet. This particular question is being studied in many laboratories at the present time but to date not many data are available. The older literature shows that the addition of fiber to certain diets will indeed inhibit tumor formation. This question is not as simple as would initially appear since in many of the older studies the fiber replaced other dietary components. In addition we now recognize that fiber is an all inclusive term which encompasses a number of distinct chemical entities. More research in this field would provide information concerning the actual composition of all types of fiber. This knowledge would permit a more accurate assessment of which particular component of a fiber is responsible for its specific effect.

It is evident then that diet plays some role in the growth and development of tumors. To date most of the studies in animals have addressed themselves to one specific component of the diet. However, since our diet is varied it is important to know how all of these components interact. Thus the deleterious effect of one component (a type of fat, for instance) may be reduced by the type of carbohydrate, protein or fiber in the diet. This is a relatively unexplored area of nutrition. It is very complex since the interaction of components requires attention be paid to many more metabolic processes than studied of a single component would. However, this should yield to expanded research and will hopefully permit us to form a more thorough picture of the total impact of diet on tumor formation. The increasing complexity of the diet picture suggests the need for large coordinated dietary studies in which the contributions of each dietary component—fat, protein, carbohydrate, fiber, trace elements and vitamins—can be properly assessed. Twenty-five years ago, when research on the effects of diet on cancer was begun, we knew much less about composition of the fat in our diet than we do today. There was also less information on the mechanisms of tumor formation and growth. The expanded knowledge of the genetics of cancer as well as of the exact chemistry of our nutritional components now provides a much more solid base from which to launch new research. The expansion of research on dietary factors in the etiology of cancer will provide important ancillary information to people interested in the genetics and growth of tumors. All of this can only help in our understanding of the tumor process and this understanding is vital to any approaches to the therapy of this disease. Insofar as the educational and health delivery systems are concerned, the best advice still seems to be moderation. While it is obivous that certain clearly tumorigenic factors should be avoided, a well-rounded diet

eaten in moderation may be the best advice for good health. More concise data, which can only be gathered through more research, will allow us to more accurately prescribe a diet which is nutritious and acceptable.

Senator McGovern. Our final witness is Dr. Gerald Wogan, of the Massachusetts Institute of Technology.

STATEMENT OF DR. GERALD N. WOGAN, PROFESSOR OF FOOD TOXICOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

Dr. Wogan. Thank you very much, Senator. I'd like to add my thanks to those of my predecessors for the opportunity to present my views.

I have my remarks outlined on a couple slides. I'm suffering from the disadvantage of being the last man on the program and therefore many of the points that I wish to make have already been made. Nonetheless, I would like to focus on a point which has been raised in several contexts but I think which deserves very considerable attention in connection with the formulation of prevention strategies. I feel very strongly, as the other witnesses have indicated, that cancer is a preventable disease and we should do everything that we can do to formulate a prevention strategy.

However, I would like to introduce a cautionary tone to the discussion dealing with the necessity of distinguishing between association and causation. This is a point which was made in the chairman's introductory remarks and has been made several times since. I think in the formulation of a really effective preventive strategy this distinction has to be kept in mind for reasons that I will point out in my remarks.

I would like to begin by expressing a view which is very widely held now by investigators seeking to find the causation of cancer, and that is that the view that most cancers are in fact induced, that is initiated, by exposure to chemicals and this view arises from basically three lines of reasoning.

One of these we have heard described in considerable detail this morning; that is, the epidemiological evidence in human populations, the geographic localization of high incidence regions, time trends within a given region, and migrant studies. All of these point to the existence of environmental factors which affect cancer incidence.

However, there's a huge amount of laboratory evidence which indicates that hundreds of compounds, hundreds of known chemicals, are able to induce cancer in animals. Some of these find their way into the environment albeit usually at very low levels, at levels far below those which are affected in inducing cancer in animals. Nonetheless, they are there and the preliminary indication is that—or the question really is, to what extent do these contribute to the causation of cancers in man? I will return to that point in just a moment.

Finally, there is a kind of negative evidence in relation to the causation of various forms of cancer; namely, that the other two known causes of cancer viruses and radiation—can be associated epidemiologically only with a very restricted set of cancer types. In the case of ionizing radiation, cancer of the bone, and leukemias; in the case of nonionizing radiation, that is ultraviolet light, the induction of skin

cancer, and in the case of viruses the best evidence, although it's not conclusive, is an involvement in the etiology of lymphomas and leukemias.

Well, the question is, then, what chemicals are associated with what forms of cancer and on the next slide I have reviewed this. There are basically only three instances in which a specific chemical insult has been associated with a specific form of cancer. One that's been mentioned over and over again this morning is cigarette smoking and lung cancer and cancer of other organ sites. The specific chemicals that are involved in this case have yet to be identified, but the association is very strong. This represents, as I indicate here, probably the highest exposure rate of any known chemical carcinogen inducing the greatest effect in populations exposed to them.

As also has been mentioned on many occasions before, cigarette smoking could account for as much as 30 or 35 percent of the incidence of total cancers. Occupational exposures represent historically the best established linkage between exposure to specific chemical agents and specific cancer forms. The recent occurrence of vinyl chloride-induced liver cancer is perhaps the most dramatic example of this association.

However, it's thought that occupational exposures per se account for no more than 1 to 3 percent of total cancers.

Finally, as several previous speakers have indicated, with all that's been said and written about the importance of food-borne contaminants and food-borne carcinogens and the risk that they pose for inducing human cancers, there's only one known example of the association between a food-borne carcinogen and the occurrence of a specific form of cancer, and that is the association between the ingestion of the mold produced compounds called aflatoxins which are very powerful carcinogens in the induction of liver cancer. This has been established in Africa, in several countries in Africa, and in Asia. However, the level at which these compounds occur in the U.S. diet and also the incidence of liver cancer in the U.S. population are both very low, so this represents numerically a minor fraction of the total cancer risk.

Well, what about the remaining cancers? Is there evidence which would link chemical exposure to the remaining fraction of cancers for which we don't know the etiology?

At the moment, we haven't a specific answer for this, so I would like to call attention to the fact that there are still some things about carcinogens in the environment that we don't know.

First of all, we don't know that we can identify all of them chemically, but more important than that, among the ones that we can identify are the possibilities of synergisms—that is of low levels of multiple agents acting in a more than simply additive form in the initiation of cancer.

Second the possibility of the changing patterns of carcinogen exposure which might in fact be related to the findings in the migrant studies; and finally, I come to the issue at question here today and that is, where in fact is the best evidence or where in this kind of model in which cancer is initiated by an exposure to a chemical and then promoted, as has been said earlier by various environmental factors like diet—where does diet fit into this picture?

There are several ways in which this could take place, although these are very poorly characterized except in a few animal models.

One is in the case of altered metabolism of carcinogens. It's very well established now that most and probably all carcinogens are not in themselves active in the form in which they appear in the environment, but once they are ingested or once exposure takes place, either in animals or in man, they are metabolically converted to another form which becomes much more active in the initiation of cancer.

As Dr. Kritchevsky just pointed out, the diet has a very dramatic effect on these enzyme capabilities, enzymatic capabilities for doing that kind of conversion, and the interactions can take place in either direction, in sensitization or in protection, so that in the formulation of control strategies this factor has to be taken into consideration.

Second, there are examples from the animal model systems in which the organ site which is affected by a given carcinogen can be completely changed by dietary manipulation. For example, I mentioned aflatoxins earlier which in animals with a very high degree of specificity induce cancer of the liver, only cancer of the liver; but when those same animals are fed a diet which is marginally deficient in vitamin A, not overtly deficient but simply marginaly deficient, the target site changes from the liver to the colon.

Senator PERCY. Doctor, could I ask the key to the puzzle you put up here, for those of us who are laymen? Could we use the word interaction for synergism? Is that correct?

Dr. WOGAN. Yes. Synergism, as I'm using it here, refers to a combined effect which is much greater than simply the additive effects of the end number of individual components.

Senator PERCY. And carcinogen is a cancer causing agent?

Dr. WOGAN. Yes. These are agents which induce cancer.

Senator PERCY. I just wanted to be sure you understood that we are not medical students. We are struggling with this chart.

Dr. WOGAN. Let me just put the main point of the whole thing in a nutshell. In the formulation of a control strategy, the point that I'm making here is that if we make specific dietary recommendations without knowing the initiating factors, if these remain unknown and if we don't identify them, then there is a risk of formulating preventive strategy on the basis of diet which in fact may either not be nearly as effective as one which would include both factors, but what's even more risky in my judgment than that is that we may make recommendations which would switch the risk by modifying the sensitivity of specific organs to the action of chemicals which can in fact induce cancer and which are present.

This is basically the message that I would like to leave from this slide. I don't mean to overemphasize this, but I think we shouldn't lose sight in the formulation of preventive strategy of the importance of identifying the causal factors and not equating associations, epidemiological or otherwise, with causation. Thank you.

Senator MCGOVERN. Thank you, Dr. Wogan, for your presentation.

[The prepared statement of Dr. Wogan follows:]

STATEMENT OF DR. GERALD N. WOGAN, PROFESSOR OF FOOD TOXICOLOGY, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MASS.

The view is now widely held that a large majority (perhaps as much as 90 percent) of cancers are caused by exposure to environmental chemicals often acting in concert with modifying factors including diet compositon and nutritional status, among others. If the initiating agents and modifying factors can be

identified, defined and understood, cotrol strategies could be formulated which ultimately could prevent the disease from developing. I wish to address my remarks to current evidence implicating chemicals in the induction of cancer, particularly as this relates to interactions with diet and nutrition, and to the kinds of further evidence that will be needed to lay the groundwork for development of strategies for prevention.

With respect to the importance of environmental chemicals as initiating agents of cancer, this assumption is based on the following lines of reasoning: (1) Viruses and radiation, the other two recognized causes of cancer, are associated only with a liimted range of cancer types, involving mainly the lymphatic system and skin.

(2) Epidemiologic evidence of patterns of cancer incidence collectively suggests the involvement of environmental factors which somehow predispose some people to development of the disease. Dramatic differences in cancer incidence occur among certain geographical areas and populations within which some subgroups are at much higher risk of developing cancer than others. Within a given population, incidences of some forms of cancer change over periods of time. Furthermore, under some circumstances migration from one country to another is accompanied by substantial changes in risks of some forms of the disease.

(3) Hundreds of chemicals have been shown to produce cancers in experimental animals. A small proportion of these exist in the general environment as contaminants of air, water and food. However, in general, the levels at which they occur appear to be far lower than levels effective in producing cancer in animals. It is difficult if not impossible on the basis of current knowledge to quantify the extent to which these carcinogens individually or collectively contribute the induction of cancers in populations exposed to them.

Much of the research that has been done on this questions up to now has sought to implicate exposure to unusually high levels of one or more known carcinogens in the causation of specific forms of the disease. However, identification of specific chemical insults as carcinogenic stimuli has been successful in only a few instances, the most important examples being the association of cigarette smoking with cancer of the lung and other organs, and the association of exposure of workers to certain industrial chemicals (e.g., vinyl chloride) with the occurrence of cancers at several sites. It is estimated that cigarette smoking is responsible for perhaps as much as 30 percent of total cancers, whereas exposure to industrial chemicals accounts for not more than 5 percent of all cancers.

In only one instance has a food contaminant been associated epidemiologically with cancer in humans. This is the recently-described correlation between the possible presence in foods of high levels of aflatoxins, products of a spoilage mold, and elevated incidence of primary liver cancer. This association has been established in several countries of Africa and Asia, in which the levels of both food contamination by the carcinogen and of liver cancer incidence are considerably higher than those in industrialized countries. Although other chemicals known to be highly carcinogenic in animals are occasionally identified as food contaminants (e.g., nitrosamines), there is as yet no epidemiological evidence to establish their involvement in the etiology of cancers in humans.

Since they cannot be attributed to exposure to a known carcinogenic stimulus, the remaining environmentally induced cancers are thought to be caused by interactions among multiple factors, some of which are only poorly defined at present. Future research efforts to elucidate causation must therefore be directed to developing an understanding of the factors involved as well as their interactions.

Possible synergism among several carcinogens occurring simultaneously may be an important consideration, but there is no evidence that this plays a role in any specific form of cancer. On the other hand, there is considerable evidence to suggest that diet and nutritional status are important components of this multifactorial system, as indicated by epidemiological studies in human populations and by experimental evidence in animals.

For example, changes in dietary habits represent perhaps the most significant cultural change accompanying migrations which are associated with marked changes in cancer rates. It is possible that these changes could engender exposure to a spectrum of food-borne carcinogens of sufficiently different character and potency to account for the altered pattern of disease incidence. However, no evidence exists that this is the case.

Considerable evidence from studies on experimental animals is pertinent to this question. There are no known situations in which nutrient deficiencies or

excesses per se are effective in inducing cancer without the simultaneous participation of a carcinogenic stimulus. However, it is clearly indicated that altered diet composition and nutritional status can bring about very significant changes in the occurrence of so-called "spontaneous" tumors in animals and also in the qualitative and quantitative responses of animals to chemical carcinogens. Specifically, not only effective dose levels but also target organs affected by given carcinogens can be dramatically modified by nutritional status. Protein and Vitamin A deficiencies are two well-studied experimental models in which this phenomenon has been investigated.

Therefore, diet and nutrition must be regarded as important modifying factors in experimental carcinogensis and may also be important determinants of the occurrence of cancer in people. Their relative importance in this regard can only be evaluated by further research efforts which effectively couple epidemiologic studies with experimental laboratory approaches.

The significant of environmental chemical carcinogens, including contaminants of food and water, must not be minimized. Research efforts to quantify exposures to known carcinogens and to identify previously unrecognized sources of carcinogens are essential, as are attempts to reduce exposure to minimum achievable levels. However, detection and quantification of carcinogen exposures will not in themselves necessarily provide all of the information essential to the development of an implementable prevention strategy. That will require in addition the definition and understanding of the various modulating factors which somehow place a proportion of the general population at high risk for cancer. Present evidence indicates that diet composition and nutritional status are important among the modifiers of carcinogenesis.

Senator McGovern. Dr. Wynder, as you know, there's been a growing anxiety in this country about the impact on food additives and food contaminants as a factor in cancer. My own wife has been very much concerned about that, and has stopped buying things that have nitrates in them and avoiding things that look like they contain red food coloring. However, your statement suggests there's no really measurable evidence that food additives and food coloring are significant factors in cancer.

Would you elaborate on that a little?

Dr. Wynder. As you know, Senator McGovern, the decisions were essentially made on the basis of the Delaney amendment which states that any food additive ingested into an animal at any concentration producing any kind of tumor needs to be banned. It's essentially on that basis that we have banned DDT and cyclamates without, I believe, proper epidemiological evidence. In other words, what I was saying is that the evidence in epidemiology has shown no relationship that these particular let's say cyclamates or saccharine increase the risk for bladder cancer.

I recognize that we can get involved in the concept of threshold levels of carcinogenesis. In my view this is a theoretical discussion that won't get us anywhere. I stress that we have to look at each material that we ban from the point of view of its cost-benefit. If we want to eliminate DDT, then we've got to say, OK, this is the kind of cost it will have to society and these are the potential benefits we have. We've got to consider its role as agriculture and its potential risk to man, as well as the availability of alternate products.

It is my view that the National Cancer Institute has recently dealt effectively with this general problem by establishing a National Clearinghouse for Environmental Carcinogenesis simply because it felt that there was a lot of—a great deal of decisions have been made which did not involve cost-benefit analysis. I wonder whether Dr. Gori may want to comment as to where this National Clearinghouse for Environ-

mental Carcinogenesis stands because it relates to a new effort by the NCI to bring greater order into this very difficult area.

Senator McGovern. What I was getting at is whether—and Dr. Gori, maybe you wish to comment—whether you think we have created exaggerated fears of the impact of food additives and what Dr. Wynder described as contaminants.

Dr. Wynder. I certainly believe that.

Senator McGovern. You think we have exaggerated them?

Dr. Wynder. The problem, Senator, is that when one talks to the news media about let's say the food additives that were just banned, they say that makes news and makes headlines while preventive medicine is dull. It rarely makes any news. Somebody once defined preventive medicine as applying to the faceless, the nameless and the unidentifiable, to themselves and others.

We ought to be very careful before the American public believes we're living in a sea of carcinogens that really everything we do is carcinogenic. We need to distinguish the important from the unimportant.

Senator McGovern. Well, by impression from these hearings is that it's been comparatively recently that medical science and medical research has started to look systematically at the relationship of diet to cancer and perhaps to some of these other major killers. Is that true? Is this comparatively a new concern and new emphasis on the part of the medical profession; instead of looking for exotic chemicals and various things in the air that may be causing cancer, that we are now beginning to look at less dramatic things but maybe more fundamental things, and that's what we eat? Is that impression correct?

Dr. Wynder. In fact, Senator, Dr. Al Tannenbaum deserves a great deal of credit for some early studies on nutrition and cancer in the early 1950's where he showed that caloric excesses in experimental animals enhance tumor formation. It was subsequently that we and others have shown in epidemiology and thus demonstrated that nutrition affects not only the cancer work in animals but also to man, that the subject has come to the forefront. I would like to give credit to the National Cancer Institute that had the vision and leadership to pick up these epidemiological data and say to the scientific community, "here's a lead that needs to be pursued." It is my view that the NIH and the HEW must not only wait until people in the scientific community have an idea, but must get them to move into new directions. The National Cancer Institute deserves much credit for bringing nutritional carcinogenesis into the forefront.

Senator McGovern. I'd like to direct a question to Dr. Hegsted and I know, Doctor, you have cautioned and all the doctors have against trying to make any definitive analysis about what a person ought to eat until you know something about the person, but would it generally be right to say that most Americans would be better off if we ate less fat, less sugar, less salt, less liquor, and ate more fiber, cereal, roughage type foods?

Dr. Hegsted. I certainly agree, only I'd expand your list a little. I think we ought to eat less meat, less saturated fat, less cholesterol, less sugar, less salt, and increase our consumption of fruits, vegetables and cereals, whole grain cereals.

I think, as I said, I see no possible risk in suggesting kind of diet, no health risk, and the probability of benefits are all these to be seen in correlation as well as some of the more definitive studies.

Senator McGovern. Are there a number of cereals on the market that are readily available to the people in the stores that you could endorse, that you can recommend? I don't want a commercial endorsement and I don't want you to give out any particular name. In other words, can you go up to the supermarket and pull off the shelf cereals that provide the kind of roughage and nutritional content that you think is desirable?

Dr. Hegsted. I'd like to comment a little more on that, because as far as I know, fiber is essentially not measurable at the moment. It's something that increases transit time through the intestinal tract and increases people's bulk and what we measure in the laboratory ordinarily and call food fiber is simply not what we are talking about. It's unfortunate, but that is the state of the art and it's a wasteland right at the moment. As Dr. Kritchevsky pointed out, wheat bran has fiber in it by definition. We know that. Whole grain cereals have fiber in them because they practice what we talk about. But by analysis, you really cannot tell. So that I think the best advice at the moment would be whole grain cereals or high bran cereals, although even there, I'm hesitating a little because I understand we have now evidence that methods of processing may determine the reactivity of some of these so-called fibrous materials.

Senator McGovern. That's really what I was getting at, whether these highly processed cereals that we eat—and you know all the popular brands—whether as a general rule you think those are good foods.

Dr. Hegsted. I'd hate to comment on individual foods as good foods. Most foods are good foods in moderation.

Senator McGovern. That was another point that Dr. Kritchevsky made.

Senator Bellmon. I thought when the Doctor mentioned cereals you were talking about cereal grains. You weren't talking about Post Toasties.

Dr. Hegsted. All cereal, anything that's made out of cereal grains, not specifically breakfast cereals.

Senator McGovern. The less processing and refining and so on that goes into foods, ordinarily the better; is that not true?

Dr. Hegsted. I think I'd have a general feeling in that direction, but I couldn't produce any particular evidence. I think usually when we think of processing of cereals, we are talking about removal of bran to produce the white flour and white rice. That, by definition, would have less fiber in it than the unmilled material. But the kinds of processing that go into breakfast cereals, I'm not really sure whether they are very important and, of course, on a nutritional basis, most of them are fortified.

Senator McGovern. Senator Humphrey, you haven't had a chance to do any questioning yet. I'll defer to you.

Senator Humphrey. Again, I want to express my thanks to our witnesses for the informative session we have had here. It's quite evident that we are more or less feeling our way as legislators in this field. The purpose of this committee is to focus attention upon the matters that have been discussed and hopefully to explore further areas.

This morning I was listening to the Today show—maybe some of you noted it—there was a psychiatrist on the show who was relating diet to mental health and mental disturbance of psychic disorders. He actually had some tests and he demonstrated them by film on the Today show. The tests were of a particular patient who reacted very sharply to fish. The tests showed the effect of the diet upon attitude and upon one's behavior.

Without going into that, I suppose that is an area that's now being explored. Am I correct? Is this an area of some major exploration?

Dr. GORI. I don't know how major, Senator Humphrey, but certainly it's an area that is being explored.

Dr. HEGSTED. Certainly some aspects of it are.

Senator HUMPHREY. We know about certain foods in terms of allergies to skin and digestive disorders, but this was in terms of the attitudinal reactions. We have information now, don't we, insofar as the impact of cigarette smoking as it relates to the incidence of lung cancer.

Dr. GORI. In some of the younger ones, yes.

Senator HUMPHREY. We also have evidence that by reducing the tars, you reduce the danger of lung cancer. Now we passed legislation in Congress that says that you have to have certain types of safety equipment on automobiles. As a matter of fact, we have gone so far as to tell the automobile producer how much mileage he has to get out of his car, and we're concerned over the automobile in terms of pollution.

Have we passed legislation that says you will reduce the tar in the cigarette to so many milligrams?

Dr. GORI. There have been several bills proposed, but to my knowledge none has passed.

Senator HUMPHREY. Isn't it a good idea?

Dr. GORI. I think it is a good idea.

Senator HUMPHREY. I mean, after all, there is demonstrable evidence that cigarette smoking is a health hazard; is that correct?

Dr. GORI. Yes.

Senator HUMPHREY. I just thought I'd bring this up as a matter of whether we ought to have some legislative intent on this matter. After all, you can't go around throwing out chemicals that we know are poisonous or just pass them around. I recollect when I was a pharmacist we had to register all of those poisons.

Dr. GORI. Could I comment briefly on this subject, Senator?

Senator HUMPHREY. Yes.

Dr. GORI. I happen to be heavily involved in smoking and health with the Cancer Institute. This problem has been with us for a long time because this is the single most clear cause of cancer in humans today, smoking, and the single most preventable cause.

Of course, how do you approach such a problem? You try to educate people not to smoke and we have done this. After 15 years or so of intensive educational effort, we still have, by the latest counts, some 50 to 60 million Americans who smoke. Smoking has been with us for 500 years. It's not likely that we are going to cancel it in 10 years. It's likely it will take a few more decades before smoking disappears from our society.

As you have indicated, legislation has been lagging for a variety of reasons that I don't want to dwell upon. Economics and the fact that people want to smoke, in spite of all warnings are the major reasons.

Therefore, the NCI felt that something had to be done for people who continue to smoke. It is well known that the more you smoke the higher your risk. Therefore, we tried to see whether we could produce cigarettes that could eventually reduce the risk to a minimum level—the less hazardous cigarette. I'm sure you have heard about it before.

The program was started in 1968 and I'm happy to say that we have reached a very definitive goal at this particular time. We can produce cigarettes that are essentially made of hot air.

Senator HUMPHREY. That's strong political competition.

Dr. GORI. It's difficult to make them less hazardous than that, but people won't smoke them. So we have tried to introduce some flavor into these cigarettes so they would become palatable to the smoker without increasing the carcinogenicity. The evidence is that this can be done. The industry has come out with new types of cigarettes which, in my opinion, with smoking moderation, would not appreciably increase the risk of the smoker over that of the nonsmoker.

There is no such thing as a safe cigarette. All cigarettes will always have a degree of hazard. However, we have enough evidence to say that certain cigarettes, if smoked in moderation, even though we know they are going to produce some risk, are not going to produce such a risk that it's going to be shown demonstrably in the general population.

Senator HUMPHREY. In other words, they are safer than others?

Dr. GORI. Well, they are much less hazardous than others.

Senator HUMPHREY. Now the cigarette industry has done a great deal about this itself. I mean, they run full page ads day after day about amounts of tar in a certain cigarette and they have a new kind coming out every week. They even have one called More coming out, which indicates there's more to come.

What I'm pointing out here is that the cigarette industry, because of this pressure from the surgeon general and from the research, has tried to get to the public with what is a less hazardous cigarette.

What about the food industry. Do you think this will have the same effect? As there's exposure of certain types of chemicals, certain types of foods that are less conductive to health and more hazardous, will the food industry advertise, for example, that this product contains less sugar? I noticed Pillsbury just put out a beverage and they've cut the sugar in half. Could we expect more of this?

Dr. GORI. Yes, I don't believe there is any industry in the United States that would like to kill its customers. All of them have an interest in keeping them alive and well. This is true for the cigarette industry as well. I'm sure that given the opportunity they would prefer to sell cigarettes that don't harm the public rather than vice versa. It's very true of the food industry I'm sure. There would be a different approach with the food industry than we have with cigarettes. Cigarettes have something we can eventually do without and for which you can become even missionary or zealous. Food is a different story. Food is a must.

Senator HUMPHREY. Now getting back to what I talked about yesterday, which is the thing that disturbs me, we can educate our people to better nutritional standards. We can put it into a theoretical framework for a moment. Theoretically, we can train men and women to prepare food properly. We can produce the proper kinds of food providing they are home to produce it, providing they eat at home and

assuming a lot of other things. But many of the people on Capitol Hill do not get home for lunch. I watch them as they come into the Senate offices with a cardboard box, some coffee, and a couple of rolls that would sicken a dreadnought. And that's their breakfast. I protest that in my office. I tell them they ought to eat at home. I don't want them to eat on my time. I believe people ought to eat before they get to work.

What do we do about this? Here you are, men of the medical profession. We obviously know you're deeply concerned and interested and you're doing marvelous research. Let's presume that if we had a life style, that people used to have 50 or 70 years ago, where you were close to home and where mother was fixing the bread and you had your own smokehouse, I don't know whether people were all that healthy or not, but it sounds good. Here today, people are on the run eating in cafeterias or getting takeout food.

Now what can we do to improve those standards? What can we do, not only to see whether or not there are rodents in the kitchen? I noticed one of the largest hotels in Washington, D.C., this morning, was served notice that their kitchen was contaminated by vermin, rats, and mice. We have survived those problems for a long time. What do you do to see that the meal you buy or the prepared food that you purchase has some nutritional value? We're dealing with the practical problem of people and their food habits.

Dr. GORI. You have to consider the problem in its global terms.

Senator HUMPHREY. Let's consider it at the homefront for a while.

Dr. GORI. At home you will have to address the people that are not at home, the children on one side, and you mentioned how sensitive children are to good advice and even to the political implications in getting mothers and fathers to the corner of—I don't remember what street it was yesterday that you mentioned in Minneapolis——

Senator HUMPHREY. Seventh and Nicholette.

Dr. GORI. You have to consider the children and develop the personal involvement of the children as they will become the adult generation of tomorrow. Something has to be done for the adults alive today, so you have to educate adults as well, which is the most difficult thing.

Yesterday the statement was made that some on us are lost; there's nothing that can be done about it. Something can be done about it either by direct education or by indirectly providing them with management situations whereby their choices are modified. I realize we cannot tamper with the freedom of choice of the individuals. On the other hand, one may consider that the choices we think we make are often determined by what we see on television and what we get through the school. So the free system may not be as free as it looks on the surface.

Therefore, we need to persuade those that make up public opinion to accept a particular policy rather than another. I believe that strides can be made on the homefront, but probably we could even make better strides in terms of changing the food and nutritional habits of institutionalized food, cafeterias, etc., starting with the Senate perhaps.

I'd like to leave some time for other comments by my colleagues.

Dr. WYNDER. Preventive medicine, Senator, like politics, is the art of the possible. In 1950, when I went with recent lung cancer and smoking data to Dr. Graham as a medical student, he said, now that

you have found the truth, you have taken the first step. I didn't realize how long it would be until we convinced this country that smoking is injurious to our health.

Interestingly enough, the tobacco industry, because of public pressure and because of laws that were passed to publish tar and nicotine levels, took up the challenge and produced products which are significantly less harmful than they were 25 years ago. When we began, cigarettes had on an average 40 milligrams of tar and 2.2 milligrams of nicotine. Nobody then would have predicated that 25 years later we would have cigarettes on the market with between 5 and 10 milligrams of tar and between 0.6 and 0.8 milligrams of nicotine. So, it can be done with the proper kind of incentives.

In my view, having testified a number of times before congressional committees, it cannot be done with legislation against the industry, be it the tobacco or food industry. We thus ought to consider the proper incentives for the food industry in this area of managerial preventive medicine. The greatest progress has not been made with what we can do for the individual because we all believe it's not going to happen to me. Managerial preventive medicine means to prepare the kinds of foods that are proper for our sedentary way of living. The meat industry ought to consider whether grass feeding does not have a nutritional and an economic advantage over corn feeding. The corn we save could feed a lot of people. Grass-fed beef has been shown to be significantly lower in fat content than corn-fed beef.

In the case of milk, we need to ask what the level of fat content of milk should be. Some countries have set an upper level of 2.5 percent. Milk is very nutritious but not with fat in it.

Eggs have a problem. Eggs are a very important part of our breakfast. Only recently I have given up eggs. If you get up in the morning and cannot eat eggs and bacon you wonder what you can eat.

My suggestion to the egg industry is to see if they can reduce the cholesterol content of eggs. The American industry is a most ingenous industry. If you give them the right kind of incentives they can produce foods that are both nutritionally sound, good tasting, and commensurate with our ability to metabolize them.

Senator HUMPHREY. My time is up.

Dr. HEGSTED. I'd just comment that we have one example of modified margarine which is aimed specifically at the kind of problem we're talking about. Before you came in, Senator, we were talking about the need for some kind of a surveillance program, defining what our problems are. I think the tough part in all this, as I see it, is the food demand in the United States is essentially fixed by the population. If you eat more of something you're going to eat less of something else, and I think under those conditions somebody wins and somebody loses, but the health of the population has to be the primary directive of what does happen.

Senator MCGOVERN. Senator Percy.

Senator PERCY. Mr. Chairman, I'd like to ask Dr. Kritchevsky and Dr. Wogan if they could comment on whether or not it is possible to get any hard figures or facts as to what would be the percentage of cancer that could be prevented by dietary changes. We haven't had those figures this morning.

Let me just ask if you could respond to the figures given by Dr. Marvin Schneiderman of the National Cancer Institute. He said that

30 percent of cancer deaths could be prevented; that diet changes alone could save about 15,000 lives a year. He mentioned as an example, 5,000 breast cancer deaths—one out of every six—could be prevented if American women ate less animal fats; increased consumption of roughage could cut the annual colon cancer death toll by one-third—from 30,000 to 20,000 deaths. Would you care to comment on whether those figures he's given are in the ballpark?

Dr. WOGAN. Well, in my opinion, they are in fact minimum figures. They represent the two incidences in which the correlations are best established with breast cancer and fat, so my own guess would be that substantially more would in fact be preventable by diet if we knew what specific recommendations to make.

Dr. KRITCHEVSKY. I'd like to say that Dr. Wogan's last few words really put the hook on it, if we only knew which recommendation to make. The suggestions that are being made are based on epidemiological studies that we know the diet doesn't cause the cancer; it seems to promote them. Hopefully, removal of that one promoting cause will then prevent cancer totally, but we really have no data on that. On the basis of what we know, we have to follow the prudent diet. We can't wait until all the returns are in because then the electorate may be dead.

Senator PERCY. I'd like to say I struggled with the same moral issue. What is our moral obligation as legislators? What do we have as a body of fact? I tend to think it's going to be very hard to legislate in this area. I'm not a smoker, but a person can look at all the various factors that cause cancer and decide not to give up cigarettes. By doing so, they are not harming anyone else. If we start to legislate for everything that everybody can do to injure themselves, it would just be unbelievable the areas we'd get into. I think legislation on nutrition education may be possible. With knowledge and understanding, at least if we injure ourselves we know we're injuring ourselves and have no one else to blame. That is our best hope, I think. I just don't think we're wise enough yet to know how to legislate in this field. Perhaps, together with industry and the medical profession, we legislators can provide the public forum necessary to inform and educate the public.

Dr. WYNDER. I would just like to take you up on this. If we would all die free of disease we would certainly help the economy of our country. If we would prevent disease we would certainly reduce the health care costs to our Nation which are now up to $118 billion a year, a fair portion of all of our salaries. It seems to me that legislators have to be concerned about the economics of prevention because we do not live in an island to ourselves. If I'm sick due to my own hands, I injure my family, I injure my coworkers. In fact, my unnecessary illness injures my countrymen.

So you have to consider the economics of health care. Some day we are going to have national health insurance—we'd better take stock of these issues.

I'm not for prohibition, but I am a believer in informing the people. I'm a believer in providing the proper incentives to individuals to have good health habits. I am a believer in providing politically doable incentives to industry to provide an environment and to provide products that are as healthy as possible.

Senator PERCY. This is one area where I think we can legislate. Certainly, we can prevent the dumping of known poisons into Lake Superior and Lake Michigan, particularly if it's going to contaminate fish. The environment is an area that I tend to think we can really go to work on because it is a factor that simply everybody is exposed to.

Senator HUMPHREY. I'd like to ask a question. On the basis of legislation, which I tend to agree with you on, you don't want to apply that test to other products? Some products that only injure the individual at least directly—heroin and cocaine—we do legislate against products like that. They are primarily injurious at first to the individual and subsequently to society.

Senator PERCY. That's true, but I would be reluctant to cosponsor any bill that legislates how much sugar can go into a product, for example. I don't think we have enough facts to do that. We would have a lot better chance at doing something about the problem that Dr. Wogan mentioned—that the exposure to industrial chemical accounts for 5 percent of all cancers.

I'd like to have that clarified because the Council on Environmental Quality concluded in its sixth annual report that exposure to cancer causing substances on the job was the biggest environmental threat to Americans. Also, Dr. Samuel Epstein of Case Western University told the Environmental Council this January that the majority of 365,000 cancer cases reported last year were traceable to environmental sources and could be prevented if Federal regulatory agencies such as EPA would crack down on industrial polluters.

Now would you care to reconcile the two conflicting pieces of information we have there?

Dr. WOGAN. I don't think I can reconcile them. I think the clearly established relationships between occupational exposure and proportion of total cancers in the working population is in the range that I mentioned. The highest estimate that I have heard or seen is on the order of 8 percent. This does not mean, however, that this hazard should be minimized by any means. It is in fact one which is perhaps more amenable to control than any other single type of exposure.

The other factor—and I would like to emphasize this—this refers only to those cancers which are initiated by exposure to the workplace. This does not, however, include whatever other cancers may result from wider dissemination of the carcinogens into the general environment and there are in fact several lines of evidence that suggest that, in some instances at least, the occupationally related cancer gives a clue as to what carcinogens may in fact be getting distributed to, for example, the families of workers.

Senator PERCY. I have just one last question, and then Senator Bellmon can ask his questions.

For the average person who faces this dilemma now, what do we do about it? Taking into account Dr. Cooper's testimony yesterday that medical school graduates today know more about heart transplants than basic nutrition, where does the average person go? Do they go to their physician for nutrition counseling, or should they go to a dietitian or a nutritionist, or do you recommend a book or just reread all the testimony given today? What does the average person do about this problem?

Dr. KRITCHEVSKY. Right now it would appear that the best source would be the evidence given today because there is no central place. Nutrition is something that everybody considers himself an expert on. People who write books with particularly appealing titles get a lot of readership when the book may not always contain everything that has to be known. I think the best approach—and its going to be a long one—is the one Dr. Wynder has started. I agree with you. I don't think you can legislate the amount of anything you can put into the food, but if you educate people into reading the labels on the food and they don't buy the food which they figure is bad, the industry wakes up to what they should be making.

Senator McGovern asked about cereals. If you went to breakfast cereals, regardless of what the front of the package says, if you read the side panel, you will find that in a lot of these high fiber cereals—the first ingredient is the sugar. The idea being that you can't get the taste people want without the sugar.

Dr. WYNDER. Currently we are also involved in a study of coronary disease prevention. We are learning from that that a very important component in health behavior modification are the so-called allied health professionals. As physicians, we are trained to do largely therapeutic medicine and economic incentives are given only in this area. If I had my way, I would like to divide medical care into therapeutic care and preventive care. We have nutritionists, sociologists, health educators and other people who can deal with young and older people in the area of nutrition and other health-related problems. I recommend that we provide some kind of health corps of allied health professionals to be regulated by national rather than by State regulations, that will take charge of these preventive-care programs.

Hypertension could significantly be reduced by such allied health professionals working in all States and under physician supervision. If we want to do better in preventive care, we've got to have the proper incentives which is best done by allied health professionals rather than the current medical establishment.

Senator PERCY. Thank you very much. And, Mr. Chairman, I'd like to thank our panel very much today for an extraordinarily interesting and informative morning.

Dr. HEGSTED. I'd like to comment on what Ernst said. I think we are only partially correct when we blame the physician for his lack of knowledge in nutrition. The main problem is that the physician has had no way to apply nutrition and because he doesn't have any way to apply it he doesn't learn it.

I believe, like Dr. Wynder has said, the physician ought to be able to make a diagnosis and a prescription in dietary terms, but you need some group to fill that prescription in terms of telling the person how to change his diet, specifically in terms of cooking products, and so on.

That will never come from the physician. I think in terms of getting nutrition into medical education, it's going to take some special legislation. The medical schools can be bought, but they can't do it any other way.

Senator MCGOVERN. Senator Bellmon.

Senator BELLMON. I'll try to be very brief, Mr. Chairman.

We have had some talk this morning about additives in foods. I'm a grain farmer, wheat grower, and something troubles me and that's the subtractive processes that our manufacturers go through. It seems

like everything that the millers or bakers do to my grain makes it cost more and makes it worth less as far as its nutritional value is concerned. They take out the germ which has the protein and vitamins and some of the minerals in it and they take out the bran which is where the fiber is, and all it leaves is the starch and then they put in preservatives which are sort of low-level poisons and make it so the bacteria and insects won't eat it and feed it to the people and raise the price by a factor of about 10.

My question is: Is there any way we can legislate in this area? Do we need some law that manufacturers cannot diminish the natural nutritive value of food?

Dr. KRITCHEVSKY. You'd have to have a set of data on what the nutrient value is. I think Dr. Gori already touched on that. We need a much better evaluation of that.

You know, the reverse is true in Italy. It's illegal to make whole wheat products.

Senator BELLMON. I didn't know that. Is there some sound basis?

Dr. KRITCHEVSKY. The basis goes back 400 or 500 years, that a lot of the insects were in the outer husk and the way to make sure nobody put it in the bread was to make it illegal. There are concerns in Italy trying to make whole wheat bread and it's being confiscated.

Senator BELLMON. But is your conclusion, then, that there's no legislative remedy for this problem? I believe Dr. Hegsted just mentioned that we might need legislation requiring nutritional education in our educational system.

Dr. HEGSTED. I don't think one can do more than establish food standards for specific products.

Senator BELLMON. We could establish a food standard by legislation.

Dr. HEGSTED. Well, yes. That's what the Food and Drug Administration does. But you will never get away with it if you want to prohibit white flour products. I'm sure of that. The desirability or lack of desirability of specific foods depends on what they are eaten with. It makes is very difficult to deal with specific foods individually because you can't blame anything particularly on a specific food. We have to deal with the diet. That's what makes this whole problem so difficult and why we can hardly respond to your question of what's the significance of white flour versus whole wheat flour in the diet.

Senator BELLMON. Well, I realize the difficulty of legislating in the area, but it seems that if the information you have given us this morning—I believe it was Dr. Wynder who pointed out there are 90,000 cancer cases a year due to cigarettes, 138,000 cancer cases in males and 230,000 cases in females due to diet, and this would seem, even though Senator Percy feels perhaps these people don't hurt anybody else, they do cause a tremendous cost to the Treasury just through medicare and medicaid in treating these kind of diseases. It seems we have a legitimate reason to be concerned and I don't like to think that we are helpless.

Dr. GORI. I believe that many of the things we have said this morning would require some changes. Nobody likes to change, particularly when we come to food. We have ingrained traditions that may be difficult to change. Industry is no different than anyone else. They don't like to change either, and one may expect some difficulties in trying to impose a new food policy on the public. It's easier to produce a pound of fat than it is to produce a pound of meat or protein. Milk is

very nutritious; however, it is very probable that the content of fat in milk today is excessive. For years we have bred cows to produce the highest fat content because that seemed to be the thing to do.

Senator BELLMON. That's not the case any longer. Holsteins are the most popular breed and they are low fat producers.

Dr. GORI. That might be the right direction then. Perhaps we can breed hens that lay low cholesterrol eggs or we could process the eggs in such a way that to remove the chloresterol. There are possible ways to do this today.

Then you have the problem of calories, the starch, the sugar in particular. The sugar is going to be a major problem due to the amount produced in the world today. There, one may think of a number of incentives that can be given, not the least, the possibility of transferring sugar into fuel.

Then, of course, the economics, esthetics, and the economics of taste, which are the economics of the advertising industry would need to be changed. It's difficult to come up with the specifics here, particularly if you ask for specifics for legislation. A cooperative effort whereby a group collects the information available and infuses it into and involves the industry and the consumer, would hopefully result in major modifications to dietary consumption and intake patterns advocated today.

Senator BELLMON. Well, now, I have a degree in agriculture and during the years I was in school I was required to take many courses in nutrition. I'm advised that at the University of Oklahoma Medical School the only nutrition courses that are offered are elective. Is this generally true throughout medical training? Do doctors not get training in nutrition as a part of their formal education?

Dr. WYNDER. That's more or less true, even in the great school of my colleague on my left, who has an excellent department of nutrition. But to what extent they have an impact on the medical students is another question.

Senator BELLMON. Well, are those courses elective? Are students not required to take courses in nutrition?

Dr. HEGSTED. I suspect certainly in 95 or 98 percent of the medical schools the nutrition courses will be elective.

Senator BELLMON. Now here's an area, it would seem to me, like we could legitimately legislate in. Most medical schools get a pretty good slice of Federal funds and most of them want more.

Dr. HEGSTED. I cannot really recommend that, but I'd like some encouragement.

Dr. WYNDER. Senator, you need to recognize the weakness of man himself.

Senator BELLMON. You don't have to specialize in nutrition, but at least you ought to have a speaking acquaintance with it.

Dr. WYNDER. There's no question if our heart transplant surgeons speak here they get a great deal of attention. Preventive medicine always has a problem. I once testified before a congressional committee and the Congressman said, "Doctor, where you sit, last week individuals with kidney disease were sitting. They pleaded for more money for kidney dialysis machines. They had 250,000 letters of support with them. How many letters do you have?" I didn't have any letter because preventive medicine will never be as attractive as curative medicine. We need to recognize our limitations.

To train and have more training in medicine toward health education is probably not the way we should go. We need to train allied health professionals that feel challenged by nutrition, that feel challenged by health behavior modification—I think that's where we ought to go.

Dr. KRITCHEVSKY. I think it should be noted where these elective courses in nutrition are offered, they are becoming increasingly popular. I think the administration of a lot of medical schools is lagging behind the interest of the students. At Cornell, for instance, a few years ago they had an open elective nutrition course which had to be given at night because they didn't have a room big enough to seat all of the students.

Senator BELLMON. I was very much impressed by Dr. Wynder's health passport for children. Is this a one-time program? Do you prepare a health passport once and is that the end of it?

Dr. WYNDER. No. My hope is that within this decade the Congress will legislate this type of health maintenance strategy for all the children in our country. We were funded to do a specific study to determine whether the use of the health passport concept could indeed reduce risk factors in children. Currently there are 3,000 children in this program in Westchester County, and New York City. What we hope, over a 3-year period, is to show whether this type of effort can reduce the risk factors in those children. If we do, and I think we shall—then we hope to come back and say to you that this ought to be a national program.

Senator BELLMON. As I understood from your testimony, you simply analyze the current condition of the child or diagnose it. Do you go further and recommend dietary changes?

Dr. WYNDER. Absolutely. In the case of those children that have elevated cholesterol—we deal directly with them. We also deal with the parents in part because there's a high correlation between the cholesterol level of children and parents largely because they tend to eat together. Also, we have an excellent rapport with the teachers. With their help we built into the school curriculum a nutrition evaluation program. We also have peer committees of children. In one school these children formed a group and "marched on the cafeteria"—what Senator Humphrey said in terms of the Senate cafeteria—they demanded the unhealthy food be replaced by nutritious food. Thus we have a total commitment from the children, the parents, and the teachers to reduce risk factors in our study schools.

Senator BELLMON. I haven't heard any one of the doctors on the panel this morning mention junk foods. Maybe that's not a specific term, but potato chips and popcorn and so on, carbonated beverages. We spend a lot of money for food stamp programs and school lunch programs and a lot of times it seems that the coke machines get more attention than the school cafeterias at lunch time.

Dr. HEGSTED. I think with regard to the food stamp program we need some information—I commented on that before—we need information on what has happened. What do they eat? Have we changed the food habits and nutritional status with the food stamp program?

I think the junk foods have taken, I would say, an excessive beating relative to their nutritional value or lack of it.

Senator BELLMON. Most of them are high in oil and starches.

Dr. HEGSTED. Many of them are, but it depends on how much you eat. Most of us who are older think that snacking is not the way people should eat, but that's the way we do eat and I think we have to be openminded about it and look at it in terms of what we know and what we don't know.

Senator BELLMON. So you wouldn't, as a panel, condemn these kinds of foods?

Dr. HEGSTED. I'm old enough to condemn them somewhat, but I think much of the information does not have a good nutritional basis.

Dr. KRITCHEVSKY. It's a matter also of total calories. Again, you can educate people to take their calories from what we consider a more acceptable form and it might be easier, but for a lot of people these are all or most of the calories they get. There's been a study done recently on fast-food hamburgers and they find one of those meals provides a respectable amount of the daily requirements of both the necessary nutrients and vital nutrients.

Senator BELLMON. That's all I have.

Senator MCGOVERN. I want to thank all five of you doctors for an excellent presentation. These hearings are the first in a series. We also recognize the need to confer with industry leaders and educators and others to implement some of the recommendations.

I'd also like to call your attention to a report that the committee is releasing today. It's a 378-page report on nutrition and health which is an update on a report we did last December. It represents an excellent overview of the relationship of nutrition to the general health of the American people. It also contains a very informative history of the attempts to include nutritional health considerations into overall food and agriculture policy. I do think we are into a very important area here and one that we will want to continue to look at for some months, and we do thank you for helping us lay a foundation here this morning.

ADDITIONAL STATEMENTS

STATEMENT OF BEVERLY McGAUGHY, LEGISLATIVE CHAIRMAN AND GRACE POWERS MONACO, NATIONAL LIAISON CHAIRMAN, CANDLELIGHTERS

Mr. Chairman and Members of the Committee: As representatives of both the general and cancer patients (our children), Candlelighers, a national organization of families of children affected by cancer, heartily endorses this Committee's inquiry into the role nutrition plays in the disease process and particularly its concern with nutrition and its relationship to cancer. We will focus our statement on the National Cancer Institute's new program in Diet, Nutrition and Cancer.

News concerning links between cancer and various foods, dietary lacks, food additives, etc. has been appearing in the public press for some time. (A few examples are bacon, nitrites and nitrates, low versus high fat diets, roughage in diet, adequate protein, vitamins, etc.) Yet, in the past, when we, as parents of newly diagnosed cancer patients asked their doctors about our children's diet, we were usually told little or nothing. We sooned learned that most of our doctors knew little or nothing about the role diet and nutrition play in the disease. We were particularly concerned by the absence of any comprehensive, coordinated program in this area at the National Cancer Institute, although they funded occasional individual researchers who were working on specific problems.

In 1973 as part of our testimony on the 1974 Cancer Act Amendments, we petitioned Congress, through Paul Roger's Subcommittee on Health and Environment of the Committee on Interstate and Foreign Commerce and Senator Kennedy's Subcommittee on Health, of the Committee on Labor and Public Welfare to rectify this situation. Their Committees saw fit to direct the NCI to institute their current program and the Committee's recommendations were adopted by the Congress.

Since the planning for this program started about two years ago, we have learned that there are many research leads to be followed, both concerning the causitive links between cancer and nutrition, and in the treatment of cancer patients through diet. Some of these very promising leads actually date from the 1930's and '40's, but have never been followed up. These facts supply additional evidence of the long-standing need for this program. The fact that NCI has received between 110 and 115 applications for the six grants to be awarded indicates the amount of interest this new program has generated.

Cancer patients often die not from cancer itself, but from anorexia either because of the patient's inability to eat or because of the body's inability to use the food taken in. Indeed, Dr. Maurice Schils, Chief of Nutrition Service at Memorial Sloan-Kettering Cancer Center, recently stated that his service is maintaining approximately one hundred cancer patients on homebased artificial feeding programs, both tubal and intravenous, who only a few years ago would have been considered terminal patients and left to die because of their seemingly insurmountable anexoria. Many of these people are now working, both as wage earners and homemakers, and leading fairly normal lives, and will probably continue to do so for a normal span of years. We think this is a *dramatic* example of the use of diet and nutrition as an actual treatment method for cancer patients.

Unfortunately, Dr. Schils pointed out that very few cancer patients will be able to benefit from this type of revolutionary treatment because practically no hospitals in the country have clinical nutritionists (physicians specializing

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in nutrition), nor are the medical schools training clinical nutritionists. Indeed, they virtually ignore the whole field of diet and nutrition. To break this vicious cycle Dr. Schils has made the following suggestions for legislative action: 1) the development and implementation of stipends for physicians in medical schools who will devote full time to teaching and research in clinical nutrition; and 2) the development and implementation of training programs in clinical nutrition in major cancer centers. Candlelighters urge that this Committee consider these suggestions in recommending legislative action. In our opinion, organized medicine has ignored nutrition for so long that it is highly unlikely that it will change its emphasis in the near future without prodding. Therefore it is up to Congress, as the guardians and dispensors of the citizen's tax monies, to remedy this situation. Such a remedy would undoubtedly result in the better health of all of us. For too long, American doctors have acted as though what we ate had little or nothing to do with our health—simply out of their ignorance. Candlelighters looks to the Congress to rectify this situation.

In closing, we applaud this committee's interest in nutrition and suggest that you consider upgrading the National Cancer Institute's Diet, Nutrition and Cancer program through whatever mechanisms are appropriate, since it now constitutes only seven-tenths of one per cent of NCI's overall '76 budget.

THE COMMONWEALTH OF MASSACHUSETTS,
UNIVERSITY OF MASSACHUSETTS,
FOOD MANAGEMENT SCIENCE LABORATORY,
SCHOOL OF BUSINESS ADMINISTRATION,
Amherst, Mass., July 30, 1976.

Mr. ALAN STONE,
Staff Director, Senate Subcommittee on Human Nutrition,
Washington, D.C.

DEAR MR. STONE: I just learned of the recent hearings of the Subcommittee. Although I could not attend personally, I am sure you received useful testimony and good advice from the experts usually expressing views on these matters. I assume that, just as in previous hearings, one particular discipline (mine) was not represented. If this was indeed the case, please permit me to volunteer my contribution to your hearing in a few words here.

As I pointed out in the enclosed reprint from *Science*, the normative aspect in human nutrition, i.e., the problem of how to improve it, is a mathematical problem. This is a discipline which is conspicuously absent from the educational background of most food, nutrition, medical, and consumer experts, and makes it difficult, if not impossible, for them to conceptualize properly the very problems they seek to solve.

The obvious point in case is the preoccupation with nutrition education in terms of teaching good food-intake habits. This approach is in conflict with the well known fact of interpersonal food-preference differences and with the theoretical observation that there can be infinitely many food intake patterns which are all nutritionally adequate. Which one of these patterns, may I ask, should be singled out, and by whom, to be followed by an obviously heterogeneous population, especially if some segment(s) will not have access to the food or, more likely, will not have the money for buying it? The answer is obvious: no one can impose his or her food preferences on others with much success. In this maxim lies, in my opinion, the bankruptcy of the present methodology of nutrition education. All the nutrition surveys, including recent school lunch plate waste studies, clearly indicate that people are unwilling to follow the restrictive and yet unspecified guidance offered by the traditional school of nutritionists. The value of this guidance, such as the Type A pattern of food group designations is itself questionable, especially with the increase of new and "fortified" food products on the market. It was found repeatedly that even hospital meals planned by dietary experts are often "unbalanced" nutritionally, as an enclosed reprint from the *Journal of ADA* shows.

For these reasons, in another enclosed publication in *Food Management* I came out in favor of nutrionally labelled and balanced meals as the practical answer to improve nutritional health directly through products available to the consumer in such a way that the food preference and nutritional needs are neither in conflict nor ignored. Considering the ever growing proportion of meals eaten away

from home, such policy will bring us closer to the stated goals of the advocates of better nutrition simply by giving the consumer a practical chance to satisfy his or her nutritional needs. The rest of this article points out the technological necessities to establish such practice in our food service industry which, since the article was written, has been greatly enhanced by the increased availability of mini- and microcomputers. You also may be interested to know that technologically it is now entirely feasible to provide shoppers with computerized food shopping guides which would determine the content of individualized food baskets with maximum utility, minimum cost, and balanced nutrition for any particular family in any locality. You may rightly conclude with me that these new technological possibilities may soon sidestep the old issue of nutrition education, and will replace it with the new issue of the education of nutritionists.

The fourth enclosed reprint from the *Cornell Restaurant and Hotel Administration Quarterly*, as well as the article in *Science*, indicates the need for interdisciplinary education and research support to train future generations of food and nutrition experts who can utilize and put into practice the above ideas and methods. Unfortunately, without that step any learned discourse on the role of mathematics and computers in human nutrition will remain extremely difficult, as you yourself will undoubtedly discover.

I believe that these issues should be included in some way in the deliberations of your Subcommittee in the best interests of the American people, regardless of how difficult it may be. If you agree, I will be glad to furnish more information or make myself available for consultation with your committee at your convenience. As of September 1, my address will be: 2719 Curry Drive, Adelphi, MD 20783.

In the meantime, I would appreciate receiving a copy of the transcripts of your last hearing, and advance notice of the future ones.

Sincerely yours,

JOSEPH L. BALINTFY, D. Eng.,
Professor of Management Science
and Operations Research Principal Investigator.

Enclosures.

[Reprinted from Science, Aug. 10, 1973]

MATHEMATICAL MODELING AND HUMAN NUTRITION

(By Joseph L. Balintfy, School of Business Administration, University of Massachusetts, Amherst, Mass.)

Jean Mayer's article "Toward a national nutrition policy" [1] is an impressive report on the recent history and accomplishments of social contributions to the improvement of nutritional health in this country. Mayer is right in pointing out the casual relations between *improper diet* and malnourishment, and he is also right in listing the potentialities of institutional feeding programs, food labeling, education, and research as possible means of achieving improvement on a national scale. However, he is not specific as to how these factors can significantly affect the following of "proper diets" and thus eliminate the causes of malnutrition.

Most nutritionists seem to share the mistaken assumption that the knowledge of the nutrient composition of foods and the recommended dietary allowances is somehow sufficient to plan a diet, when in fact this information contains only part of the coefficients of the system of mathematical equations that must be solved to determine non-negative quanties of food. Contrary to popular belief, the problem of diet *planning* is not a nutritional, but a mathematical one [2]. Moreover, the term "proper diet" defies definition, both conceptually and operationally, unless the problem is cast into some mathematical model built upon the concepts of constrained optimization techniques. The scientific methodology to plan diets which are "proper" in the sense of satisfying consumers while meeting nutritional and budgetary allowances is already well developed [3, 4]. Years of research and repeated comparisons in many institutions [4, 5] have consistently shown that diets planned with mathetmatical techniques on computers will cost less (by 10 to 30 percent), be preferred, and be better balanced nutritionally than diets planned by conventional means. It is laudable that increased federal funding is now available to extend particiption in the school lunch and other volume feeding programs. But by changing from the conventional to the mathematical

(computerized) method of diet planning, these programs could be extended to about 20 percent more people without extra funds.

Other disturbing signs point to the existing shortcomings in diet planning methods. One is the proposed rule of the Food and Drug Administration for nutrition labeling [6]. Nutritionists without mathematical models have limited use for precise nutrient composition data; more data means only that more information will have to be ignored. The proposed labeling formally advocates shortcuts in determining the precision of nutrient values that do not benefit the consumer, yet place unnecessary constraints on the food packagers. In this process, the issue of the consumer's right to know and the method of using the information are confused.

It is consistent with this picture that the majority of the population is ignorant or indifferent about proper diets. Of the millions who "eat out," no one can purchase a balanced meal. A fixed combination of menu items that explicitly guarantees some specified fraction of recommended daily allowance [7] is yet to be included in the menus of our food service industry.

A move toward mathematical methods for meal planning will require an interdisciplinary approach, with the participation of fields not traditionally linked to that of human nutrition. Only with the aid of mathematics, mathematical statistics, psychometrics, operations research, and computer science can the vast amount of information generated by nutrition science be fully utilized in medical or economic decisions. Mathematical modeling is the key to the perspective Mayer envisions when he calls for the cooperation of the scientific community in re-examining "our policies and habits concerning food." Within this broad framework, however, three specific issues emerge that must have top priority in our national nutrition policy. These are the problems of data, education and research.

Nutrition science is a quantitative field, routinely producing and using a large amount of tabulated data. It should be a fundamental part of our national nutrition policy to see that a reliable source of food nutrient composition data is available and easily accessible to the public through a central computerized data bank.

To help nutritionists begin to conceive diet problems in mathematical terms, a complete overhaul of the curriculum in dietary education is necessary. The recent report of a study commission on dietetics [8] omits any reference to this need. The recognition of the role and vaule of scientific methods in diet planning is the responsibility of the leading educators and researchers in nutrition science. Until this responsibility is met, cooperation between experts and other scientists who are now often considered "outsiders" will be hindered.

The art of mathematical modeling in the field of human nutrition is still in a developmental stage. With more and better data and with improved interdisciplinary cooperation, research teams could develop more sophisticated and acceptable models of diet planning that could be applied in hospitals, supermarkets, restaurants, and even to the cost-of-living index [9]. Research in these areas demands both talent and funds, but the return in benefits to the public far outweighs the investment. The extension of funding for diet planning research should be an integral part of any program or policy which is aimed at the revitalization of nutrition science and the increase of its potential contributions to our life.

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[Reprinted from Journal of The American Dietetic Association, December 1972]

Integrated Nutrition and Food Cost Control by Computer[1]

(By Mary Jane Gelpi, R.D.[2], Joseph L. Balintfy, D.Eng.[3], Lyman C. Dennis II[2], and Irene K. Findorff, R.D.[2,4] Computer Sytem Research Graduate School of Business Administration, Tulane University, New Orleans, La.)

Computer systems utilizing mathematical programming[5] have been designed and applied to menu planning. Implementation of regular and multi-diet programs of computerized menu planning demonstrates significant raw food cost savings and greater nutritional control than is generally obtainable with conventional menu planning techniques.

It is widely accepted that any efficient feeding program involves the advance formulation of a menu and that control cannot be achieved without prior planning. Control for large-scale feeding operations begins with the definition of menu planning as a decision process to assure satisfaction of a large set of simultaneous requirements of nutrition, palatability, and production. The recognition of the mathematical nature of menu planning [1] led to the application of mathematical programming in diet planning [2, 3] and menu planning [4] models. Implementation of mathematical programming to menu planning [5–7] demonstrates that menus planned by conventional, manual techniques are not optimal with respect to food cost and nutritive control. Menu planning models developed by Balintfy and other investigators [8–11] have been adapted for use in hospitals and related institutional food service operations, and resultant menus have afforded raw food cost savings of 9 to 34 per cent while satisfying nutritive stipulations with greater accuracy than was possible with conventionally planned menus [12].

The tool for performing precisely and efficiently all the computations called for in the mathematics of balancing diets is the computer. This article reports the results achieved by an integrated computerized menu planning system designed, implemented, and evaluated during seven years of research. The purpose of the study was to evaluate the raw food cost, palatability, and nutritional content of conventional menu plans vs. menus planned with computer assistance. The investigation reported here was conducted during 1968–69 at the 253-bed West Jefferson General Hospital in a suburb of New Orleans. The dietary department, directed by a head dietitian and five staff dietitians,[6] serves approximately 550 patient meals and 600 to 800 persons each day in the cafeteria.

The conventional menu plans served at the hospital are seasonal cycle menus consisting of a selective regular diet menu and a number of non-selective modified diet menu plans patterned after the regular menu. The computer models developed to plan menus reflected these features of the conventional system.

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[1] This investigation was wholly supported by PHS Grant 00087.

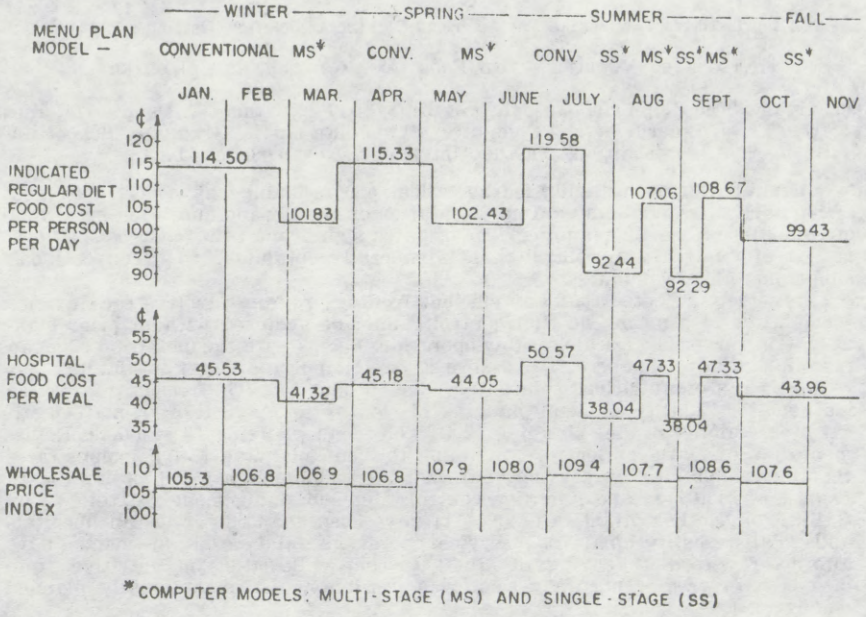
[2] Present address: Management Optimization Systems, Inc., New Orleans.

[3] Present address: School of Business Administration, University of Massachusetts, Amherst.

[4] The authors would like to express their appreciation to Michael Neeb for the design of the reporting system which produced a considerable portion of the results presented and to Barbara Clardy for extensive dietary technical assistance.

[5] "Mathematical programming" is a collective term used to identify a relatively new branch of applied mathematics which includes linear programming, integer programming, non-linear programming, and stochastic programming. The word "programming" stands for "programming optimum activities" in the context of this terminology and has nothing to do *per se* with computers. The solution of mathematical programming problems of realistic size, however, cannot be attempted without the aid of high speed digital computers which are coded (programmed) for such tasks. For further details, see reference (1).

[6] The researchers gratefully acknowledge the cooperation and assistance of David M. Smith, F.A.C.H.A., Administrator, West Jefferson General Hospital, Marrero, Louisiana, and the dietary staff under the direction of Margaret Granier, R.D.



*COMPUTER MODELS: MULTI-STAGE (MS) AND SINGLE-STAGE (SS)

FIGURE 1. Comparative raw food costs.

DESIGN OF THE COMPUTERIZED MENU PLANNING SYSTEM

The results to be described were obtained from a dietary information system organized around a time-shared computer[7] and a dedicated disk file[8] linked via telephone lines to remote terminals[9] at the West Jefferson General Hospital and two other cooperating hospitals. The dietary staff of each hospital possessed on-line access to centrally shared data files, to a library of various information programs, and to the menu planning program. Data on food items, recipes, and the nutritive composition of foods for each hospital were collected, organized, and stored on the disk file. Details of the coding and operational procedures are available [13]. The first model developed and implemented produced menus on-line through a multi-stage process, that is, through a day-by-day planning process with the control benefits of the on-line environment [14]. The second model planned the optimal set of menu items for the entire menu planning cycle in a single stage, and this plan was then computer-scheduled into daily menus [15]. In the final stages of the research, a mathematical programming model was built and implemented to plan modified diets by computer.

Data evaluating the computer models were systematically collected during the implementation of each menu planning system. The evaluations are presented here in two phases—Phase One reporting the results of a one-year comparative study of conventional and computerized regular diet planning and Phase Two comparing conventional and computer planning of eleven modified diets.

SELECTIVE REGULAR DIET MENU PLANNING

Evaluation of regular diet planning concentrated on three controllable aspects of the conventional and computerized systems: (a) raf food cost, (b) palatability as measured by patient satisfaction, and (c) nutritive value.

Raw food cost

To study the effects of all influencing factors, the service of conventional and

[7] IBM 7044.
[8] IBM 1301.
[9] IBM 1050.

computer-planned menus (including both single-stage and multi-stage computer plans (was alternated throughout the study. Data were collected for ten planning periods which varied in length from two to six weeks. Because of the selective nature of the regular diet, the statistics for average raw food costs were weighted by the number of patients selecting each menu item.

The upper line of Figure 1, indicating average raw food cost per patient on a regular diet based on the price level of September 27, 1968, illustrates considerable differences in food cost, ranging from $1.15 to $1.20 for conventional menus and from $1.00 to $1.09 and 92 and 99 cents, respectively, for multi-stage and single-stage computer menus. The weighted average indicates savings of 16.35 cents a day for each patient served a regular diet planned by the computer. This saving could have been increased to 21.87 cents if the superior single-stage menu planning model had been used consistently.

Food cost figures for the middle line (figure 1) were obtained from the hospital accounting records and represent the total raw food cost for the regular diet, modified diets, and the cafeteria divided by the number of meals served, and then calibrated for correct indication of the menu planning periods. These values show the historical food cost data per meal based on the total cost of raw food for all regular diets, modified diets, and cafeteria meals. It is interesting that total raw food costs moved in close harmony with the regular diet raw food costs and were always lower when menus were planned by computer. This is explained by the fact that the content of both the modified diets and the cafeteria menus were affected by the regular diet menu. Based on meals served during 1968, the toal raw food cost saving achieved through computerization of only the regular diet menu planning was $17,349.24, a significant 10 per cent of the total raw food expenditure. This food cost saving was realized during the same period that the wholesale index of farm products and processed food rose 3.9 per cent [16].

Palatability as measured by patient satisfaction

It was of interest of evaluate how different planning systems affected patient satisfaction. For this purpose, a questionnaire designed to test the patient's acceptance of conventional and computer-planned menus was distributed to 5,740 patients on the regular diet at the time each was discharged from the hospital. Subjects were asked to circle three of sixteen descriptive terms assigned a ranking and numeric scale by hospital staff members ranging from "delicious" (scale value, 3.25) to "unappetizing" (scale value, 13.33). Other specific aspects of satisfaction—taste, temperature, variety, amount, texture, color, and service—were also included in the questionnaire and were rated on a 7-point scale from 1, "excellent," to 7, "terrible." Of these, only variety was considered a factor that might be appreciably affected by computerized menu planning.

The data graphed in figure 2 show the mean responses with 95 per cent confidence intervals obtained from the measurement of general acceptance and menu variety for the conventional and computer-planned menus. The means exhibit only random variation and are not statistically different from each other, indicating that palatability was as well controlled by computer-planned menus as by the conventionally planned menus.

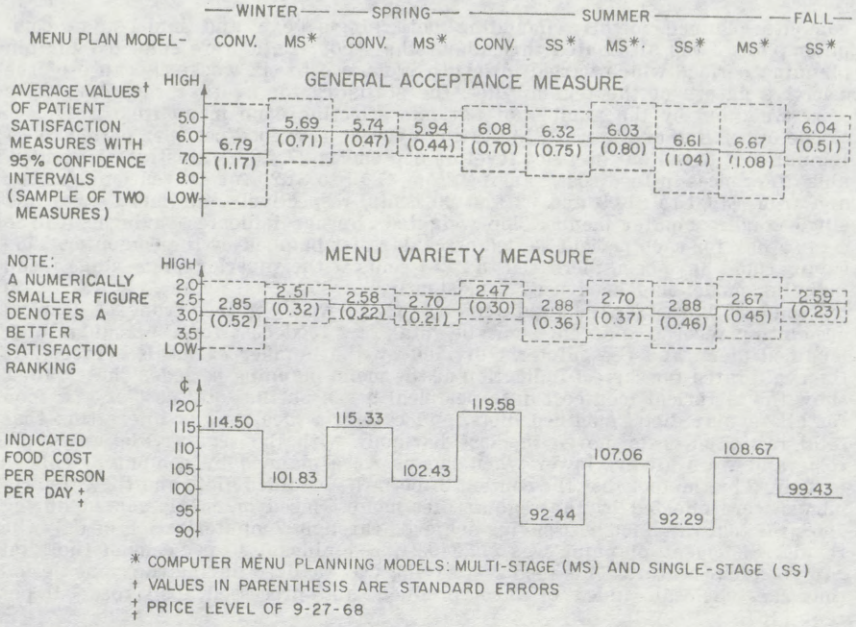


FIGURE 2. Comparison of patient satisfaction measures and raw food cost for the regular selective menus.

Nutritional content

An additional aspect of menu plans evaluated for both conventional and computer systems was nutritive control. Figure 3 shows data which depict the changes in the average value of the menus for four selected nutrients—calories, protein, thiamin, and iron[10]. The average nutritive intake planned per patient per day is represented by the solid line; the dashed line indicates stipulated nutritive levels. The originally stipulated levels were changed after a reassessment of the hospital's nutritional standard based on results of nutritional analysis made with computer assistance. Although the requirements for calories and iron were increased during the fall of 1968, the computer-planned menus continued to meet the stipulated nutritive levels, but the patients received, on the average, food with a lower nutritive content due to random menu item selections. As can be seen from Figure 3, the computer menus met the stipulated nutritive levels more precisely than did the conventionally planned menus.

It can be concluded from the evaluation of regular diet menu planning that the technique of mathematical programming permitted a hospital menu to be planned which significantly lowered raw food cost while maintaining desired palatability and nutritional qualities.

[10] Nutrient constraints used for menu planning were provided by the hospital dietary staff and were based on the Recommended Dietary Allowances (17).

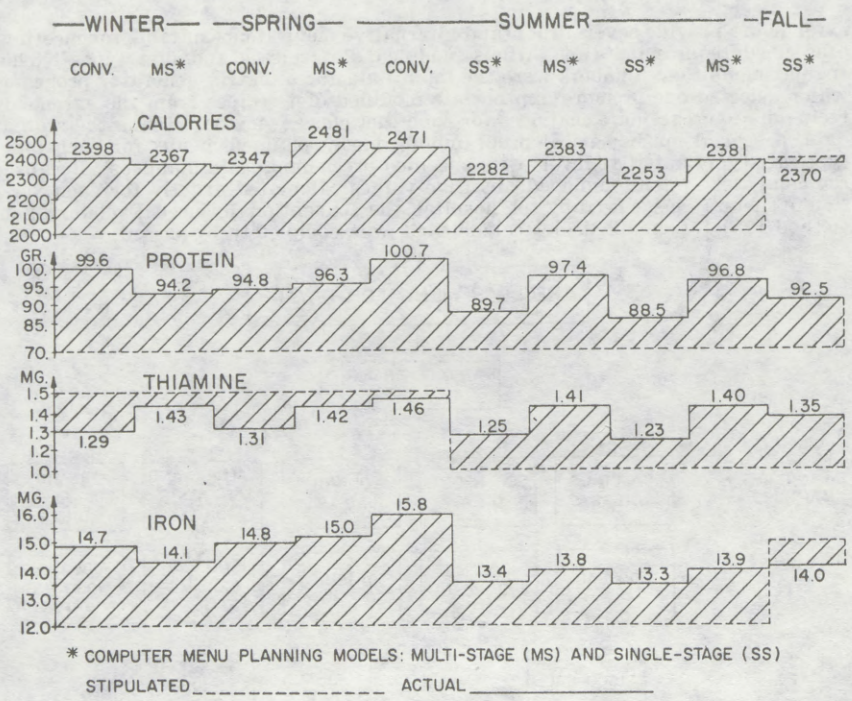


FIGURE 3. Stipulated and actual nutritive composition of regular selective menus.

MODIFIED DIET MENU PLANNING

Based on experience gained in modeling regular diet menu planning, the research staff subsequently undertook the design and programming of a computerized modified diet menu planning system for at least 90 per cent of modified diets. Balancing diets for more than one nutrient is a strictly mathematical problem of solving simultaneous systems of equations which may involve dozens of constraints and hundreds of variables; mathematical problems of this size and complexity can be solved accurately in a reasonable time only by a computer.

The most common conventional method of modified diet planning involves manipulating menu items from Exchange or other food lists to construct menus with suitable nutritional and palatability attributes. Exchange lists are organized by categories of basic food groups with weighted nutritive values assigned to each. Thus the calculation of diets according to the list principle has a major shortcoming, i.e., the nutritive data of individual institutional recipes are not calculated and, consequently, the aggregate nutritive amounts for each diet are not utilized. In contrast to the precision of computerized diet planning with the best available compositional data, the methodology of conventional modified diet involves balancing sets of random variables (aggregate amounts of each nutrient) by trial and error methods.

There are a number of differences between regular diet and modified diet planning methodologies, but the most significant is the problem of production links between diets. Figure 4 depicts the conceptual design of the modified diet planning system. From the regular selective menu for a given day, some or all of the menu items were designated as input data to the modified diet system. Corresponding to each of these regular items was a set of computer-stored recipe modifications for each class [11] of modified diet, selected in accordance with the customary food production modifications used by the hospital. These modified diet recipes were compactly stored by means of a unique coding process, and recipe modifications were based on substitute recipe ingredients, portion-size revision, and alternative menu item selections. Through this concise recipe storage scheme, the recipe file was

extended to provide several thousand alternative menu items suitable for meeting prescribed requirements of various modified diet classes and diet types.[11] The regular menu item numbers were the input data for a matrix generator program which selected one or more appropriate modified diet recipes from the extended recipe file to create data matrices for each diet class every day. Using the stored data, a special mathematical programming model planned menus for each diet type satisfying nutritive levels with specified precision at minimum cost. Because the computer system employed nutritive values calculated exactly for each version of menu items served by the hospital, the conventionally used Exchange list method [18] for modified diet calculations was completely by-passed.

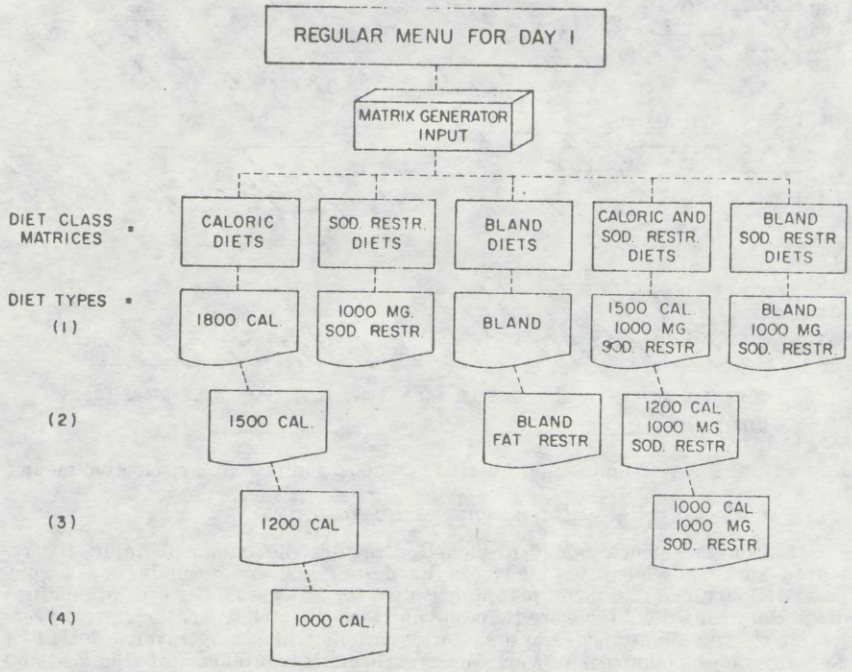


FIGURE 4. Conceptual system of modified diet planning by computer.

Figure 5 shows a print-out for a 1,500-kcal diet served without change to a patient with diabetes. Note that these menus reflect the caloric requirement of "less than or equal to 1,530 kcal," which a survey of dietitians and doctors indicated was an acceptable caloric standards for the 1,500-kcal diabetic diet. This menu was generated from the items on a regular menu. The particular recipe modification corresponding to each item selected by the computer is referred to as "version" 1, 2, or 3. The printed name of the menu item does not reflect the changes indicated by the modified diet version chosen. Portion size by weight and food cost of one portion of the altered menu item are indicated.

The raw food cost of this one-day menu was 98.96 cents. The required levels of nutrients are expressed as either less than or equal to a required amount or greater than or equal to a required amount. Since a range was stipulated for carbohydrate, both inequalities were used. The nutrients actually supplied by this menu demonstrate the close control achieved. The slack percentages represent each nutrient deviation from the required level.

Table 1 shows the same computer-planned 1,500-kcal diabetic menu shown in Figure 5 but finalized for presentation to the patient. Menu item portion sizes

[11] The term "diet class" refers to common qualitative criteria for differentiation of modified diets, e.g., low-sodium, bland, diabetic, and so forth. "Diet type" refers to the quantitative nutritive levels stipulated for various diets belonging to a particular class.

were converted manually from actual weight to volume measures where appropriate. In Table 1, measures are not noted for items with standard portion sizes. For example, 8.6 oz. skim milk by weight is, in fact, 1 cup by volume. In addition, the menus were color-coded to facilitate the serving operation and provide immediate identification of diet classes.

DIET NAME—DIABETIC (1,500 CALORIES)—DAY 7

Category	Recipe No.	Recipe name	Version	Portion Size (ounces)	Portion Cost (cents)
		Breakfast:			
1	900700	Prune juice	1	2.1	2.40
2	900040	Bacon strips	1	.5	2.31
3	230020	Farina	3	11.7	8.33
4	440040	White bread	1	1.0	1.35
5	480040	Coffee/cream/sugar	1	9.5	5.62
		Lunch:			
6	0				0
7	420040	Breaded veal cutlet	1	2.0	18.01
8	330130	Mashed potatoes	1	7.0	2.92
9	900520	Green peas and mushrooms	2	1.7	4.46
10	900585	Combination salad	2	2.5	2.67
11	900710	Purple plums in syrup	1	3.0	5.37
12	470000	White bread with butter	1	1.2	2.55
13	480140	Iced tea/superose	1	8.4	1.79
		Dinner:			
14	900310	Cream of mushroom	1	4.0	2.67
15	40170	Grilled minute steak	3	2.0	15.99
16	0				0
17	210010	Buttered leaf spinish	2	3.5	4.98
18	280040	Peach salad	1	2.8	7.77
19	180025	Dietetic Jello	1	2.0	1.20
20	470000	White bread with butter	1	1.2	2.55
21	450080	Skimmed milk	1	8.6	6.03

Note: Food cost for 19 menu items is 98.96 cents.

NUTRITIONAL SPECIFICATIONS

Number	Nutrient name	Required level	Units	Nutrients in diet	Slack percentage
1	Calories (Lt.)	1,530.00		1,439.75	5.899
2	Protein (Gt.)	70.00	Grams	71.90	2.720
3	Fat (Lt.)	70.00	do	61.72	11.828
4	Carbohydrate (Gt.)	138.00	do	151.40	9.708
5	Carbohydrate (Lt.)	162.00	do	151.40	6.545
6	Carbohydrate breakfast (Lt.)	53.00	do	47.56	10.267
7	Carbohydrate lunch (Gt.)	100.00	do	111.92	11.923
8	Calcium (Gt.)	760.00	Milligram	977.09	28.565
9	Iron (Gt.)	13.50	do	18.67	38.286
10	Vitamin A (Gt.)	5,000.00	I.U	11,452.42	129.048
11	Thiamine (Gt.)	.60	Milligram	.95	58.351
12	Riboflavin (Gt.)	.90	do	1.84	103.965
13	Niacin (Gt.)	9.90	Milligram equivalent	25.87	161.299
14	Vitamin C (Gt.)	65.00	Milligram	65.14	.216

FIG. 5. A computer-planned modified diet.

A menu for the same diet planned from the same regular menu by the conventional Exchange list technique is shown in the bottom half of table 1. The computer compilation of nutrients, displayed below the menu itself, clearly indicates the nutrient deviations from the norm established. The cost of this menu was $1.32 as compared with the 99-cent cost of the computer menu shown in the top half of Table 1, a 33-cent saving per patient in good cost in this case.

EVALUATION OF CONVENTIONAL AND COMPUTER-CONTROLLED MODIFIED DIETS

To obtain systematic nutritive and food cost information about conventionally planned modified diets, a study was conducted for two weeks. Information on methods of food preparation and portion size was collected for menu items in-

cluded in eleven conventionally planned modified diets. A study was also made of the same diets, both as planned by the dietician and as served by the diet aides. Similar data were subsequently collected for computer-planned modified diets, and all the data were evaluated through the dietary information processing programs of the system [13] producing (a) nutritional and (b) raw food cost comparisons between the two methods of planning.

TABLE 1: Computer-planned and conventionally planned 1,500 kcal diabetic diets, with nutrients calculated

COMPUTER-PLANNED MENU

Sunday breakfast	*Sunday noon*	*Sunday evening*
¼ c. prune juice	2 oz. special breaded veal cutlet	½ c. cream of mushroom soup
farina [1]	regular mashed potatoes	2 oz. plan grilled minute steak
2 strips crisp bacon	½ c. plain peas and mushrooms	plain leaf spinach
½ pt. skim milk	combination salad with Zero dressing	diet peach-cream cheese salad
1 slice toast	3 oz. dietetic purple plums	dietetic Jello
coffee with 2 individual creamers	1 slice bread	1 slice bread
salt, pepper, Superose	1 pat butter	1 pat butter
	iced tea with lemon wedge	½ pt. skim milk
	salt, pepper, Superose	salt, pepper

Food cost: 98.96 cents per patient.

Nutrients	Amounts	Percent deviation
Calories	1,440.0	−.04
Protein (grams)	71.9	.03
Fat (grams)	61.7	−.1
Carbohydrate (grams)	151.4	.01
Calcium (milligrams)	977.0	.2
Iron (milligrams)	18.7	.2
Vitamin A (I.U.)	11,452.0	1.3
Thiamine (milligrams)	1.0	.7
Riboflavin (milligrams)	1.8	1.0
Niacin (milligrams)	25.9	1.6
Ascorbic acid (milligrams)	65.1	0

CONVENTIONALLY PLANNED MENU

Sunday breakfast	*Sunday noon*	*Sunday evening*
½ small sliced banana	3 oz. special baked veal cutlet	2 oz. roast beef
1 box Puffed Rice	½ c. plain fresh mashed potatoes	½ c. egg noodles
plain scrambled egg (1 Exchange)	½ c. green peas and mushroom caps	½ c. frozen leaf spinach
1 slice toast	combination salad with Zero dressing	sliced tomatoes on lettuce leaf
1 pat butter	100 gm. fresh orange sections	75 gm. diet Royal Anne cherries
½ pt. homogenized milk	1 slice bread	1 slice bread
coffee with 2 individual creamers	1 pat butter	1 pat butter
salt, pepper, Superose	iced tea with lemon wedge	½ pt. homogenized milk
	salt, pepper, Superose	salt, pepper

Food cost: $1.316 per patient.

[1] Measures are not noted for items with standard portion sizes.

Nutrients	Amount	Percent deviation
Calories	1,612.0	[1] 7.5
Protein (grams)	83.0	18.6
Fat (grams)	66.8	—4.5
Carbohydrate (grams)	172.3	[1] 14.8
Calcium (milligrams)	979.0	22.3
Iron (milligrams)	14.6	—2.6
Vitamin A (I.U.)	12,730.0	147.4
Thiamine (milligrams)	1.2	98.1
Riboflavin (milligrams)	2.0	121.4
Niacin (milligrams)	31.1	213.7
Ascorbic acid (milligrams)	149.0	129.3

[1] Nutrient violation.

Nutritional comparison

To evaluate the nutritive composition data, tolerance values were established which could be used to measure the extent of nutritional variation inherent in conventional methods of diet planning. These tolerances used in evaluating the conventional diets were more generous than those used for computer solutions as the computer could always meet nutritive requirements within a narrower tolerance. The evaluation of the conventional diet utilized tolerance levels of plus and minus 5 per cent, an attempt to approximate the nutritive precision expected by physicians, dietitians, and hospital administrators.

The lack of control as judged by the 5 per cent tolerance levels for calories with the 1,500-local conventional diabetic diet can be seen in Figure 6. This graph illustrates the magnitude of the caloric deviation from the stipulated or tolerable values, as well as the number of days that the acceptable tolerance ranges were exceeded; in this case, the caloric content was considered unacceptable for thirteen of the fourteen days of the study. This diet was typical, i.e., it did not exhibit exceptional nutritive variability as compared with other conventionally planned modified diets. Diabetic diets have been chosen for presentation here because they require and receive more control attention than other modified diets evaluated for this study.

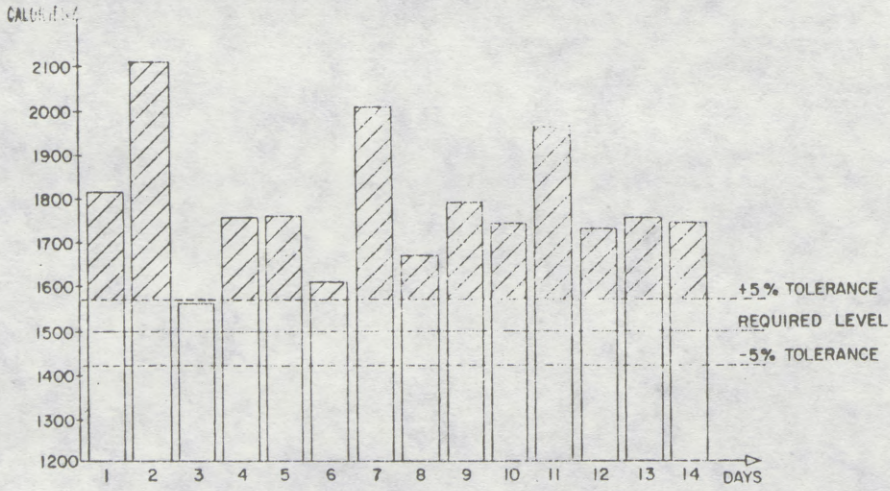


FIGURE 6. Calculated daily caloric content of conventionally planned 1,500-kcal diabetic diets as served to patients.

That all the diets evaluated produced similar results is clear from Table 2 which presents the frequency of violation during a two-week period of 5 per cent tolerances around nutritive constraints in the eleven conventional diet menus.[12]

[12] All evaluations are based on planned (not ingested) nutrients, since computerization affects only planning methodology.

For each diet, the 5 per cent tolerances were applied to all nutrients for which control was specified. The minus and plus notations indicate, respectively, that any value less than 5 per cent of the stipulated requirement was not acceptable and a value greater than 5 per cent of the stipulated requirement exceeded the tolerance permitted. As a typical example of daily nutritive variability, the source data for Table 2 indicates that for the 1,800-kcal diabetic diet, twelve of fourteen daily dietary plans failed to fall within the 1,710- to 1,890-kcal range. Out of 154 possible nutrient-days, thirty-nine violations occurred. Zeros indicate that the stipulated nutritive requirement was satisfied for all fourteen days; dashes mean that control of the nutrient was not required for that diet type.

The last column in Table 2 contains a summary of the data in terms of the percentage of total nutrient-days that requirements were violated. The degree of violation appeared to increase with the complexity and restrictions of the diet. These data revealed that the first six sample diets exceeded tolerance values on an average of 29.3 per cent of the time and that the last five combination diets exceeded control levels 32.4 per cent of the time in terms of the total nutrient-days.

TABLE 2.—FREQUENCY OF NUTRIENT DEVIATIONS IN CONVENTIONALLY PLANNED DIETS

Diet	Days that nutrients did not meet permitted tolerance levels												Average percentage of nutritive tolerance violation [1]
	Calories	Protein	Fat	Carbohydrate	Calcium	Iron	Sodium	Vitamin A	Thiamine	Riboflavin	Niacin	Ascorbic acid	
Applied sign of tolerance (±5 percent) [2]	±	—	+	±	—	—	±	—	—	—	—	—	
Diabetic:													
1,800-kcal (14 days)	12	0	10	12	0	0	—	3	0	0	0	2	25.3
1,500-kcal (14 days)	13	0	10	11	1	7	—	3	0	0	0	3	31.2
1,200-kcal (9 days)	8	0	4	8	1	8	—	3	0	0	0	3	35.4
1,000-kcal (7 days)	7	0	4	7	0	6	—	3	0	0	0	2	37.7
Sodium-restricted, 1,000 mg. sodium (14 days)	12	0	—	—	0	6	13	1	2	0	0	3	26.4
Bland (14 days)	9	0	—	—	0	7	—	2	1	0	0	6	19.8
Diabetic plus 1,000 mg. sodium:													
1,500-kcal (14 days)	11	0	7	10	0	7	14	2	0	0	0	1	30.9
1,200-kcal (14 days)	13	0	6	10	0	10	14	4	0	0	0	3	35.8
1,000-kcal (14 days)	12	0	4	12	3	12	14	6	0	0	0	4	40.0
Bland-plus:													
Sodium-restricted (12 days)	11	0	—	—	0	5	12	3	4	0	0	4	32.5
Fat-restricted (8 days)	8	0	7	—	0	3	—	2	0	0	0	5	31.8

[1] Percentages were calculated on the basis of total nutrient days which represented the number of nutrients stipulated for a diet type multiplied by the number of days that diet was served. Dashes indicate that the nutrient was not evaluated for the respective diet type.

[2] Indicates whether a nutrient was evaluated at a plus or minus 5 percent of the stipulated value, or both.

That deficient control was still observed when the satisfaction of nutritive requirements was considered on an average rather than a daily basis is shown from the data in Table 3. Although the computer-planned diets met the nutritive requirements with consistent exactness, the convenional diets violated nutritive tolerances for calories, fat, and carbohydrate. Comparison of Tables 2 and 3, shows that nutritional balance was more nearly achieved by manually planned diets when appraised on an average over a two-week period than on a daily basis. The figures in Table 3 also show that errors do exist during the transition from plan to service and in some cases deviations in nutrients were magnified in actual food service.

Data in Tables 2 and 3 show the degree of the inherent shortcomings in the Exchange list method. It was predicted that that mathematical approach would produce better control of nutrients and palatability than the conventional method could provide; the results of this study confirm this. This conclusion is limited to the comparison of the planning methodologies alone; clinical ramifications of the findings should be established by other studies.

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TABLE 3.—NUTRITIVE AND COST EVALUATION OF CONVENTIONAL AND COMPUTER-PLANNED 1,500-KCAL DIABETIC DIET

Nutrients	Calories	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Calcium (milligrams)	Iron (milligrams)	Vitamin A (I.U.)	Thiamine (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)	Ascorbic acid (milligrams)	Cost (cents)
Stipulated per day	[1] 1,500	[2] 70	[3] 70	[4] 150	[2] 800	[2] 13.5	[2] 5,000	[2] 0.60	[2] 0.90	[2] 9.9	[2] 65	----------
Conventional:												
Planned	1,646	82.7	72.8	[5] 168.4	936	13.6	11,232	1.22	1.86	26.2	110	116
Served	[5] 1,790	95.8	[5] 79.9	[6] 174.3	909	14.7	10,210	1.25	1.94	29.8	109	129.13
Computer:												
Planned	1,466	80.1	57.4	159.9	948	14.0	12,932	1.19	1.98	25.0	107	87
Served	1,482	79.4	58.9	160.8	949	13.9	11,286	1.16	1.97	24.6	103	89.04

[1] Tolerance: ±5 percent.
[2] Tolerance: −5 percent.
[3] Tolerance: +5 percent.
[4] Tolerance: ±8 percent.
[5] Violation of tolerance.

Raw food cost comparison

That the mathematical diet planning models produce food cost savings as well as a higher degree of nutritional control can be seen from the information in Table 3. The conventional modified diet as planned and served ranged in raw food cost from $1.16 to $1.29, whereas the analogous computer diet showed respective food costs of 87 and 89 cents. Food cost to the hospital is determined by the menu as it is served; thus the indicated mean raw food cost savings was 40 cents per day per patient. Similar savings were confirmed when the other ten modified diets were appraised with respect to food cost. The projected savings possible through the use of computer-planned modified diets are illustrated in Table 4. The mean food cost savings, for all eleven diets evaluated during the two-week study, when projected for a three-month cycle, would be $1,500. These results discredit the widely held belief that modified diets must be expensive to serve and at the same time indicate that multiple nutritive and palatability constraints can be satisfied with minimum food cost when mathematical optimization techniques are used for diet planning.

TABLE 4.—PROJECTED SAVINGS POSSIBLE THROUGH USE OF COMPUTER-PLANNED MODIFIED DIETS[1]

Diet	Mean patients/day	Projected patients per 3-mo cycle	Food cost savings per day (cents)	Food cost savings per 3-mo cycle
Bland	16.0	1,440	24.0	$345.60
Sodium-restricted	9.5	855	28.5	243.68
Diabetic:				
1,000-kcal	0.5	45	17.1	7.70
1,200-kcal	0.8	72	26.0	18.72
1,500-kcal	2.5	225	42.1	94.72
1,800-kcal	2.3	207	55.6	115.09
Bland:				
Fat-free	1.6	154	−10.1	−15.55
Sodium-restricted	1.2	108	21.5	23.22
Sodium-restricted:				
1,000-kcal	1.0	90	−9.7	−8.73
1,200-kcal	1.1	99	16.7	165.33
1,500-kcal	2.0	180	29.4	529.20
Total	38.5	3,465		1,518.98

[1] Dietary census reports compiled at West Jefferson General Hospital, Mar. 17 to 30, 1969, and computer evaluations of onventional a nd computer-planned modified diets, Mar. 17 to 30, and May 19 to June 1, 1969, respectively.

FOOD PRODUCTION CONTROL

It was mentioned earlier that a specific mathematical problem exists in multi-diet planning because of the necessity of providing production links between the diets. Without these links, the different diets optimized independently may contain too many different items relative to available food production capacity. After some initial experiments, a coding system was devised which reduced food production diversity to a minimum and produced an acceptable number of versions and portion sizes. In computer-planned simple diets, there were actually fewer versions and portion sizes than in hand-planned diets. Overall, however, the computer-planned modified diet menus did introduce 12 to 18 per cent more versions and portion sizes than comparable hand-planned diets due to more combination diet versions and portions.

Before computerization, because of the limited number of employees available to implement the food service operation at the study hospital, most modified diet menu items were prepared to meet the requirements of the most restrictive diets. This procedure imposed unnecessary nutritive restrictions on many of the patients on modified diets who could be permitted more palatable food. The modified diet menu items for the computer-planned diets eliminated much of the over-restrictiveness in an effort to provide more appetizing food to the patient while still adhering to the limitations of his diet. In addition, it was found that many specially packed items required by Exchange lists could be eliminated in favor of unmodified or slightly modified items from the regular diet. Although a few additional menu items were needed for the production and service of the computer diets, the meals were more palatable than those planned by conventional methods.

As shown previously with conventional diet menus (Table 2), the more restricted a diet becomes, the greater the frequency of nutritive violation. Because the hospital endeavored to control production by preparing only a few modified diet menu items, nutritive satisfaction was often not obtained. The computer techniques imposed reasonable production demands with improved nutritive control and savings in food cost. Further improvements of the system were prevented only by the expiration of funds for the project.

OPERATIONAL CONSIDERATIONS

The results reported above were based solely on experience with the Tulane research systems for regular and modified diet menu planning. Because, from a systems viewpoint, this was a research rather than a production-oriented endeavor and because the Tulane computer, operating with a specially designed on-line configuration, required specialized computer programs, the actual diet planning systems as developed by the researchers are not immediately applicable or readily convertible to hospital production situations. However, some discussion of the principal cost factors of a computer-assisted dietary system may be of interest.

The principal costs facing those interested in a computer-assisted menu planning system are: (a) the system, (b) data base development, (c) system installation, (d) system operation, and (e) some contribution to the cost and maintenance of the computer on which the programs are run.

The institution installing a computer-assisted dietary system will find that the task of data base development (the collecting and processing of recipe and food item data) will require about 75 per cent of the staff effort allocated to the total project. If a dietary department is willing to use recipes other than its own, a presently available proprietary data base can significantly shorten implementation time. Several regular menu planning systems based on Tulane research are available. A computer manufacturer distributes a free computer-assisted menu planning (C.A.M.P.) system [11], and several firms offer proprietary dietary systems, including enhanced versions of C.A.M.P.

On the basis of a fully operational menu planning computer system and available experienced staff, estimates can be made of computer costs. If menus are planned for a two- to four-week period and cycled over a season, the computer[13] time needs for a quarter will be approximately 4 hr. for all phases of regular and modified diet menu planning.

CONCLUSIONS

A new dimension in the management of food services has been achieved with the design and implementation of these regular and multi-diet systems for computerized menu planning. By producing food costs saving with improved nutritional control and patient satisfaction, these systems serve as an efficient tool for the management of institutional feeding. The shortcomings of computer-planning menus observed, such as indirect control of production time, labor, and available equipment, have been remedied in more recent production systems based on the research described here.

Systems based on the Tulane research (C.A.M.P. and others, including enhanced versions of C.A.M.P) have been and are operational in hospital, school, nursing home, and prison feeding situations. The authors are aware of applications in Canada, Great Britain, and Western Europe in addition to several dozen in the United States.

The research systems described here are primarily decision-oriented; hence computerization is limited to feeding correct and up-to-date information into the menu planning models. This approach did not attempt to do justice to the many possible computer applications in the day-to-day operations of dietary departments.

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COMPUTERS 1984

(By Joseph L. Balintfy, Ph. D.[1])

It's always risky to prophesy the future. Yet some trends in computers and institutional foodservice are obvious: there will be more computers of more kinds available in 1984 than there are now, and there will be more foods and more kinds of food products for more customers. It is more difficult to predict how computer advances will affect food management.

Today's shopping list of computers, minicomputers, small, medium and large computers and computer utilities and networks, are all waiting to be used by foodservice directors and dietitians. The cost of using computers or buying them will continue to go down. The only problem is the computers don't come packed with data and programs.

Data and instructions for collecting or using it will have to be provided by the users, present and future. Foodservice directors and dietitians, who know food management, will have to dream up ways of making computers serve them.

In this context it's clear that to predict the future of computers in food management, we must predict the evolution of food management ideas and their computerization. We can speculate about various stages of advancement in

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[1] Mr. Balintfy created the first computer assisted menu planning program, CAMP. He is an acknowledged authority in the area of computer application in institutional foodservices.

different segments of the foodservice industry. We shall discuss three main evolutionary stages.

The first stage is simple electronic data processing. We can easily predict that the overwhelming majority of the foodservice industry will pass this plateau by 1984. Almost any computer facility can be used to adapt tasks presently done by hand; anyone can think of detail work or records keeping applications without much training or exposure to computers. Applications like these, which make no attempt to integrate the whole data processing system may be regarded by 1984 as merely training for foodservice managers. Once people begin to use computers for these purposes, they will quickly recognize that, with expert help, computers can do entirely new tasks or previously infeasible tasks. This is the next stage of evolution.

In the second stage of computerization, experts will help foodservice managers to construct a generalized framework of computerized management information systems. Such systems are characterized by large data banks, instant access to information and programs to cross-reference and interrelate facts and figures. All this will produce hitherto unavailable reports for management, based on large volumes of data and the vast numbers of interconnections made possible by computers' high computation.

By 1984 All Major Volume Feeding Institutions Will Routinely Use Computers for Menu Planning

STANDARDIZED RECIPES—A MUST

When this stage is reached, the recipe data file will be fully coded and stored for use in subsequent reports by the computer. Recipes are the most important documents of any volume feeding system. They provide the information, not only to govern converting raw foods into menu items, but also to control other aspects of foodservice. Relations between sales and the various food ingredients to be purchased, relations between the latest food prices and the raw food cost of the products, relations between the nutrient composition of ingredients and that of menu items—or between what is on hand and what should be available and what must be bought are of crucial importance. Yet foodservice directors and dietitians know that without computers these relations cannot readily be expressed quantitatively because of the mass of computational detail involved. This is the classic case, for food management, where computers can perform tasks not manageable by manual methods, making new and more accurate information available. All this will be made possible by standardized recipes. Without standardized recipes, there can be no computerized food management information systems, and there can be no truly standardized recipes without a computerized management information system.

In this second stage of computerization, computers and foodservice managers will interact closely. Foodservice directors and dietitians in 1984 can look forward to reports from the computer concerning all aspects of their operations. Food production will be assisted not only by the steady increase of convenience food items, but also by an increased level of process control by the computer. Computers will scale recipes according to production needs and will even print the labels on bags of ingredients to be assembled before cooking, while simultaneously recording the transaction on inventory and cost reports. On the other hand, the manager who is less concerned about the nitty-gritty can evaluate several alternatives of whole menu cycles by computer from the point of view of food cost, labor, equipment utilization, customer census and so on, without having to serve them. With such assistance, managers will be better able to understand the relations he deals with and the control he can exert over his system.

The prototypes of computerized food management information systems were developed in the late sixties and are presently available both in the public domain (as in the CAMP documentation) and commercially. By 1984 all foodservice directors will be familiar with the benefits of such systems and the majority of volume feeding operations will use computer control in one version or another.

PREFERENCE AND FREQUENCY

This brings us to the third and most advanced stage of computerization in food management to be reached by 1984, when computer systems will be routinely used both for information processing, and as decision-making tools. Here we are talking

mainly about systems and services which do not exist today but certainly will by the end of the decade. To flesh out these predictions, let us consider for a moment the present frontiers of know-how in food management research and their likely impact on computers and customers 10 years hence.

We have discussed some advantages of computers in dealing with foodservice data and with relations among the data. This sets the stage for experiments and studies concerning the nature of these relations per se. The studies of relations between quantities is called mathematics; its application to reality leads to the formation of mathematical models. Such models provide double benefits for the computer-oriented foodservice director. They provide, first of all, a safe theoretical foundation describing possibilities and options. Second, they provide a blueprint of instructions for computers in the only language they understand. Furthermore, with theory comes abstraction, and with abstraction comes the freedom and opportunity to talk about complexities and generalities in terms at once simple and specific.

Take the issue of customer preferences for meals. There is nothing more complex or more general among foodservice directors' objectives than satisfying customers' preferences. This most general and complex problem can be dealt with by mathematical models and computers. Since computers can handle only quantitative information, we had to first measure and define preferences for menu items. We soon realized that none of the traditionally used food preference data was good enough for the computer. As we discovered, the reason is that the preference for an item by a person or a population is not a constant attribute of the item. Instead, it is a function of the time since the last exposure.

In other words, the preference and the frequency of serving an item are related quantities, one defining the other according to a special rule of correspondence. In mathematical terms, this relationship is called a function, and it is characteristic of the items and persons involved. However, it turns out that it is possible to estimate these functions in practice. And nothing is more appropriate for the computer than such data in functional form, to be stored and evaluated and utilized by a mathematical model.

The graph, on page 255, shows, the preference-frequency function of an astronaut, plotted appropriately by a computer for two items from the Skylab menu. The horizontal scale is the frequency of servings in 28 days, and the vertical scale indicates the preference in terms of utility, on a centered ratio scale. In nonmathematical terms, utility is something like satisfaction: up to a point, the astronaut wants more servings; past a certain frequency, he becomes tired of the taste, and his satisfaction and preference decline with more frequent servings. While this scale is based on centered ratios, similar preference indicators can be devised from hedonistic scales or even on the Neumann-Morgenstern utility scale.

The graph shows that for both filet mignon and veal there is a unique frequency (9.34 and 4.01 servings per four weeks respectively) where the preferences are maximal. Either increasing or decreasing the serving frequency relative to these values will tend to decrease the utility the items would contribute to the menu cycle. The model shows, and consequently the computer will know, by exactly how much. This is important because the unconstrained maxima of these functions—the "bliss points" as economists call them—will seldom be reached in reality. The vertical scale also shows that this particular astronaut rates the utility of filet mignon more than four times higher than veal. This is, of course. his prerogative.

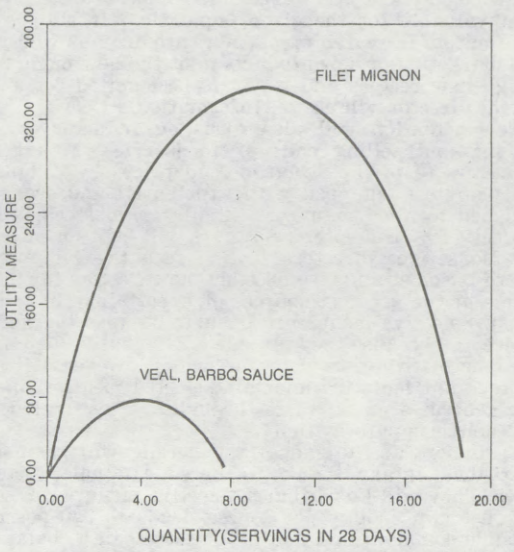
The same techniques can be used to get similar information from anyone by means of questionnaires. Indeed, it is already being applied in large scale studies. Theoretically, everyone may have a different preference-frequency function for each item, and the functions may also change over time. Practically, however, a lot of data clustering and condensation may occur for homogeneous populations. In any case, functional representation of preferences seems to provide the first reliable measure for this aspect of customer preference for a sequence of meals.

Other aspects, or more precisely, the utility of other aspects, can easily be added. More mathematical and statistical techniques, like methods of conjoint measurements and multiattribute utility theory, contribute the formulas that permit us to determine the joint effect of menu items in the total utility of the meals. While we all know that apples and oranges can not be added, these new techniques make it possible to combine utilities of different menu items correctly and thus ultimately to represent a population's preference for a whole menu cycle by a

single number. Typically, this number will embody such aspects of preference and the utility of menu items as defined by their freguencies, the weights of the importance of the courses, and the effects of compatability between the items in the meals.

The Preference - Frequency Functions of Astronaut Dr. Joseph Kerwin for two selected items of the Skylab Menu.

The data was provided through a questionnaire filled out for the author by courtesy of NASA. The mathematical model applied is described in "Modeling Food Preference Over Time" by J.L. Balintfy, W.J. Duffy and P. Sinha, to appear in *Operations Research*, 1974.



What we have described thus far is a new process to do two things: first, collect and interpret the preference survey data for a given population by computer; and second, apply this information to a given menu cycle, computing the total utility of that cycle, again by computer. Once the data is collected, we can evaluate a given menu plan. A computer can now provide the expected utility rating for it, a single number. Our data can be applied to another menu plan to produce another rating—lower or higher. But is the primary problem of food management to evaluate plans ex post facto? Clearly this is like locking the barn door after the horses are gone. The real problem is how to plan a menu cycle to begin with that will maximize customer preferences and thus have the maximum utility. This is the gargantuan decision making task that foodservice directors and dietitians of the future will rely on computers to solve. As a matter of fact, there is plenty of empirical and theoretical evidence to suggest that menu planning decisions cannot be optimized without turning the job over to a computer and a mathematical program. Such programs already exist, and as the foodservice industry's knowledge of computers grows, they will surely be made use of.

In 1984 People Will Choose Between Pre-Selected Meals Instead of Menu Items

We can predict, therefore, that by 1984 all major volume feeding institutions will routinely use computers for menu planning. Their computers will be packed with preference survey, recipe, cost and nutrient data for all their items. Utility-maximized menus which meet budget and nutritional allowances as well as production and service specifications will be computer produced. The already familiar package of information processing programs will be easily integrated with the new menu planning capabilities. Together they will generate purchase orders, inventory transactions, food issue orders and so on necessary to administer and control the delivery of meals with a prior assurance that the meals will also deliver the greatest utility per dollar—the most "bang for buck" for the fortunate customer. And the computer will also determine selling prices to assure a profitable operation.

Will computers eliminate the need for human foodservice directors? On the contrary: with computers to do the detail chasing, new vistas will open for the manager where currently neither interest nor applications exist. For instance, optimum computer menus will routinely provide lists of dual properties spelling out what kinds of preference, nutritional or other attributes of various items are most valuable for the given population. It will be up to directors to use this information in searching out new products as well as in aiding the development and marketing of new products to fit the new menu plans. The computer will help design new recipes and products best suited for a given foodservice operation, but the director will use the information.

New attention will also focus on reducing uncertainties at both the purchasing and selling ends of foodservice. Management knowledge will allow managers to predict volatile food prices by computers, and to choose vendors by computers equipped with expotential and econometric forecasting models—designed by food managers. Similarly, most sales figures will be available for projection by computers. So there will be a lot of sophisticated evaluation work for foodservice directors just to feed the computers properly evaluated data. There is something else possible, however, as far as sales predictions go.

One of the greatest sources of uncertainty in sales prediction is the selective menu. Selective menus are popular because they offer the customer freedom of choice and because they provide a safeguard when management is not sure about the true distribution of preferences. However, it is impossible or very costly to balance nutrients in randomly selected meals. This same source of uncertainty also generates much waste through over estimated sales; it will continue to do so despite computerization.

Customers at the end of the decade will be more sophisticated about their nutritional intake, thanks to the educational effects of F.D.A. nutrient labeling rules. They will know that a selective menu with, say, 20 courses per day, offering just two choices per course, leads to 220 possible meals: over a thousand possible combinations. Not all of these can be balanced for the 17 plus nutrients the consumer will be worried about. Our current cavalier assumptions that people select their meals according to their nutritional needs will be abandoned as unsound by 1984. Instead, customers will be offered choices between preselected meals instead of menu items, and each meal will be standardized for nutrients and calories. That is, it will be a SNAC Meal.

The acronym SNAC refers to a new product, an optimum and fixed combination of menu items like some breakfast menus of today. The important difference is that each SNAC meal will guarantee one-third of the Recommended Daily Allowances for all nutrients, with an assured calories rating. There will be 800 calorie, 1000 calorie or even 300 calorie and 1400 calorie SNAC meals displayed or on the menu. For heterogeneous populations there will be more than one SNAC meal offered within the same calorie rating. SNAC meals will be new products only in principle, and they will not necessarily require the introduction of new food products. Their novelty lies in new combinations of old things which would be impossible to have on hand on a meal by meal, day to day basis. The possibilities and parameters are easily determined and planned for by computer.

THE FUTURE OF SNAC

Customers choosing SNAC meals will have no problem maintaining their weight or nutrition while choosing according to their preferences. On the other hand, food directors will be able to serve greater variety of combinations and quality, possibly with fewer food products. This will reduce randomness in sales predictions that now arise from the multitude of items which can be chosen on a selective menu.

It is conceivable that SNAC meal service may coexist with current service style during a transitional period, but once it takes hold, it will have a sweeping impact on the volume food serving facilities of the future. Since most of a customer's selection problems are solved for him, choices of meals might be made just as effectively by simply looking at a picture of the real meal and selecting by remote control. Also, the fixed combination of menu items can be partially or even completely preassembled on plates (as is now done with airline dinners) and delivered by the most efficient method. This will certainly be a new kind of computerized meal service, a vast change from today's. As G.B. Shaw once said, "Other people see things, and say why. But I dream things that never were, and I say why not?"

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College Food Service Management—A Scientific and Democratic Approach

(By Joseph L. Balintfy, D. Eng.)

In the following article, Dr. Joseph Balintfy presents an intriguing thesis. He argues that mathematical models can be employed to optimize menu selections within the constraints imposed by diners' preferences, nutritional requirements, and budgetary limitations. He suggests that the best areas in which to test this proposition is not in its most obvious application—volume feeding for captive groups in hospitals or penal institutions—but in college food service management, where the skilled personnel and computer capacity necessary for implementation are readily available.

Dr. Balintfy's explanation of the preference-frequency relation and constrained optimization is a condensation, in simplified terms, of earlier work. Even the reader equipped with the rustiest of mathematical capabilities, however, should be able to follow his argument and perceive the implications that such research holds for the future of food service management. Perhaps in the not too distant future the perennial problem of what to serve and when to serve it can be solved by using a mathematically precise "best fit" model instead of the present "best guess" approach.—*Peter Rainsford, Ph.D., Assistant Professor in Hotel Administration, Cornell University.*

Dr. Joseph L. Balintfy is professor of Management Science and Operations Research in the School of Business Administration, with a joint appointment in the Department of Industrial Engineering at the University of Massachusetts. Before joining these faculties, he was professor of Operations Research and chairman of the Management Science Program at Tulane University. Earlier, he was assistant professor in the University of Technical Sciences, Budapest, Hungary, the country of his birth. He obtained his doctorate in engineering at Johns Hopkins University. Dr. Balintfy has held numerous Federal grants for research in the fields of his specializations and is the author of numerous research reports, some of which are listed among the references to this article.—*Ed.*

It is common knowledge that the recent sudden increase in food prices has caused uncommon deficits in the food service operation of most institutions. The fees charged for board or the prices of menu items sold could not be raised fast enough to cover the increase in raw food cost. Whenever they were raised in colleges, however such attempts were often met with strong resistance or even boycotting by the students. In these confrontations a legitimate issue has gradually surfaced: What are the students getting or entitled to get for their money?

No one would argue that the meals should meet the preferences of the customers who pay for them, but this leaves the subjective problem as to how much satisfaction is in a dollar's worth of food. No one would argue that the meals should also be nutritious but usually no one could account for the exact nutritional content of meals, especially when chosen from selective menus. We are thus left with the disturbing conclusion that in the conventional operation of college food service departments no one can establish with objectivity and certainty the qualitative aspects of a major product—the meals—for which money is collected from the students. Consequently, legitimate arguments are deemed to remain unsettled on such crucial issues as how much money is necessary to maintain some established quality of food service in the face of rising food cost; or, conversely, how much percentage drop in quality would be experienced by not overstepping the existing food budget.

Answers to these questions are now forthcoming from a branch of science which is not traditionally linked with food service management. Mathematical models were recently formulated and tested which explain quantitatively how food preference can be measured and how it depends on the time of last service, on the similarity to other items served before and on the compatibility with other items in the same meal [4, 8] [1].

The logical extension of these findings results in two sifinificant methodological breakthroughs for food management. One, it is possible now to determine an aggregate preference measure with certainty to assess or compare the qualitative values of meals or a sequence of meals, selective or not. And two, since this

[1] References are listed at the end of this article.—*Ed.*

measure is quantitative it can be maximized subject to nutritional and budgetary constraints by known techniques of mathematical programming. This powerful new tool of constrained optimization techniques is able in essence to convert the preference ratings of a population directly into a corresponding unique optimal meal sequence, or menu plan, which meets all the predetermined qualifications. And that is the key to a democratic approach to college food service.

With the aid of such new scientific techniques, students could and should formally participate in the meal planning decisions of their institutions. Since the conversion process from food preferences to preference-maximized meals is unique, and since a given meal plan determines in advance the cost and nutritional qualities of food service, students in the future could decide by means of filling out the appropriate questionnaires as to what kind of meal service they want for their money. These new food preference questionnaires, just like as many votes in any democratic process, will join the data base that food management will be obligated to use along with food cost, nutrient, and recipe data.

From here on the mathematical model and the computer—trusted by both students and management—will take over and identify the most preferred nutritious meal plan(s) money can buy. If and when the students get tired of it, new preference questionnaires can be collected, resulting in new optimal meals plans. The control over the acceptability of the menus is thus passed on to the customers who pay for it. The control over the economic and nutritional feasibility of food production is taken over by the computer. The technological aspects of food production and service, however, will remain in the hands of food management just as before but minus the headaches.

What follows is an attempt by the author to make it a believable case that the tools and the time for a scientific and democratic approach to college food management have indeed arrived. In fact, the approach is valid for alleviating the volume feeding problems of any captive group such as people in schools, hospitals, nursing homes, penal institutions and is currently under study by military food service experts. College food management is singled out in this article simply because of the availability of many factors favorable to early implementation. Most colleges actually do have the manpower, the computer, and the intellectual capacity ready to be organized and utilized for scientific innovations.

A NEW METHOD OF MEASURING FOOD PREFERENCES AND THE PRINCIPLE OF CONSTRAINED OPTIMIZATION

Food preference and frequency questionnaires have been used in food service for a long time, but an important point has been missed somehow in all past applications. The point is that the preference for a given menu item[2] is the *function* of the frequency at which it is being served to a given individual.

No matter how much one likes apple pie, he or she would not eat it every day. Experiments have shown that for most items the preference per serving at two days' interval will be greater than at a one day interval, and in fact would continue to increase as the interval lengthens. Remember that we all tend to develop some degree of craving for foods we like and have not had for a long time. Consequently, any measure or estimate of preference is undefined unless the respondent is pinned down to a time frame of reference.

For instance, if the menu cycle is one month long, a precise estimate of the preference rating could be attempted by a question such as: *How much do you like apple pie if you have not eaten it for one month?* Another question or the same item would establish the preferred time interval of servings. With a fixed cycle in mind, this translates to the preferred frequency of serving per cycle. If this frequency is more than one, the interservice interval will be shorter and thus the preference per serving will decrease. The total preference realized from the repeated servings, however, tends to increase, and in fact will reach its maximum if the items are served exactly at the preferred frequency of the respondents. A little logical analysis reveals that the freqency rating question could indeed not be answered without the supposition that something is maximized at that point.

This, in a nutshell, is the secret of the intimate interrelation between the service frequency of an item and the total preference that can be associated with it in a given cycle. Serving the item less frequently or more frequently than it is wanted will tend to reduce the total preference in both cases. With the aid of quantitative measures and the mathematical expression of the relations, we

[2] A given menu item here means a standardized food product.

can compute exactly by how much. We can also begin to sum up the measures of preferences for all the other items in the cycle as well, and with a little extra care and effort (discussed later) we may have a preference measure for the entire menu plan. As we see, preference and frequency attributes of items jointly figure in every menu plan. Without knowing the exact nature of this interrelation, however, the preference for the menu could only be subjectively determined where the management, by necessity, interprets the preferences of the customers in their own way.

It is realized here that most food service managers and other experts may have misgivings about the meaning and reliability of food preference estimates and about the feasibility of collecting data on complex questionnaires. They need not worry. It is true that *preference* is not measuring satisfaction with the meal but rather the anticipation of satisfaction. And that is about the best measure to apply to a yet-to-be eaten menu. Planning precedes service, and unless we use the anticipated value of that service (where anticipation may be conditioned by past experience) there is nothing left to plan with. At worst the students' anticipated preference will replace that of the management.

As far as reliability is concerned, it is quite possible that some of the questionnaires will contain wild guesses, yet experience has shown that, on the average and over a large population, the standard error of estimates is reasonably small and can be further reduced by proper clustering. Moreover, the road to adaptive improvement is always open. If for any reason an undesired bias has devloped in the estimation of preferences, its effect on the meals will be readily observed and will lead to an automatic correction the next time around. Again, even if we permit the notion that preference estimates are only guesses, they will be at least the best guesses of the paying students and not the best guesses of management.

Finally the question of feasibility should also be settled. When our first questionnaires involving preference time relations were ready to be distributed [8], we were advised by all local food service and dietary experts that students would not be able to fill them out. We received over 30 percent usable returns. Since then [12] we learned that even elementary school children can fill out certain simplified versions of such questionnaires. It is true that information is lost by simplification, but again the information gained is still much more than anyone ever had before. Ideally, two or more time-related preference estimates, measured on the magnitude scale, are needed per item along with the frequency ratings but one can make do with as few as two questions per item as will be demonstrated below.

For the purpose of elucidating the quantitative meaning of the arguments advanced above, the following small-scale illustration is presented. Unfortunately, realistic meal planning problems are too complex and large to be useful for illustrative analysis. For this reason the example may look hypothetical; nevertheless, the results apply to large-scale problems just the same.

Suppose we consider two entree items only: item "A" (say, a turkey item) and item "B" (a ham item), each prepared according to an appropriate standard recipe and procedure. Suppose that the preference estimate of a certain individual is measured for these items on a hedonic scale[3] (which is permissible only under certain conditions), given that the items were served four weeks ago (i.e., at a serving frequency of once per four-week interval).

The estimates are shown in table 1: scale value 7 for item "A" and 6 for item "B." This is to say that item "A" is preferred over item "B" if either one of them is served only once in four weeks. The individual's preferred frequencies are, however, 3 for item "A" and 4 for item "B" in the four-week interval, which is likely in the case of turkey and ham. We know that total preferences are at their respective maximum at these serving frequencies, and with the aid of some elementary college calculus these maxima were computed and displayed in table 1, and are designated by stars (*). It is shown that for item "A" the maximum preference measure is 12.6 and is reached at serving frequency 3. This measure is, of course, much less than 3 x 7 and is seen to decrease even more as the frequency deviates from 3 in any direction. For item "B" the maximum of total preference is somewhat higher, (13.7), reached at a once a week level frequency.

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[3] The hedonic scale is an interval scale of the measure of likes and dislikes. On the customary seven-digit hedonic scale, 1 may correspond to *extremely dislike* and 7 would mean *like extremely*, while 4 would be the netural point *neither like nor dislike*.

Table 1 shows that while on the basis of item preferences alone turkey (7) is preferred more than ham (6), with frequencies properly included we may argue that four servings of ham are preferred over three servings of turkey. More than that, we may also argue that two servings of turkey is better again than six servings of ham, etc. The figures show the futility of comparing or assessing item preferences outside the context of the frequency of servings.

TABLE 1.—AN ILLUSTRATION OF THE DEPENDENCE OF TOTAL PREFERENCE FOR 2 DISTINCT MENU ITEMS ON THE SERVING FREQUENCY; INCREMENTAL PREFERENCE IS THE INCREASE (DECREASE) IN PREFERENCE DUE TO 1 ADDITIONAL SERVING

Serving frequency in 4 weeks	Menu item "A"		Menu item "B"	
	Total preference	Incremental preference	Total preference	Incremental preference
(1)	(2)	(3)	(4)	(5)
1	7.0	7.0	6.0	6.0
2	11.2	4.2	10.3	4.3
3 [1]	12.6	1.4	12.9	1.6
4 [1]	11.2	−1.4	13.7	.8
5	7.0	−4.2	12.4	−1.3
6	0	−7.0	10.3	−2.1

[1] Preferred serving frequencies for items "A" and "B" respectively.

The source of the difficulty is that the preference-frequency relation is "nonlinear," as mathematicians would say. While it is correct to assume that the raw food cost of two servings of an item is twice the cost of one, the preference for two servings of the same item in the same cycle is not twice the preference of one. That is the meaning of nonlinearity. Table 1 shows that the preference for two servings of item "A" is not 2×7 but $7+4.2=11.2$, where 4.2 is the increment in total preference due to one additional serving, called "incremental preference." The incremental preference—i.e. the increase in total preference at three servings—is even less, 1.4 scale units. And beyond that the increments become negative. As we eat more we enjoy it less. Consequently, total preference shows a maximum at three servings and will decrease with increased frequency. The same phenomenon is observable for item "B" where the incremental preferences change signs; hence the optimum for the preference total is reached at four servings per cycle.

Table 2 is the extension of this exercise to the elementary rules of finding the optimum *combination* of items "A" and "B" in a menu plan. First we assume that a whole four-week menu is planned save one day without a single serving of ham or turkey. This means that we may choose only one of the items to complete the menu plan. That choice is obviously item "A," which has the highest incremental preference at this point.

Next, assume that we may add two servings of "A" and/or "B" to complete the menu plan. If we choose two "A" or two "B", table 1 shows the corresponding total preferences as 11.2 or 10.3, respectively. The incremental preferences suggest, however, that 1A+1B would have a preference total of 13, which is greater than the others; hence it is an optimum combination.

Using the same logic and applying the rule of finding the maximum of the sum of incremental preferences, we arrive at the full list of optimal combinations shown in table 2. It is seen that the total preference from both items is reached at serving frequencies three and four, respectively. So we have a way to find and represent the optimum combination of items in terms of preferences that is one of the basic tasks of menu planning. In this process, we assumed that the preferences of different items are "additive" as it may be in the case of such unrelated items as ham and turkey. For other combinations of items similarity and compatibility measures are also necessary to include in computing total preference. This is a rather complex but feasible and well understood procedure which is not discussed further here.

The emphasis on the maximum of preferences which inevitably occurs at the preferred frequency of the individual should not mislead the reader into believing that such a maximum is always attainable. For one thing, people's eyes are often greater than their stomachs, and they will not necessarily realize that

items eaten with high frequency will tend to crowd out from their menu schedules other items they may also like.

The other more prevalent and pressing constraints of eating are money and nutrition. No matter how much we like certain items, we may not be able or want to afford them. We all operate under some budget constraint. So a more realistic definition of the problem is to find the maximum of preference at a level of budget we can or are willing to pay. Table 3 shows how this principle works in practice. Suppose we want five servings of some combination of items "A" and "B." Table 2 tells us that the 2A+3B combination provides the maximum preference. (This is, of course, already a constrained level of preference since the true maximum is realized at seven servings.) Suppose further that item "A" costs $.80 and item "B" costs $1.20. At these prices we pay $5.20 for the optimum combination.

Table 3 shows that more costly combinations would not buy us more preference. It also shows the effect of less expensive combinations. At $4.40 the maximum preference is only at the 17.20 scale value; nevertheless, this is the maximum we can get at the prevailing cost. If the relative cost changes, however, to $.90 for "A" and $1.10 for "B," we have to pay $4.70 to maintain this level. On the other hand, if we cannot pay much more than $4.40, the maximum preference of the combination we can afford will be reduced to about 7.

TABLE 2.—THE NUMBER OF SERVINGS OF ITEMS "A" AND "B" THAT WILL MAXIMIZE TOTAL PREFERENCE, GIVEN THE NUMBER OF SERVINGS TO BE PROVIDED

Number of servings to be provided by "A" and/or "B"	Optimal number of		Maximum of total preference
	Item "A"	Item "B"	
1	1	0	7.0
2	1	1	13.0
3	1	2	17.3
4	2	2	21.5
5	2	3	24.1
6	3	3	25.5
7	3	4	26.3
8	3	5	25.0
9	4	5	23.6
10	4	6	21.5

These examples in Table 3 spell out the cost benefit of preferences and the effect of price changes on preferences in a manner which can be generalized for large-scale meal planning decisions. Any budget level determines corresponding optimum combination of menu items where total preference is at maximum. As relative costs change, the same level of preference can be maintained only by changing the budget, changing the menu or, most likely, both. All of these changes and their effects can be evaluated quantitatively with the aid of the model presented.

TABLE 3.—OPTIMAL COMPOSITION OF 5 SERVINGS, SUBJECT TO GIVEN COST CONSTRAINTS

Allowable total cost	Optimal composition of servings	Preference maximum	Cost after relative price change
$4	5a+0b	7.00	4.50
$4.40	4a+1b	17.20	4.70
$4.80	3a+2b	22.90	4.90
$5.20	2a+3b	24.10	5.10
$5.60	1a+4b	20.70	5.30
$6	0a+5b	12.40	5.50

Budget is not the only constraint on our eating behavior. For people to stay alive and healthy, our meals should meet certain nutritional requirements. These, too, may have drastic limitations on the frequency of certain items we like. Table 4 shows the partial results of a study performed with the cooperation of astronauts[4]. The items listed were among the entrees of the Skylab experiments and the preferences for them were estimated on a central ratio scale, un-

like the data on the previous figures. In Figure 4, first we see that the preferred frequencies add up to more than 28 days; hence each had to be reduced by the rule of maximizing the sum of incremental preferences. This way the cycle length became a constraint and reduced total preference somewhat. The next column shows what happens to total preference when certain nutrients were restricted in the combination of entrees within a ±20 percent tolerance level. Further restriction induced an even more drastic drop in preference and shows items well past their preferred frequencies. Nevertheless, these combinations are still optimum relative to the given constraints.

Motivation for this study was the need for keeping certain minerals in the astronauts' diet within narrow limits. The effect of such policy on the preferences indicates that in certain cases dietary supplements might be recommended to meet nutritional specifications without depressing preference levels.

The foregoing examples establish by generalization the central truth that a one-to-one correspondence does exist between the measure of maximum preference for any combination of items; i.e. menus that can be realized at the level of budget and/or nutrition specified. This is to say that the preference data of individuals can be interpreted with scientific objectivity in terms of the optimal menu plan which corresponds to it. And the answer to the question posed in the introduction is: Yes, we *can* determine quantitatively what students will get for their money. To be sure, they will not get a lot for a limited budget and will never get everything they think they want, but they can be assured that the system will maximize their preferences subject to conditions agreed upon in advance.

TABLE 4.—COMPARATIVE DISPLAY OF THE OPTIMUM SERVING FREQUENCIES FOR 28 DAYS AS DERIVED FROM SURVEY RESPONSES OF AN ASTRONAUT AND APPLIED TO A MATHEMATICAL PROGRAMING MODEL WITH TIGHTENING CONSTRAINTS

Selected dinner entrees	Preferred frequencies	Optimum frequencies		
		Cycle-constrained	Within 20 percent of nutrient requirements	Within 20 percent of nutrient requirements
Prime rib of beef	9	8	7	3
Filet mignon	9	8	6	1
Lobster newburg	4	3	2	0
Chicken with gravy	2	1	2	4
Turkey with gravy	2	1	1	1
Pork loin with dressing and gravy	2	2	2	2
Veal with barbecue sauce	4	3	3	5
Chicken and rice	4	1	3	7
Pork with scalloped potatoes	2	1	2	5
Frequency total	38	28	28	28
Preference total	966.67	916.45	852.40	345

Two significant points should be added here. First, in case relative food prices shift, as they usually do, the optimal combination of items will change with it. Menu cycle after menu cycle will likely be somewhat different but for good reason. Even housewives substitute foods when relative prices change. There is no reason to assume that preferences can only be maintained by the application of the "fixed basket" concept[6] and that the cost of meals should always go up proportionally with the cost of foods. Studies indicate that such policy alone would always raise meal cost 1.5 to 2.0 percent higher than it should be.

The other point also refers to potential cost saving. If the preference total of a menu plan is related to its cost and nutrient composition by a mathematical function, it is obvious that such a function cannot be maximized by non-mathematical means. Consequently, conventionally planned menus always exhibit the opportunity loss of suboptimal decisions. The preference the students realize in present meals is generally less than they could get for their money. Conversely, they would have paid less for the meal preferences they now enjoy had their menus been planned by mathematical optimization techniques. In fact, they would pay about 18 percent less according to a study with similar data[12]. Other studies based on cost minimization models show an equivalent of 10 to 35 percent possible cost saving[5]. In all of these applications, of course, the exact nutritional control comes free of charge with the package as a by-product.

HOW IT WILL WORK

One of the advantages of scientific approaches is that the user can invoke the predictive power of science in describing the phenomena expected to occur. Intuition is fine, especially if nothing else is available, but the world is full of disillusioned people (including food service managers) who have been betrayed by their intuition and made a wrong decision once in a while, despite their best efforts and intentions. The application of scientific method to decision making avoids such troubles, provided that sound and relevant assumptions are embodied in the model.

The assumptions in the model at hand are indeed simple and indisputable. They include the students' rights and ability to express their preferences concerning the menu items they want ir their meals. They contain well proven psychometric methods for the measurement of those preferences. And finally they rely on the exacting methods of mathematical optimization theory and data control which goes with it. On this basis it is safe to predict how the new scientific and democratic approach will work in practice and what its ramifications are.

First of all, the new approach will depend upon the intermittent administration of specially designed questionnaires. The preference estimates for menu items and foods will be elicited in the function of the desired serving frequency, along with preferences for meal structures and the appropriateness of items in different courses. The responses will be clustered and aggregated by means of the data-processing technique available for the college, and the information will enter the data bank of food service management. Needless to say, such a mass of data involving thousands of students and hundreds of items are exceeding the data—processing capacity of the human mind, which is where computers come into the picture. It is not too farfetched to assume here that every college already has either some computer facility or access to it.

The computerized data bank of food service management will, of course, contain other data as well, classified and stored according to well established procedures[1] on food data files, nutrient data files, and recipe data files. The last one contains the blueprint of food production and is recognized as the key to standardization and control. Table 5 shows the computer-coded version of a sample recipe from the CAMP documentation[1]. It presents the exact quantities, cost and nutrient composition per portion is computed by interfacing the data on the food and nutrient files, ingredient by ingredient. The resulting portion cost information is not only accurate, but it can be continuously updated by computer in face of food price changes.

TABLE 5.—COMPUTER IMAGE OF AN INSTITUTIONAL RECIPE TAKEN FROM AN APPLICATION OF THE CAMP PROGRAM (1)

[Recipe name, Veal Scallopini; Number of portions, 100; Color, multicolor; Flavor, mild texture; meal code; 4; course code, 3. Recipe code L1033; estimated portion size, 5.65 ozs.; soft temperature; hot attributes, 0-0]

Ingredient No.	Ingredient name	Quantity		Unit		Yields				Nutrient code	S. food group	CD
		Pounds	Ounces	Amount	Measure	Preprep	Prep	Cook	E.P.			
LO3-3055	Frozen veal steaks	25	0	100.00	4 oz. steaks	1.00	1.00	0.66	1.00	23820	0	0
165-6867	Hard wheat flour	1	2.0	4.50	Cups	1.00	1.00	1.00	1.00	26500	0	0
262-8886	Salt	0	5.1	.50	Cup	1.00	1.00	1.00	1.00	19630	0	0
LO3-2730	Peppers	0	.2	1.00	Tbsp	1.00	1.00	1.00	1.00	37410	0	0
LO3-2670	Liquid shortening—Frymax	57	2.0	7.75	Gallons	1.00	1.00	1.00	.03	14017	0	0
LO3-2670	Liquid shortening—Frymax	−55	−6.5	7.52	do	1.00	1.00	1.00	1.00	14017	0	0
823-7663	Fresh garlic, chopped	0	1.0	7.00	Cloves	.88	1.00	1.00	1.00	10290	0	0
128-1179	Dehydrated chopped onions	0	4.0	1.00	Cup	1.00	1.00	1.00	1.00	10290	0	0
227-1387	Dehydrated green peppers	0	2.1	.50	No. 2½ can	1.00	1.00	1.00	1.00	14140	0	0
616-81	Salad oil	0	3.9	.50	Cup	1.00	1.00	1.00	1.00	34560	0	0
582-4060	Canned tomatoes, crushed	12	12.0	1.67	No. 10 cans	1.00	1.00	1.00	1.00	14018	0	0
234-6217	Beef gravy base	0	2.0	5.00	Tbsp	1.00	1.00	1.00	1.00	30800	0	0
NOO-8888	Water	4	2.7	2.00	Quarts	1.00	1.00	.57	1.00	27010	0	0
262-8886	Salt	0	1.9	3.00	Tbsp	1.00	1.00	1.00	1.00	19630	0	0
127-8922	Fresh parsley, minced	0	4.0	2.00	Cups	1.00	1.00	1.00	1.00	14720	0	0
LO3-2728	Oregano	0	0	1.00	Tbs	1.00	1.00	1.00	1.00	37340	0	0

[1] Portion yield in ozs., 5.64; recipe yield in lbs., 35.27; percent waste, 0.02. Percent difference, −0.12; total recipe cost, $43.82; portion cost, $0.438.

Nutrient composition/portion:

Calorie	287
Protein (grams)	20.9
Fat (grams)	18.7
SFA (grams)	7
Oleic acid (grams)	6
Linoleic acid (grams)	4
Cholesterol (milligrams)	74
CHO (grams)	7.3
Calcium (milligrams)	28

Nutrient composition/portion:

Iron (milligrams)	3
Sodium (milligrams)	1,027
Potassium (milligrams)	522
Vitamin A (IU)	610
Thiamine (milligrams)	.10
Riboflavin (milligrams)	.22
Niacin (milligrams)	4.6
Vitamin C (milligrams)	16

The recipe in table 5 is a model of a transformation process whereby food ingredients enter and food products; e.g. menu items exit. Strictly speaking, "food service" should be called "meal service," because its function becomes usable only through the output end of the process. The above described data organization helps to identify data with the relevant output entities in such a way that preferences, cost, and nutrients are all directly linked with the items listed on the menus. With this approach, the menu—especially a nonselective one—indeed becomes an effective device of food cost and nutrition control.

A prerequisite of reaching this state is, however, the meticulous coding of all the recipes of the institution for computer storage and access. Having done that, the nonlinear programming model of preference maximization can be formulated and solved by standard techniques[13]. College food service managers can count on a helping hand in these areas from students or members of their Operations Research, Industrial Engineering, or Business Administration faculties, who will probably be glad these days to prove the practical value of their theoretical skills.

The optimal menus in their simplest form will look like the list in table 4 extended over all the courses and meals. Such a list already determines total preference, food cost, and nutrition—but it still must be scheduled on a meal by meal basis. Here we can foresee several modes of operations. The most likely version is that several optimal lists will be printed for each cycle with varying budget levels, so the students can choose among the most acceptable versions and prices.

It is also likely that at least two separate clusters will be formed from the preference ratings: girls and boys. Aside from the possibility that marked preference differences may exist between these groups, the daily nutritional allowances are certainly significantly different for the sexes[11]. Boys in the 19–22 years age bracket need larger amounts of nine nutrients than girls do and require the same amounts of eight nutrients, while the girls need 80 percent more iron than the boys do. Such disparity clearly cannot be met by the same menu, at least not economically. The unisex concept ends at the "chow" line for physiological reasons.

The digression into the field of nutrition is necessary for two good reasons. First, the reader is reminded that the mathematical model provides us with the unique ability to assess the quantitative effects of nutrient "constraints" on the cost and preference of the optimal meals. As a matter of fact, we cannot define optimum meals without nutritional feasibility, just as we cannot define balanced meals without a mathematical model[2]. If college girls do indeed require 900 calories per day less than boys[11], they can very likely get "better" meals for the same money or equivalent meals at less cost than the boys. (They still would pay the same, however, if a policy of equalization of fiscal load is implemented.)

The second reason of emphasizing the nutritional control of meals is the right of the students as customers to expect it from college food service. At a time when the customers' rights for nutrient information is well established in principle through the new labeling rule of the FDA[9], it is time to consider the possibility of meal labeling along with the more general question of the nutritional adequacy of college meals.

Professional assurances to this effect are suspect on account of the outdated methodology used in practice. Indeed, the only study done recently[10] has shown some inadequacies, which, after more careful analysis, revealed that the *joint probability* of receiving all the nutrients in adequate quantities from the meals was near zero. One decisive factor in such results is, of course, the selective menu. It is well known, and has also been proven mathematically[7], that selectivity means loss of control both in food cost and in nutrition.

Relative to this background, the scientific approach to college food service will advocate by necessity a form of non-selective meal service first proposed by the author in [3]. Knowledge always imposes restrictions on our alternatives. Since the students will know that the meals do maximize *their* preferences, they will more likely accept the resulting balanced meals as their best alternative for healthy eating. They may even find more enjoyment in the novel knowledge of their scientifically controlled nutrient intakes than in the imaginary freedom of random food gathering. The realization of success in this direction clearly depends on the marketing strategy applied. In those colleges where the meal service is already nonselective, obviously it will get only more acceptable through scientific planning.

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Thus, the projected procedure of the implementation of a scientific and democratic approach to college food management will be manifested in the following most likely forms:

1. An agreement between the student body and food management on the price of weekly (daily) meal tickets will be reached. This price will include some fixed, per meal share of the labor cost and overhead and the full raw food cost of the preference maximized meals. This agreement may fix the raw food cost for a longer period in which case the preference measures will fluctuate with the change in food prices or fix the preference level in which case raw food cost will change from time to time.
2. Students will receive a fixed combination of items, i.e. a nonselective balanced meal for their meal tickets with the possible option to substitute or buy extra items at a price. These meals will be labeled nutritionally (by the computer) and identified on the cafeteria line similarly to the "specials" now used in many institutions. In co-educational colleges separate balanced meals may be available for the females and males.
3. The items in the balanced meals may be part of the set of other items sold on the cafeteria line for students and faculty in the usual fashion so the outward appearance of food service will not change for those customers who are not entitled or do not want to have the privileges of the new system.

The proof of the pudding is in the eating. Only the application can verify the value of the ideas set forth in this article. Since the road toward the goal of a scientific and democratic approach in food management leads through computerization, which is *per se* an inevitable development[5], those who are willing to try out these ideas have nothing to lose by the experiment.

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STATEMENT OF DR. GEORGE L. BLACKBURN, ASSISTANT PROFESSOR OF SURGERY, HARVARD MEDICAL SCHOOL, BOSTON, MASS.

The number-one unrecognized, untreated disease in the United States is hospital malnutrition. One might doubt that statement, given the overwhelming community problem—obesity. The emphasis on obesity, together with the many nutrition surveys which fail to reveal community malnutrition, in large part

account for the crisis that now exists. Hospital malnutrition is due to an effect many diseases exert, particularly when they are severe and apt to cause hospitalization. Severe and apt to cause hospitalization. Severe infection, trauma, and cancer produce mental and physical stress which leads to loss of appetite, and anorexia, resulting in extreme loss of weight. Significant malnutrition approached 50% in a survey in a municipal hospital and was severe (based on developing community criteria) in 10%.

The entire medical and surgical population of a municipal hospital was surveyed; this represented 380 patients in four separate surveys, each presenting the same data. The prevalence of protein-calorie malnutrition was 44% or greater by these criteria (weight/height 45%; triceps skin-fold, 76%; arm-muscle circumference, 55%; serum albumin, 44%; and hematocrit, 48%). These results were reproducible without significant variation between surveys. In 34% of patients, a lymphopenia of 1,200 cells/cu mm or less was found, a level likely to be associated with diminished cell-mediated immunity. Compared with a similar survey among surgical patients, the medical patients were more depleted calorically (weight/height, triceps skin-fold) but had better protein status (arm-muscle circumference, serum albumin). Significant protein-calorie malnutrition occurs commonly in municipal hospitals in both medical and surgical services.[1]

The consequence is devastating. A vicious cycle of increased weakness, depression, and anxiety, leading to further loss of appetite and anorexia culminates in severe malnutrition. The results are that patient's general response to infection, including immune competency and wound healing are diminished, resulting in much suffering and death.

In large part, this practice occurs because of physicians' current lack of knowledge. Allowing patients to lose 8–15% of the body cell mass is accepted practice in medicine simply because it "may be inconsequential." Such casual delays in the implementation of other medical therapies such as antibiotic therapy for infection and insulin therapy for diabetes would be unthinkable. It is unfortunately a common practice to permit depletion of body cell mass until protein calorie malnutrition occurs. An urgent mandate from Congress is required to correct this deficiency. The facts are that there is inadequate recognition of the importance of nutrition in medical education. There are not enough teachers who know about protein-calorie malnutrition or disease in protein malnutrition to expose this problem. Western medical textbooks are inadequate in providing instruction as to the treatment for this disease.

In no area of medicine is the problem more pathetic than in cancer. The fear of cancer, coupled with its yet unexplained reduction of appetite and weight loss add to the suffering of many of our citizens. In addition, presently available techniques of surgery, radiotherapy, chemotherapy, and immunotherapy are impaired due to the weakness and wasting of the cancer victim.

No segment of medicine could be more deficient and ignored than nutritional support of the cancer patient. Considerable basic and clinical research is required to correct these deficiencies. The characterization of the nutritional states of various cancer patients and the establishment of norms by which to define normal nutrition are required. Studies using usually acceptable protocols still await adequate funding.

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[1] JAMA 235 : 1567–1570, 1976 ; JAMA 230 : 858–860, 1974.

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Prevalence of Malnutrition in General Medical Patients

Bruce R. Bistrian, MD, MPH, PhD; George L. Blackburn, MD, PhD;
Joseph Vitale, ScD, MD; David Cochran; Judy Naylor

• **Three, single-day nutritional surveys at weekly intervals were conducted in the general medical wards of an urban municipal teaching hospital. The techniques of nutritional assessment included anthropometric measures (weight/height, triceps skin fold, arm-muscle circumference, serum albumin, and hematocrit). The prevalence of protein-calorie malnutrition was 44% or greater by these criteria (weight/height, 45%; triceps skin fold, 76%; arm-muscle circumference, 55%; serum albumin, 44%; and hematocrit, 48%). These results were reproducible without significant variation between surveys. In 34% of patients, a lymphopenia of 1,200 cells/cu mm or less was found, a level likely to be associated with diminished cell-mediated immunity. Compared with a similar survey among surgical patients, the medical patients were more depleted calorically (weight/height, triceps skin fold) but had better protein status (arm-muscle circumference, serum albumin). Significant protein-calorie malnutrition occurs commonly in municipal hospitals in both medical and surgical services.**
(*JAMA* 235:1567-1570, 1976)

THE FAILURE to survey the incidence and prevalence of protein-calorie malnutrition and examine its relationship to the prognosis of various diseases cannot be consistent with good patient care. While previous studies have identified a substantial prevalence of malnutrition among hospitalized adults by using hair analysis and vitamin assays,[1,2] only recently has the protein and energy status of patients been assessed by anthropometric criteria, including the measurements of triceps skin fold and arm-muscle circumference.[3] These anthropometric measurements are useful not only for their simplicity and ease of obtaining but because they reflect physiologically important tissues. When serum albumin levels are also measured, characterization of protein-calorie malnutrition as marasmus, kwashiorkor-like, or intermediate states is possible.

After the striking and unexpected finding of 50% prevalence of protein-calorie malnutrition in surgical patients, a confirmatory study was undertaken among general medical patients in the same hospital. The survey technique was modified by conducting several follow-up examinations at weekly intervals and recording dietary intake. The follow-up examinations made it possible to assess the reproducibility of results based on anthropometric measurements and obtain data over an extended period of hospitalization rather than at a single point in time. Since similar data do not exist in adults, these findings emphasize the importance of nutrition surveillance in other hospitals with different diseases and patient populations.

METHODS

Three single-day surveys of patients in the general medical wards of an urban municipal teaching hospital were conducted in each of three consecutive weeks in May 1974. The patients' upper arm circumference and triceps skin fold were measured, and arm-muscle circumference derived as described previously.[3] The patient was asked his height since it was rarely available from the chart. The weight, age, sex, primary diagnosis, hematologic values (hematocrit, white blood cell count, and percent of lymphocytes) within seven days, and serum albumin measurements by an automated system of chemical analysis within ten days of the survey day were taken from each individual's hospital chart. In addition, each patient's nutrient intake from the previous week was classified according to the likelihood of meeting daily protein and calorie requirements: (1) inadequate to meet requirements, ie, nothing taken by mouth, parenteral 5% dextrose and water, or saline; (2) unlikely to meet requirements, ie, clear liquids; (3) possible to meet requirements, ie, house diet, full liquid, chemically defined diets, and therapeutic diets such as low-sodium and low-residue; (4) likely to meet requirements, ie, total parenteral nutrition. Patients were arbitrarily assigned to disease categories.

A total of 251 patients were examined in the three surveys. Fifty-one patients were examined in two surveys and 18 patients in three. Subsequently, all values were entered into the PROPHET computer system for data reduction and statistical analysis. Standards for weight/height, arm-muscle circumference, triceps skin fold, and serum albumin were from a generally accepted source.[4] Severe depletion was considered 60% of standard and below; 60% to 90% of standard was classified moderate depletion. A serum albumin level greater than 2.8 gm/100 ml but less than 3.5 gm/100 ml was considered moderately lowered, while less than 2.8 gm/100 ml was classified as severely depleted.[4]

RESULTS

Table 1 shows percentile distribution of anthropometric measures from the three medical surveys. By one-way analysis of variance, no significant variation in protein-calorie malnutrition prevalence was noted among the three surveys by any of the three criteria (weight/height,

From the Department of Nutrition and Food Sciences, Massachusetts Institute of Technology, Cambridge (Drs Bistrian and Blackburn), the departments of medicine (Dr Bistrian), surgery (Dr Blackburn), and pathology (Dr Vitale and Ms Naylor), Boston City Hospital, and the Nutrition Support Service, Cancer Research Institute, New England Deaconess Hospital, Boston (Drs Bistrian, Blackburn, and Mr Cochran).

Reprint requests to Cancer Research Institute, New England Deaconess Hospital, Boston, MA 02215 (Dr Bistrian).

Table 1.—Anthropometric Measures of Protein-Calorie Malnutrition in Three Surveys of Medical Patients

	Standard*					No. of Patients
	>90%	90%-81%	80%-71%	70%-61%	≤60%	
Weight/Height						
Survey						
1	62	24	9	3	2	66
2	49	23	21	7	0	57
3	51	19	19	11	0	53
Total						
Present study	55 (96)	22 (39)	16 (28)	7 (12)	1 (1)	**176**
Composite study†	61 (84)	18 (25)	13 (18)	7 (9)	1 (1)	137
Triceps Skin Fold						
Survey						
1	29	4	14	4	48	92
2	18	9	10	9	55	82
3	23	3	8	14	52	77
Total						
Present study	24 (60)	5 (13)	11 (27)	9 (22)	51 (129)	**251**
Composite study†	26 (53)	5 (11)	12 (24)	7 (15)	50 (101)	204
Arm-Muscle Circumference						
Survey						
1	53	29	15	2	0	92
2	49	26	20	4	2	82
3	39	32	21	5	3	77
Total						
Present study	47 (119)	29 (73)	18 (46)	4 (9)	2 (4)	**251**
Composite study†	50 (103)	29 (59)	17 (34)	3 (7)	0 (1)	204

*Numbers in parentheses are population values; others are percent of patients with given characteristic.

†For the composite study, all patients from each survey were pooled by using measures from the first examination of each patient only.

Table 2.—Serum Albumin Levels in Three Surveys of Medical Patients*

	Survey			Total in Study	
	1	2	3	Present	Composite†
Albumin, gm/100 ml					
>3.5	63 (36)	48 (26)	55 (23)	56 (85)	55 (74)
2.8-3.5	26 (15)	30 (16)	31 (13)	29 (44)	29 (39)
<2.8	11 (6)	22 (12)	14 (6)	16 (24)	16 (21)
Total	**(57)**	**(54)**	**(42)**	**(153)**	**(134)**

*Numbers in parentheses are population values; others are percent of patients with given characteristic.

†See Table 1 footnote.

arm-muscle circumference, triceps skin fold). Therefore, the sums of all data from the three surveys were combined and compared with the results of the earlier study of surgical patients.[3] By χ^2 analysis, medical patients were significantly more severely depleted according to both triceps skin fold and weight/height criteria ($P < .001$, two-tailed test). Conversely, protein-calorie malnutrition prevalence by arm-muscle circumference standards was significantly more severe among surgical patients ($P < .001$, two-tailed test). Serum albumin levels were insignificantly lower in surgical patients ($.1 > P > .05$, two-tailed test).

To provide a larger population for correlating nutritional indexes, data from all medical patients were pooled using individual measures only for the first examination (Tables 1 and 2). Significant (linear regression) correlations with r values >.5 were noted between percent standard of arm-muscle circumference and percent standard of weight/height ($r = .598$, $P < .001$ [Fig 1]), and percent standard of weight/height and percent standard of triceps skin fold ($r = .606$, $P < .001$ [Fig 2]). Serum albumin vs hematocrit approached these criteria ($r = .461$, $P < .001$) in the composite medical survey and exceeded them in two of the three medical surveys ($r = .555$, $P < .001$; $r = .427$, $P < .001$; $r = .572$, $P < .001$).

If results of weight/height, triceps skin fold, arm-muscle circumference, and serum albumin are divided into three categories—severe depletion, moderate depletion, and normal—a significant correlation is noted (Table 3) by χ^2 testing between arm-muscle circumference and albumin but not between triceps skin fold and albumin.

In patients having a second assessment, values both rose and fell while the mean value for all measures except skin fold fell, although insignificantly, irrespective of diet. This failure to detect a change in nutritional status is likely a result of the brief study period and rapid patient turnover. Nutritional values are slow to respond in the presence of disease,[5] and only 37% of patients had two assessments. The mean weight/height fell significantly in those with three assessments (week 1 vs week 3).

Forty-seven percent of patients had a low hematocrit (men <41%, women <36%). While leukopenia was rare, 34% of patients had lymphopenia (less than 1,200/cu mm).

The average age was not significantly different among the surgical patients, 56.9±18.4 years (range, 13 to 97), and the medical patients, 57.5±17.9 years (range, 20 to 97). Malnutrition by weight/height, arm-muscle circumference, triceps skin fold, and total lymphocyte count was tabulated according to disease classification (Table 4). Although cancer patients had the greatest prevalence of protein-calorie malnutrition, all other disease categories also showed significant amounts.

COMMENT

A low serum albumin level may be seen in conditions other than decreased intake, including that due to increased loss of protein, as in renal and gastrointestinal disease, or reduced synthesis, as in liver disease. However, it is difficult to consider a patient with hypoalbuminemia well-nourished, whatever the cause. The significant correlation of arm-muscle circumference with serum albumin level in the study would tend to support this conclusion, since the former would not be primarily affected by renal, hepatic, or gastrointestinal disease.

One might question the use of 90% standard as the threshold level for

Table 3.—Anthropometric Measures and Serum Albumin Levels in Composite Survey* of Medical Patients

	Albumin, gm/100 ml		
	<2.8	2.8-3.5	>3.5
% of Standard Triceps Skin Fold			
<60	16	20	36
60-90	3	10	13
>90	4	8	21
	χ^2=3.98		
	P>.05		
% of Standard Arm-Muscle Circumference			
<60	1	0	0
60-90	17	21	31
>90	5	17	39
	χ^2=11.33		
	P<.05		

*Numbers represent patients in each category.

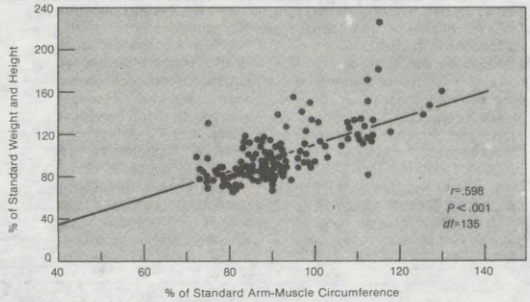

Fig 1.—Relation of weight/height to arm-muscle circumference in composite medical survey.

protein-calorie malnutrition, but significant protein-calorie malnutrition exists even if the 80% level is chosen. More important, the standards for arm-muscle circumference and triceps skin fold used are very similar to recently published standards from the Ten-State Nutrition Survey.[4] With weight/height, ideal body weights from a US population underestimate the average American adult. Thus, these results confirm a substantial prevalence of protein-calorie malnutrition among adult patients in an urban municipal hospital.

Differences in amounts of protein-calorie malnutrition measured by the various methods are likely to be biologically significant and represent the disproportionate loss of a particular tissue. Three major tissues—skeletal

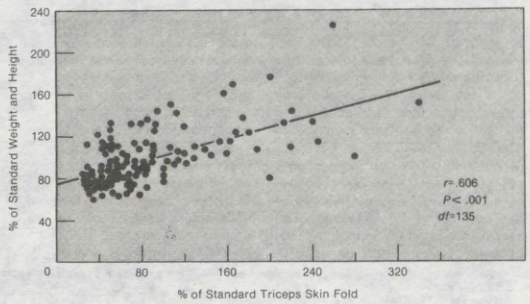

Fig 2.—Relation of weight/height to triceps skin fold in composite medical survey.

Table 4.—Malnutrition by Disease Category in Composite Survey of Medical Patients

	Triceps Skin Fold			Arm-Muscle Circumference			Weight/Height			Total Lymphocytes	
Disease	<60%	60%-90%	>90%	<60%	60%-90%	>90%	<60%	60%-90%	>90%	<1,200/cu mm	≥1,200/cu mm
Cancer	6	75% 3	1	0	7	70% 3	0	4	40% 6	3	35% 5
Alcoholism, gastrointestinal and liver	29	10	13	0	23	29	1	16	35	13	21
Peripheral vascular	0	1	4	0	2	3	0	0	5	0	3
Cardiac	23	17	18	0	27	31	0	15	43	8	32
Respiratory tract	10	1	5	0	7	9	0	4	12	6	5
Metabolic	3	4	2	0	2	7	0	2	7	1	4
Neurologic	8	4	2	1	10	3	0	2	12	4	7
Psychiatric	1	0	3	0	2	2	0	2	2	0	3
Infectious	17	8	6	0	17	14	0	6	25	13	13

*Numbers indicate patients in each category.

muscle protein, visceral protein, and fat—are available to meet energy requirements in the semistarved state generally present in ill patients. The state of each can be independently assessed with nutritional measurements. Triceps skin fold thickness indicates fat stores, and arm-muscle circumference the state of muscle protein.[4] Levels of circulating proteins, such as transferrin or albumin, reflect the visceral protein status,[7] whereas weight/height, even when not distorted by disease, is a composite measure.

The most favorable adaptive response when caloric requirements cannot be met is maximal derivation of energy requirements from fat stores and minimal derivation from catabolism of skeletal muscle, the more expendable and larger protein store. This situation prevails in fasting man.[8] When stress states such as trauma or sepsis supervene, protein losses increase whether the individual is semistarved[9] or fasting.[10] This marked loss of nitrogen in the urine following injury has been interpreted to be the result of skeletal-muscle catabolism.[11] One explanation is thought to be a stress response in which higher insulin levels reduce lipolysis and its contribution to energy requirements, with increased reliance on amino acids to meet the deficit.[12] Not only are protein losses greater, but visceral protein apparently becomes a major caloric contributor when carbohydrate-containing semistarvation regimens are employed.[7]

It is conceptually useful to consider that malnutrition in adult patients occurs in a continuum analogous to classical pediatric protein-calorie malnutrition. From adult marasmus with severe depletion of weight/height, arm-muscle circumference, or triceps skin fold and maintenance of serum proteins, it extends to a syndrome with some metabolic characteristics of kwashiorkor, notably depressed circulating proteins despite often normal anthropometric measures. Protein-calorie malnutrition was significantly more prevalent in medical patients (measured by triceps skin fold and weight/height), reflecting caloric depletion and a marasmic variant, while severe protein depletion (arm-muscle circumference, serum albumin) was more common in surgical patients, which is consistent with the more catabolic nature of surgical illnesses.[13]

The amount of protein-calorie malnutrition found in both patient categories is alarming. Moreover, protein-calorie malnutrition was not confined to diseases like cancer, which are generally accepted as having a serious effect on nutritional status,[14] but was widely distributed among broad disease categories. This is not meant to imply that the nutritional status during hospitalization resulted from the nutritional support but rather that little attempt was made to reverse protein-calorie malnutrition. If no effective therapy were available to accomplish nutritional repletion in the presence of disease, these findings would be of theoretic interest only. However, new techniques of nutritional support, particularly hyperalimentation[15] and chemically defined diets,[16] can restore or maintain nutritional status except during the acute phase of illness in many, if not most, disease conditions.[17-21]

The causes for lymphopenia in 34% of patients surveyed were presumably multiple and not specifically identified, but could be expected to be associated with impaired cellular immunity[22] and increased susceptibility to opportunistic infection.[23] Because nutritional deprivation is one cause of lymphopenia[7] and impaired cell-mediated immunity,[7,23] it provides an additional reason to improve the nutritional support of hospitalized patients.

These findings reemphasize the need for similar studies in other institutions with different disease states and patient populations and stress the importance of increased attention to the nutritional status of hospitalized patients. Only with these objective data can progress be made in providing nutrition therapy in a manner comparable to other medical treatments in the care of the hospitalized patient.

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Protein Status of General Surgical Patients

Bruce R. Bistrian, MD, MPH; George L. Blackburn, MD, PhD;
Edward Hallowell; Robert Heddle, MB, BCh

• **In a survey of the protein nutritional status of all patients on the surgical wards of an urban municipal hospital, accepted standards indicated moderate to severe protein-calorie malnutrition (PCM) in one half of these patients as judged by triceps skin fold and arm muscle circumference measurements. Weight for height was less severely affected. Although serum albumin levels were recorded in only 43% during the perisurvey periods, the correlation between arm muscle circumference and serum albumin level was highly significant, suggesting that this measurement would substantiate a rate of approximately 50% malnutrition.**

(*JAMA* 230:858-860, 1974)

SEVERAL studies have reported the frequent occurrence of malnutrition in hospitalized patients in municipal[1] and university hospitals in the United States.[2-4] In two of these reports,[2,3]

For comment see p 879.

low serum albumin levels were used as the principal criterion. The most important component of nutrition surveys in underdeveloped countries is anthropometric measurements, but these have not been applied to assessment of nutritional status in hospitalized patients. The ease and simplicity of measurement and the potential value for clinical monitoring led us to conduct this investigation of protein-calorie malnutrition (PCM) in a municipal hospital.

From the Department of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge (Drs. Bistrian and Blackburn), and the Department of Surgery (Drs. Bistrian, Blackburn, and Heddle and Mr. Hallowell), Boston City Hospital, and the Harvard Medical School (Dr. Blackburn), Boston.

Reprint requests to Department of Nutrition and Food Science, 50 Ames St, Massachusetts Institute of Technology, Cambridge, MA 02139 (Dr. Bistrian).

MATERIALS AND METHODS

The entire surgical-patient population of the hospital (131 patients) was surveyed in March 1974. Patients were distributed as follows: general surgery, 61; medical, 1; oral surgery, 5; neurosurgery, 14; ear, nose, and throat, 9; orthopedics, 25; urology, 12; and miscellaneous, 4. The causes for admission were representative of those for the general and specialty surgical services.

On the survey day, the following information was recorded for each patient: age, diagnosis, height, recent weight (within two weeks of the survey, by chart or from the patient), and serum albumin level on admission and within two weeks of the survey, if available on the chart. Triceps skin fold and mid-arm circumference were measured on the survey date by a generally accepted technique[4] and the calipers were calibrated. The information was entered into the PROPHET computer system for data reduction and statistical analysis. This included the derivation of the estimated arm muscle circumference (C_m) as an indicator of the body's muscle mass from the arm circumference (C_a) and the triceps skin fold (S), with the use of the equation $C_m = C_a - \pi S$. Standards for weight/height, triceps skin fold, and arm muscle circumference were taken from a standard source[4] and entered into the computer. Sixty percent of standard and below was considered severe depletion; from 60% to 90% of standard was considered moderate depletion.

RESULTS

Significant PCM of both moderate and severe degree was identified by the criteria of weight/height, triceps skin fold, arm muscle circumference, or recent serum albumin values. As shown in Table 1, interesting differences emerged depending on the measure chosen. Arm muscle circumference, which is better than other measures of tissue protein stores, indicated 12% severe and 36% moderate PCM for a total of 48%, whereas the triceps skin fold suggested a substantially greater prevalence of severe PCM (35%) despite essentially the same amount of total PCM by this measure (56%). Weight was recorded in 93 patients. Weight/height was not a sensitive measure, since it identified only one severely depleted patient. For this population, serum albumin values were distributed as follows: greater than 3.5 gm/100 ml, 46% (population size of 26); between 2.8 and 3.5 gm/100 ml, 27% (population size of 15); less than 2.8 gm/100 ml, 27% (population size of 15).

Although only 56 serum albumin

levels were recorded in the perisurvey period, 15 indicated severe PCM, and 15, moderate PCM. As shown in Table 2, the correlation of arm muscle circumference and serum albumin level was highly significant ($P < .001$), suggesting that had more serum albumin levels been determined, levels of PCM similar to those identified by arm muscle circumference would have been found. Of a total population of 30 with low and very low serum albumin values, 21 or 70% were associated with low or very low skin folds, and 20 or 67% were associated with low or very low muscle circumference. In a total population of 15 with very low serum albumin values, 12 or 80% were associated with low or very low skin folds, and 13 or 87% were associated with low or very low muscle circumferences.

For 24 patients, both on admission and follow-up, serum albumin determinations were available. Of these, ten patients had an entering value greater than or equal to 3.5 gm/100 ml and it subsequently fell below this level in three patients.

Separation of patients by service is shown in Table 3. Although some categories have small numbers, severe PCM was more common in patients on the surgical and ear, nose, and throat wards. As expected, in more seriously ill patients, especially those with cancer, a higher percentage of abnormal values was noted. This is shown in Table 4 where separation is by the following disease categories: (1) *Cancer*–colostomy, cancer, mass, neoplasia, and rectal lesion; (2) *Trauma*–trauma, gunshot wound, craniotomy, and fracture; (3) *Major Surgery*–thoracotomy, cholocystectomy, exploratory, hernia, pancreatic surgery, and appendectomy; (4) *Minor Surgery*–bite, laceration, testicular biopsy, bunion, circumcision, and ear or ear drum surgery; (5) *Infections*–osteomyelitis, empyema, cellulitis, abscess, and pneumonia; (6) *Perivascular Disease*–arterial insufficiency, ulcer of leg, thrombosis, gangrene, embolectomy, foot, angina, amputation, and cardiovascular disease; (7) *Urological Surgery*–prostate surgery, obstruction, and transurethral resection; (8) *Orthopedics*–back pain, laminectomy,

Table 1.—Results of Anthropometric Measures of PCM* by Percentile Classification

	Weight/ Height, % (No.)		Triceps Skin Fold, % (No.)		Arm Circumference, % (No.)	
>90% of standard	78 (73)		44 (57)		52 (67)	
90%-81% of standard	12 (11)	20%	2 (3)	21%	20 (26)	36%
80%-71% of standard	8 (7)		14 (19)		11 (14)	
70%-61% of standard	1 (1)		5 (6)		5 (7)	
≤60% of standard	1 (1)		35 (46)		12 (16)	
Total	**(93)**		**(131)**		**(130)**	

*PCM indicates protein-calorie malnutrition.

Table 2.—Correlation of Anthropometric Measures of Malnutrition

	Skin Fold*			Arm Circumference†		
Albumin	Very Low (≤60%)	Low (>60%, <90%)	Normal (≥90%)	Very Low	Low	Normal
Very low, ≤2.8	11	1	3	5	8	2
Low, <3.5, >2.8	7	2	6	4	3	8
Normal, ≥3.5	7	3	16	1	4	21

*By χ^2 test, $.1 > P > .05$.
†By χ^2 test, $P < .001$.

Table 3.—Patients With Protein-Calorie Malnutrition

		<60% of Standard				<90% of Standard			
		Skin Fold		Arm Circumference		Skin Fold		Arm Circumference	
Hospital Service*	Total Patients	No.	%†	No.	%†	No.	%†	No.	%†
Surgical	61	24	39	10	16	34	56	29	47
Medical	1	0	0	0	0	0	0	1	100
Dental	5	1	20	0	0	3	60	1	20
Ear, nose, and throat	9	4	44	2	22	6	66	4	44
Neurological	14	5	36	0	0	8	57	3	21
Orthopedic	25	3	12	0	0	10	40	12	43
Urological	12	2	17	0	0	6	50	5	42

*Service not recorded on four patients.
†Percentages are in terms of the total number of patients on the particular service.

Table 4.—Occurrence of Protein-Calorie Malnutrition by Disease Category

	Total No. of Patients	Standard Triceps Skin Fold		Standard Arm Muscle Circumference	
		No. (%) <60%	No. <90%	No. (%) <60%	No. <90%
Cancer	25	12(48)	18	5(20)	14
Trauma	39	13(33)	23	1(3)	17
Major surgery	8	1(13)	1	0(0)	4
Minor surgery	9	2(22)	3	1(11)	2
Infections	9	3(33)	3	2(22)	2
Peripheral vascular disease	22	8(36)	12	6(27)	14
Urological surgery	4	0(0)	2	0(0)	2
Orthopedics	8	1(13)	6	0(0)	2
Other abdominal conditions	9	4(44)	5	0(0)	3

disk, myelogram, knee or hand surgery, and prosthesis; (9) *Other Abdominal Conditions*—pancreatitis, fistula, burn, rectal prolapse, and gastrointestinal bleeding.

COMMENT

A striking prevalence of PCM in adult, hospitalized patients was found by accepted but seldom used measures of protein status. A partial explanation for the failure to recognize this prevalence earlier is the reliance on weight/height as the routine measure of nutritional status. Demonstrated here again is the relative insensitivity of weight as an indicator of PCM, though, when present, weight loss is usually striking and likely to be noted and treated.

This point supports our previously reported finding[5] that weight is a useful indicator of impaired status only when lean body mass is reduced. Obese patients maintained on an orally administered protein-sparing regimen may have considerable weight loss but maintain tissue protein stores as measured by serum albumin and transferrin values, nitrogen balance, or total body potassium counting.[6,7] Protein-depleted patients may have restoration of serum albumin with little weight change,[7] and acutely ill patients fed a protein-sparing parenterally administered diet may maintain their protein nutriture despite continuing weight loss as long as fat stores are available.[8]

Reliance on weight as a standard cannot be the entire explanation, however, for failure to recognize PCM of this prominence. Weights were rarely recorded and were available in most instances only because the ambulatory patient had access to balance scales on each ward. A recently obtained value for serum albumin was available in only 56 patients (45%) despite general acceptance of this as a useful criterion of protein status.[4-9]

The value of serum albumin determinations as a measure of significant protein deficit is confirmed by the high correlation with arm muscle circumference; conversely, this reflects on the possible use of arm muscle circumference as a clinical indicator of nutritional status and response to therapy in hospitalized adults.

If these indicators of PCM only identified a population at risk of developing deficiency, ie, a reflection of dietary deprivation and not of possible malfunction, these results would be less disturbing. In the hospitalized adult, however, cellular immunity is lost when this degree of PCM occurs.[7,10] With depressed serum albumin and transferrin values, *Candida* colonization and lymphopenia are frequent.[7] In addition, decreased production of antibody to a graded stimulus and lymphocyte transformation to phytohemagglutinin have been noted in similar patients,[10] findings also characteristic of kwashiorkor.[11,12] Protein-calorie malnutrition in adults has received little attention, in great contrast to pediatric PCM, despite the obviously prevalent preconditions for its development in many hospitalized patients, namely, prolonged semistarvation in patients with hypercatabolic illness.

Although data are scarce, the fact that serum albumin values fell below 3.5 gm/100 ml in three of ten patients after admission suggests that at least some of the malnutrition occurs after hospitalization, even though now, with newer nutritional techniques such as elemental diets,[13] protein-sparing with intravenously administered amino acids,[14] or hyperalimentation,[15] this is theoretically preventable. Certainly, frequent venipunctures are essential in hospitalized patients, but they can lead to mild anemia.[16] While rehydration early after admission can lower hematocrit readings and serum albumin levels, these therapeutic maneuvers would not explain the low body-fat stores and tissue protein levels as estimated by triceps skin fold and arm muscle circumference.

This report confirms recent studies[1-3] suggesting that nutritional support of hospitalized patients has been neglected. More data from other types of patients and institutions are urgently needed, but it is clear that the consequences of malnutrition in hospital patients and the appropriate therapies available for PCM need to be more widely disseminated. This requires greater emphasis on nutrition in the training of physicians, a point made by others.[17-20]

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Data analysis was performed on PROPHET and was sponsored by the Chemical/Biological Information Handling Program of the Division of Research Resources, National Institutes of Health (RR-76).

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Printed and Published in the United States of America

HARVARD MEDICAL SCHOOL,
DEPARTMENT OF SURGERY,
Boston, Mass., July 22, 1976.

Telegram to:

Senator EDWARD KENNEDY,
Senate Health Subcommittee, U.S. Senate,
Washington, D.C.

Knowing your interest in health care, I would like to call your attention to a Senate Subcommittee Hearing on nutrition on July 27th and July 28th, particularly the report on nutrition in cancer by Dr. Gio Gori from the NCI on July 28th. This report points out that malnutrition similar to what you observed in the refugee studies in South East Asia, occurs in many hospitalized patients in the United States. Patients with cancer comprise one group of hospitalized patients for whom there has now been formulated a well-conceived and organized program. This program will provide recognition, assessment and treatment of hospital malnutrition. The program will allow the best clinical investigators, guided by well-planned protocols and the rules of informed consent, to discover new nutritional therapies that will not only improve quality of patient care during chemotherapy and radiotherapy but also will reduce hospital costs. The patient who is strong nutritionally will complete his therapy in the shortest time with the best possible response.

These concepts need more development and further funding so that the knowledge may be distributed to physicians for wider use.

I hope you will be able to attend the hearings and add your support to these valuable programs.

Sincerely,

GEORGE L. BLACKBURN, M.D., Ph.D.,
Assistant Professor of Surgery.

HARVARD MEDICAL SCHOOL,
DEPARTMENT OF SURGERY,
Boston, Mass., July 22, 1976.

JANE BRODY,
The New York Times,
229 West 43d Street, New York, N.Y.

DEAR MS. BRODY: The nutrition hearings of the Senate Subcommittee on Nutrition are being held July 27th and July 28th. A good "upbeat" story is contained in the testimony on the Diet Nutrition and Cancer program being reported by Gio Gori on July 28th. Hopefully you or Nancy Hicks can cover this study. Certainly this program would allow the best clinical investigators to use sound protocols and do some good for a very large population of patients now suffering from hospital malnutrition—perhaps 30% of total population with 5–10% severe.

Should you need additional background material, please let me know and I will get it to you.

Regards.

Sincerely,

GEORGE L. BLACKBURN, M.D., Ph.D.,
Assistant Professor of Surgery.

Careers in Nutrition from the Clinical Viewpoint

by George L. Blackburn, M.D., Ph.D.
and Bruce R. Bistrian, M.D., M.P.H., Ph.D.

A major impediment to clinical careers in nutrition is the widespread lack of appreciation for the role of nutrition in clinical practice. This is best exemplified on the clinical level by the failure in American hospitals to recognize or to treat effectively adult protein-calorie malnutrition (PCM). Protein-calorie malnutrition is not an isolated problem; the widespread prevalence of malnutrition has been identified[1] and confirmed.[2] In a recent one day survey of the nutritional status of surgical patients[3] nearly 50 percent of those hospitalized were moderately or severely malnourished. The criteria used were serum albumin (SA), triceps skinfold (TSF) and arm muscle circumference (AMC) measurements, but not weight-for-height (W/H) ratio (Figures 1 and 2).

To confirm these findings we conducted three similar surveys at weekly intervals of medical patients in the same hospital; hematologic values were part of the nutritional profile.[4] In an attempt to determine the effect of conventional nutritional support, the dietary intake of patients for the week preceding each survey was also recorded. Similar degrees of PCM were found, although calorie depletion (TSF, W/H) was significantly more common, and protein depletion (AMC, SA) significantly less severe in the medical patients. Interestingly, the nutritional support which patients received did not change their nutritional status.

While much emphasis is given to inadequate recognition and support for nutrition in medical education, the fact is that there are not enough teachers knowledgeable in PCM to expose this problem. The time given to nutrition is squandered on subjects irrelevant to clinical medicine in the U.S. such as vitamin deficiencies. PCM on the other hand is a difficult disease to treat and calls for teaching material not readily available in Western medical textbooks.[5]

Techniques of Nutritional Assessment

It is necessary to apply newer techniques of nutritional assessment developed for children in nonindustrialized societies to hospitalized adults in the U.S.[6] These more sensitive and meaningful techniques include anthropometric measurements like triceps skinfold and arm muscle circumference,[7] serum protein levels such as serum albumin,[8] transferrin or iron-binding capacity[9] and tests of immune function.[10-12] The creatinine-height index developed by Viteri[13] can also be a useful index of depletion of lean body mass in adults.[14] Coupled with an inability to recognize the prevalence of this disease, however, is the lack of understanding of the profound detrimental effect of malnutrition on host response to illness.[15] The failure to see the similarities between the child with marasmus due to the unavailability of food and the cachectic adult whose primary disease prevents food intake or utilization limits the teacher of nutrition who is seeking objective support for the thesis that nutrition is an important discipline for the medical student or practitioner. The child with

Dr. Blackburn is Director and Dr. Bistrian is Assistant Director of the Nutrition Support Service, Cancer Research Institute, New England Deaconess Hospital, 194 Pilgrim Road, Boston, Massachusetts 02215.

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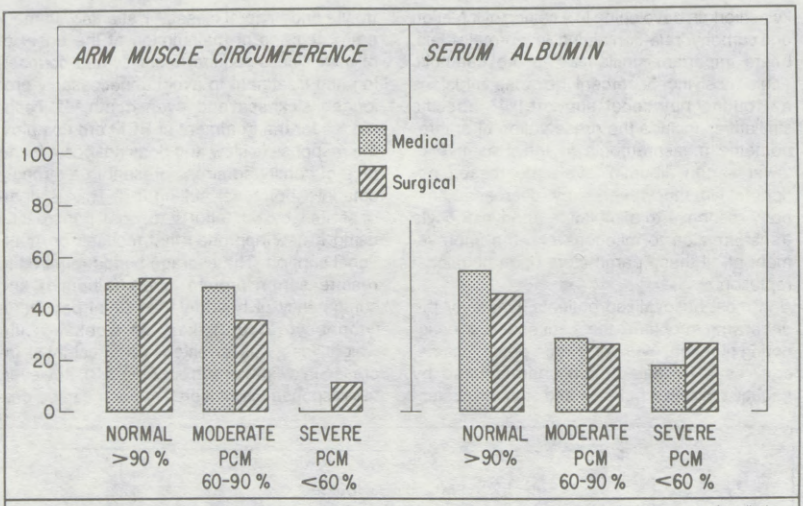

Figure 1. Anthropometric estimates of nutritional status (weight/height) and body fat stores (tricep skinfold) in surveys of medical and surgical patients in an urban municipal hospital. Medical patients were more commonly depleted by these two measures reflecting caloric deficits.

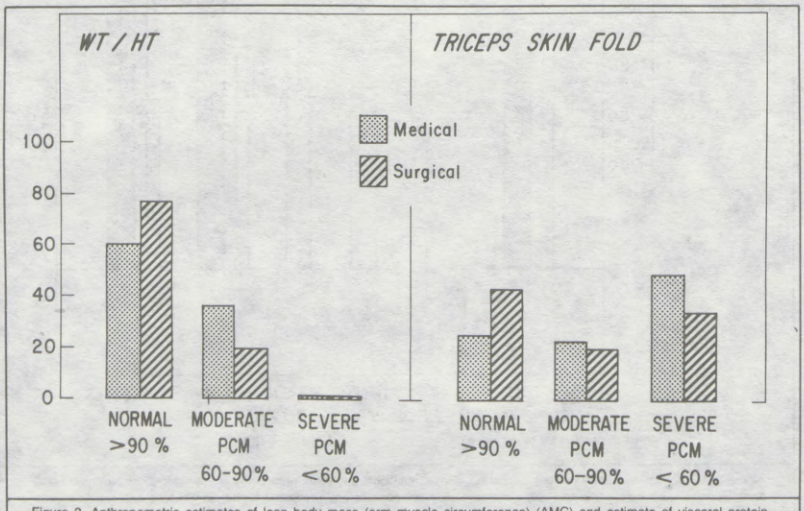

Figure 2. Anthropometric estimates of lean body mass (arm muscle circumference) (AMC) and estimate of visceral protein status (serum albumin) in medical and surgical nutritional surveys. Surgical patients were more severely depleted than medical patients by these measures of protein status.

kwashiorkor, developing in a setting of infection and carbohydrate-containing, low-protein diets, bears important similarities to the catabolic adult receiving 5 percent dextrose infusions as routine nutritional support.[16,17] Specific similarities include the preservation of anthropometric measurements in the presence of lower serum albumin levels, depressed peripheral lymphocytes, anergy, decreased antibody response to stimulation and lymphocyte transformation to mitogens and the improvement of all these parameters upon nutritional repletion.[18]

In most hospitalized patients, whatever the underlying problem, the consequence of ignoring nutrition, even for a short period of time, can result in malnutrition characterized by negative nitrogen balance and significant electrolyte and mineral losses.[5] Patients with moderate degrees of malnutrition at the onset of of their illness require sophisticated counseling and treatment to avoid unnecessarily prolonged sickness and even death.[6,18] Techniques for the treatment of PCM are complex; the response is slow and does not occur in the face of continued stress present in a strongly catabolic hormonal setting.[19,20] This is demonstrated by our efforts to treat pancreatitis using a new approach that focused on nutritional support. The average period required to restore serum protein levels (albumin) and competency of host defense (total peripheral lymphocyte count) was ten weeks. While weight loss was arrested, no substantial increase in weight occurred (Figure 3); however, the response to nutritional support can be dra-

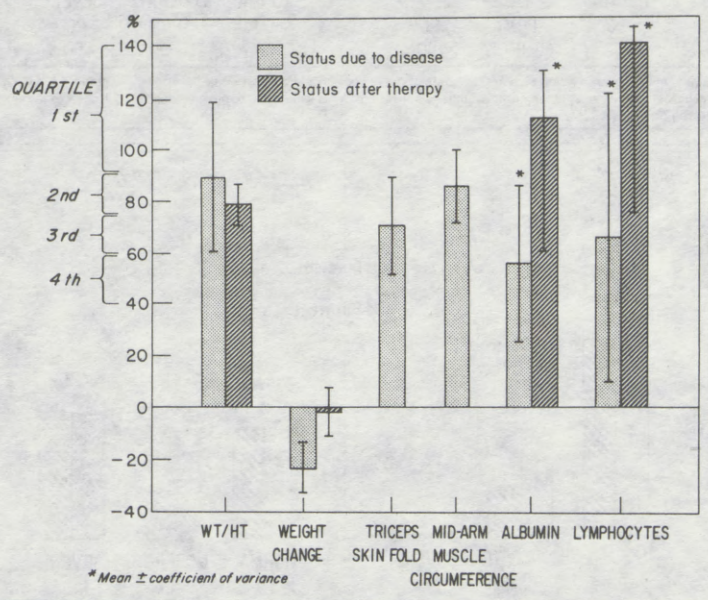

Figure 3. Anthropometric measurements reveal substantial nutritional depletion, particularly of the muscle compartment (AMC) and visceral protein status (albumin and lymphocytes). Nutritional therapy prevented further weight loss and significantly restored the visceral protein compartment. This is characteristic of enteral feeding in contrast to parenteral feeding. While weight loss was prevented, in general it is a poor reflection of early effects of the nutritional therapy.[19]

Reprinted from J. Surg. Res. 18:477-483, 1975.

matic and indeed life-saving. The above group of patients underwent surgery without any significant time-delaying complications where the major complication rate is generally 9.2 percent.

Defined Formula Diets

Developments in defined formula diets and total parenteral feeding represent major medical advances that rank with the discovery of antibiotics, heart-lung bypass pumps and renal dialysis in their influence on the survival.[21] In certain conditions such as inflammatory bowel disease,[24] fistulas of the alimentary tract,[23] acute and chronic pancreatitis[19] and acute renal failure,[25] enteral and parenteral hyperalimentation have become the primary mode of therapy. In others, particularly cancer, optimal nutritional support has been a useful adjunct to primary immuno-, chemo- or radiotherapy.[26,27] The proper use of this new therapy, however, is a sophisticated science; satisfactory results are a consequence of an understanding of nutritional biochemistry and metabolism. The practitioner responsible for this therapy must have proper training and use that knowledge almost daily in order to avoid complications and provide the best care for each patient.[5]

Nutritional Support Service

Our concern with the poor nutritional status of hospitalized patients and a lack of nutritional knowledge both in the diagnosis and treatment of malnutrition led to the development of a Nutrition Support Service.[6] The ultimate goal of this service is to monitor the nutritional status of all hospitalized patients, to consult and/or supervise the appropriate therapeutic support in selected patients, and to provide a multidisciplinary approach to the nutritional problems that arise in the hospital. Particularly with the advent of total parenteral nutrition (TPN) has the need for a team approach and standard guidelines become essential so that dangerous complications—sepsis, pneumothorax, hyperosmolarity—can be minimized. A Nutritional Support Service should combine the services of nursing, dietetics, pharmacy and physical therapy with the major clinical disciplines to encourage the treatment of protein-calorie malnutrition.

The operation of the Nutritional Support Service is greatly aided by the procurement of objective data with which to make a nutritional assessment and formulate a nutritional prescription. The "input" data is shown in Table 1. The "output" is derived from a variety of formulas and nomograms incorporated into a computer program which includes the basal energy expenditure (BEE) based on Harris-Benedict standards.[22] By considering four variables (weight, height, age, sex), these standards allow better adjustment not adequately covered by formulas using weight alone.

In states of mild to moderate catabolism where restoration of lean body mass is required, delivery of standard total parenteral alimentation at 1.75 times BEE will produce positive nitrogen balance.[22] Enteral hyperalimentation to produce similar nitrogen balance is achieved at calorie intake of 1.54 times BEE. If only maintenance of lean body mass is desired, less protein and calories are required as shown in Table 1.

This information together with the Nutrition Assessment Summary (Table 2) are maintained on the patient's chart. They serve as an important reminder of the nutritional state of the patient and the need for adequate nutritional support to restore deficiency, particularly of the kwashiorkor-like variety manifest by depression in serum albumin, transferrin, total lymphocyte count and immune competence. The use of these tables has been more fully described elsewhere.[19,32,33]

Curriculum Development

Besides patient care, clinical nutrition provides unlimited research opportunities in basic and clinical sciences. Recent advances in total parenteral alimentation,[28] defined formula diets[29] and protein-sparing therapies in starvation,[30] opened up numerous avenues for research. This includes the creation of products, delivery systems and techniques for nutritional support along with investigations into the metabolic response to disease and its successful manipulation. Research of this type would in-

volve work in nutritional biochemistry and metabolism, clinical nutrition and food technology along with the general research tools of modeling, statistics and data processing. This emphasizes the necessity of a multidisciplinary approach if modern medical research is to be fruitful. These areas of research, however, are presently being explored by a small group of physicians from various clinical disciplines, for whom clinical nutrition is an avocation and not a specialty.[31] The solution to this present situation is the education of physicians in nutrition at all stages of their training. Those responsible for graduate medical education must re-establish priorities of what will be taught given the limited time and support available. The first priorities for the clinical nutritionist are to design a curriculum that will "sell" to today's students, and to provide a recognizable (and remunerable) clinical service that will demonstrate the relevance of nutrition in their future practice. If these are accomplished, additional specialists should be attracted. Then will they be able to make a living rather than a hobby out of such interests. Nutrition as a specialty can resume the major role it held prior to the discovery of antibiotics and insulin, a time when it represented the major therapeutic tool possessed by all physicians.

Because nutrition cuts across most specialties, core teaching, which is so popular among medical students today, is ideally suited for nutritional education concerning protein-calorie malnutrition. In other disorders with a major nutritional component, for example, infectious disease, cancer, trauma, diabetes, obesity, instruction should concentrate on nutrition and its effect on metabolism.

The teaching of metabolism, particularly the influence of "energy substrates" on organ function, proved to be the most effective pedagogical approach to the science of nutrition. Unfortunately, metabolism has become almost as neglected as nutrition. Fluid and electrolytes, acid-base balance and substrate-hormone interactions no longer appeal to the traditional disciplines usually called upon to teach them. The result is that many physicians are unable to provide sophisticated "molecular support" to patient care. Relating physiological biochemistry to the hospitalized patient, particularly in terms of optimal nutritional support, produces visible results. Thus it is very effective in student teaching. Not only is the quality

Table 1

Computer/calculator determination of protein and calorie requirement for nutrition maintenance or anabolism either orally or parenterally. Estimates based on surface area plus age and sex.[22]

DATA FED INTO COMPUTER

1. Height-Inches
2. Weight (Usual) lbs.
3. Frame Type (Ring) small, medium, large
4. Weight (at Rx) lbs.
5. Weight (Ideal) lbs.
6. Surface Area M^2
   (See table. Based on weight at Rx)

COMPUTER FEED BACK

Height cm. (in x 2.54)
Weight (Usual) kg. (lb. x 2.2)
Weight (at Rx) kg. (lb. x 2.2)
Weight (Ideal) kg. (lb. x 2.2)
Usual Weight - Ideal Weight
Weight at Rx - Ideal Weight
Weight at Rx/Ideal Weight %
Weight at Rx/Usual Weight %
Basal Energy Expenditure
kcal / 24 hrs.
kcal / Hr/ M^2
Anabolic Requirements
Kcals/24 hrs.
I.V. (B.E.E. x 1.76) kcal
Oral (B.E.E. x 1.54) kcal
Nitrogen Anabolic Requirements/24 hrs.
I.V. (kcals ÷ 150) g
Oral (kcals ÷ 150) g
Protein (Amino Acid) Requirements/24 hrs.
I.V. (N x 6.25) g
Oral (N x 6.25) g
Maintenance Requirements
Kcals/24 hrs.
Oral (B.E.E. × 1.22) kcals
Nitrogen Maintenance Requirements/24 hrs.
Oral (kcals ÷ 300) g
Protein (Amino acid) Requirements/24 hrs.
Oral (N x 6.25) g

From Nutrition Support Service, New England Deaconess Hospital.

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Table 2

Nutritional Assessment and Metabolic Status form for clinical studies. This detailed assessment will allow accurate interpretation of the role of nutrition in clinical studies.

Nitrogen Maintenance Requirements/24 hrs. Cal:N Ratio 300:1

Oral (kcals ÷ 300) g

Protein (Amino Acids) Maintenance Requirements

Oral (N x 6.25) g

24 hr. Anabolic Requirements Standard Hyperalimentation (TPN) or high N defined formula diet (DFD) Cal:N 150:1 1 ml = 1 calorie

4. 25% Amino acids
   25% Glucose - TPN — mls (=Anabolic IV kcal)

High N DFD — mls (=Anabolic Oral kcal)

24 hr. Maintenance Requirements Oral Cal:N 300:1

Standard DFD — mls (=Maintenance kcals)

PERCENTAGE STANDARD NUTRITIONAL PARAMETERS

Triceps Skinfold
Mid Upper Arm Circumference
Mid Upper Arm Muscle Circumference
Albumin
Creatinine Height Index
Total Lymphocyte Count
Transferrin

CELLULAR IMMUNITY SKIN TESTING EXPRESSED AS mm PERCENTAGE NORMAL REACTION (read all reaction 2mm; standard = 5mm)

Candida (Hollister-Stier) & Varidase (Lederle) 1 ml of solution diluted 1:100

Immediate	**Immediate**
@ 24 hrs.	@ 24 hrs.
@ 48 hrs.	@ 48 hrs.

Dinitrochlorobenzene Contact Sensitization

@ 24 hrs., @ 10-14 days

2,000 μg
50 μg
50 μg (Challenge Dose)
If positive at 2,000 μg or 50 μg site at 10-14 days without challenge, consider 90%.
If positive only on challenge, consider 60-90%.

SUMMARY (CHECK)

STANDARD PARAMETERS		90%	60-90%	60%
Weight/Height				
Triceps Skinfold				
Mid Upper Arm Circumference				
Mid Upper Arm Muscle Circumference				
Albumin				
Creatinine Height Index				
Lymphocyte Count				
Iron Binding Capacity/ Transferrin				
Cellular Immunity SK/SD				
Other	Candida			
	D.N.C.B.			

Nutritional or Metabolic Status (Check)

90% Standard	Not Depleted
60-90%	Moderately Depleted
60% Standard	Severely Depleted

TYPE OF PROTEIN CALORIE MALNUTRITION (CHECK)

Acute Visceral Attrition (Kwashiorkor-like)
(Wt/Ht, TSF, AC, AMC, CHI preserved; Albumin and Transferrin acutely depressed)

Adult Marasmus (Cachexia)
(Wt/Ht, TSF, AC, AMC, CHI depressed; Albumin and Transferrin preserved until late)

Intermediate States

Acute Visceral Attrition Superimposed on Adult Marasmus
(Wt/Ht, TSF, AC, AMC, CHI depressed; Albumin and Transferrin rapidly and acutely depressed)

PRIMARY DIAGNOSIS

From Nutrition Support Service, New England Deaconess Hospital.

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of existence enhanced but morbidity and mortality can be significantly reduced.

The proverbial competition between medicine and surgery will abate in this neutral ground of nutritional support.[32] If you will, nutrition might be seen as a "United Nations" where many disciplines come together in teaching, patient care and research.

Summary

If the field of nutrition is to stay abreast of the times and obtain the interest, respect and curriculum support it deserves, it must establish its importance as a clinical speciality. A nutritional support service is the ideal vehicle to exemplify nutrition's role in curative medicine. While delivering patient care, a nutritionally characterized and closely documented patient population provides an excellent base to further knowledge in clinical medicine.

The metabolic consequences of severe illness oblige us to employ a diet therapy with maximum leverage to improve the quality and likelihood of recovery. Unfortunately, the lack of sufficient knowledge prevented a general recognition of the extent of the problems involved in hospital dietary deficiencies and of the techniques for reversing those discrepancies. The multifaceted aspects of a nutritional support service in patient care, education and research, however, lead to an increased awareness of the importance of nutritional support and to a greater application of optimal nutritional care for the hospitalized patient. □

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JOHNSON & JOHNSON,
New Brunswick, N.J., July 8, 1976.

GEORGE BLACKBURN, M.D.,
Assistant Professor of Surgery, Harvard Medical School, New England Deaconess Hospital, 185 Pilgrim Road, Boston, Mass.

DEAR GEORGE: I would like to thank you for your letter of June 22 concerning your interest in using the digestive aid in your multi-clinic study of the treatment of patients suffering from cancer of the pancreas.

I understand that Bruce Semple will be providing the digestive aid product for your study, and I am sure that you will obtain some interesting data in the study. We will look forward to obtaining the results of the study as our interest in the Exploratory Division is still high in the field of nutrition, and we are looking for new opportunities in this field.

We have always appreciated the kind assistance you have given us in relation to our programs, and we look forward to working with you in the future in new areas as they evolve.

With all best wishes,
Sincerely yours,

GAVIN HILDICK-SMITH, M.D., F.R.C.P.,
Director, Medical Affairs.

JOHNSON & JOHNSON,
New Brunswick, N.J., June 14, 1976.

GEORGE BLACKBURN, M.D.,
New England Deaconess Hospital, 185 Pilgrim Road, Boston, Mass.

DEAR GEORGE: Many thanks for your letter of June 3 in which you very kindly outlined the amount of digestive aid that you would need in the tumor study outlined in your protocol.

At this time the Baby Products Company will be taking over all the responsibility for future clinical studies of the digestive aid. They will, I think, be primarily interested in studies in pancreatic insufficiency but may be interested in providing materials for your tumor study. As such I am sending all the data you submitted to me to Dr. Bruce Semple, Director, Medical and Regulatory, and will ask him to contact you concerning your tumor study.

I shall be in contact with you when Bruce and his colleagues have decided what further studies are needed with the product in pancreatic insufficiency. I know Bruce will wish to meet with you in the near future concerning the status of your study and what interest he has in supporting it further.

With all best wishes,
Sincerely yours,

GAVIN HILDICK-SMITH, M.D., F.R.C.P.,
Director, Medical Affairs.

Johnson & Johnson's experimental digestive enzyme effectively replaces the enzymes absent, or otherwise inactive, as a result of pancreatic insufficiency. These microbeads contain a consistent amount of lipase, amylase, and protease protected by a pH sensitive enteric coating. This covering resists the acidity of the stomach, but dissolves in the more alkaline environment of the duodenum within 12 minutes, thus releasing the enzymes for digestion. The microbeads taken with food become dispersed with the contents of the stomach, and continue to release active enzymes as long as food passes into the small intestine, thus allowing the nearly complete digestion of carbohydrate, protein and fat.

This product is under clinical investigation by the Nutrition Research Laboratory, New England Deaconess Hospital, Harvard Medical School and the Department of Nutrition and Food Science, Massachusetts Institute of Technology.

If you have any inquiries, please contact the laboratory at 277-9500.

JOHNSON & JOHNSON DIGESTIVE ENZYME STUDY—STATISTICAL ANALYSIS, APR. 15, 1976

Parameter	Without 16A	With 16A	p=probability of no significant difference
Weight (kilogram)	54.14 (37.3–76.4)	56.48 (40.0–76.7)	$0.01<p<0.02$
Arm muscle circumference (centimeters)	19.95 (15.9–25.8)	20.95 (17.0–28.3)	$.005<p<.01$
Caloric intake	1914.35 (884.7–2763.0)	2139.85 (1,343.5–3,095.7)	$.01<p<.02$
Fat intake (gram)	76.38 (31.0–138.0)	87.88 (52.5–121.0)	$.05<p<.10$
Fecal fat (gram per day)	22.61 (1.1–74.0)	17.34 (2.2–52.3)	$.3<p<.4$
Fat utilization (percent) (Fat_{in}–Fat_{out} /Fat_{in})	68.76 (1.32–97.76)	77.66 (22.0–97.79)	$.2<p<.3$
Stool frequecy (per 24 hr)	5.94 (2–23)	2.78 (1–12)	$.001<p<.005$
Serum albumin	3.81 (2.1–5.1)	4.20 (3.3–5.0)	$.01<p<.02$
Serum transferrin	193.00 (116–250)	237.75 (176–300)	$.05<p<.10$
Serum total iron Binding capacity	286.6 172–377	347.8 223–461	$.2<p<.3$

JOHNSON & JOHNSON DIGESTIVE ENZYME STUDY, DATA TO APR. 15, 1976

Pan	Fat_{in} I	Fat_{in} II	F. Fat I	F. Fat II	Fat utilization I	Fat utilization II	$Cal._{in}$ I	$Cal._{in}$ II	Stool frequency I	Stool frequency II	Alb. I	Alb. II	AMC I	AMC II	Trans./ TIBC I	Trans./ TIBC II	N. Bal. I	N. Bal. II	Wt.I	Wt.II
1	120.3	115.5	40.7	28.0	66.17	75.76	1,806.7	2,123.3	4	3	4.4	5.0	20.0	20.3	250/330	210/279	+5	+4	43.2	48.7
2	116.0	96.0	2.6	2.5	97.76	97.40	2,763.0	2,230.0	----	----	4.1	4.3	----	----	270	----	----	+10	43.6	47.0
3	100.0	100.0	18.0	9.2	82.00	90.80	2,400.0	2,400.0	2	2	4.3	4.2	17.2	17.5	250	200	+5	+6	50.4	50.9
4	63.3	121.0	5.7	22.0	91.00	81.82	2,298.7	3,095.7	2	1	2.4	3.3	22.3	22.3	116	196	0	+6	70.0	66.0
5	69.7	99.7	5.7	2.2	91.82	97.79	1,697.7	2,125.0	2	2	3.1	4.0	23.2	----	230	290	−6.5	0	70.0	74.5
6	36.0	67.0	21.0	5.5	41.67	91.79	1,436.7	2,056.3	3	2	3.2	3.3	17.5	18.6	136	176	−5	+6	49.0	49.0
7	101.0	101.0	19.1	4.0	81.09	96.04	2,291.0	2,291.0	3	3	4.1	4.2	20.1	----	436	----	+7	----	63.2	75.0
8	138.0	94.0	74.0	26.8	46.38	71.49	2,406.3	2,410.0	5	1	4.7	----	23.5	26.4	----	----	----	----	70.5	73.4
9	----	----	----	----	----	----	----	3,052.5	4	1	3.5	4.3	17.8	19.1	300	----	----	+1	51.0	----
10	----	----	----	----	----	----	----	----	5	2	2.1	4.4	18.7	20.5	136	240	−7	----	56.0	63.1
11	31.0	52.5	9.1	7.2	70.65	86.29	1,405.0	1,343.5	3	2	2.8	4.3	15.9	17.0	186	290	+2	0	38.6	40.0
12	78.25	62.0	28.2	31.9	63.96	38.87	2,101.0	2,250.7	9	3	3.0	3.6	14.3	----	260	----	+5.4	+4.3	37.3	44.4
13	52.0	59.0	36.7	45.9	29.42	22.20	1,643.7	1,660.3	23	12	5.1	4.6	18.12	19.46	250/403	----	−8	----	45.5	46.4
14	60.5	83.4	59.7	9.6	1.32	88.49	1,213.0	1,580.5	7	3	4.5	4.9	25.8	28.3	240	300	−13	−7	76.4	76.7
15	81.5	81.0	26.1	52.3	67.98	35.43	1,859.5	2,295.0	15	3	4.5	5.0	24.5	23.2	270	461	----	+11.5	73.6	71.0
16	42.7	83.3	1.1	8.9	97.42	89.32	884.7	1,698.7	7	3	4.5	4.6	20.7	23.4	480	489	−1	+2	57.6	59.0
17	110.3	115.7	----	----	----	----	213.4	2,248.0	4	2	3.6	3.8	20.1	20.0	172	223	+1	+3	44.6	48.7
18	50.0	71.3	8.7	13.0	82.60	81.77	213.9	2,246.2	4	2	3.6	3.4	17.2	17.2	360/284	408	+10	+10	42.3	44.3
19	47.9	91.5	5.3	2.5	88.93	97.27	206.4	2,107.5	5	3	3.9	----	17.4	----	377	368	+3	----	45.9	44.0

JOHNSON & JOHNSON DIGESTIVE ENZYMES—PROTOCOL No. 0845.01–4037.11C

I. BACKGROUND

Although several digestive enzyme preparations are available on the market, most have been very disappointing clinically. Even the best of the available formulation leave much to be desired. They lack potency and consistency of clinical response. Most of the available digestive enzyme preparations are inactivated by gastric digestion. Those enzyme preparations that are enteric coated, are low in active enzymes and they are deficient in lipase. Moreover, the coatings generally fail to protect the enzymes against gastric inactivation and many fail to disintegrate in the duodenum under neutral conditions within a reasonable time. Johnson & Johnson Digestive Enzymes contain proteases, amylases and lipases plus a uniform enteric coating which resists gastric digestion. There is a need for a potent effective-formulation of digestive enzymes containing proteases, amylases and lipases which will give uniform and predictable response from patient to patient. Johnson & Johnson Digestive Enzyme comes close to meeting these requirements. This protocol is designed to demonstrate the *safety* and *effectiveness* of Johnson & Johnson Enzymes in a clinical setting using a sequential analysis to determine effectiveness.

II. OBJECTIVE

The objective of this study is to determine in a series of single-blind clinical trials whether or not the Johnson & Johnson Digestive Enzymes is safe and effective as a supplement for digestive enzymes in patients with known pancreatic enzyme insufficiency. Each patient will serve as his own control.

III. INVESTIGATOR

George L. Blackburn, M.D., Ph. D., New England Deaconess Hospital, 185 Pilgrim Road, Boston, Massachusetts 02215.

IV. DESIGN OF THE STUDY

Pre-treatment evaluation during the first three days of the study will be with patients on a standard diet and with an inactive control product (Placebo). The results of treatment with Johnson & Johnson Digestive Enzymes after 10 days will be evaluated against the control period with the placebo. In appropriate studies, another enzyme preparation (Viokase or Cotazym) will replace and/or accompany the placebo the control period.

V. FORMULATION

J & J D. E. containing lipases, amylases, and proteases will be made available in enteric coated sperical form. The responsible physician will set the dosage for each particular patient, not to exceed 12/day.

VI. DURATION OF THE STUDY

Acute phase

Two weeks per individual—three days for pre-treatment on control diet with a placebo preparation and/or other enzyme preparation, and ten days on control diet and treatment with J & J D. E.

Followup phase

Each patient who successfully completes the "acute phase" will be maintained on digestive enzyme supplementation and will be recalled after three, six, twelve, and eighteen months for the evaluation of their biochemical and nutritional parameters in order to assess long term effects of treatment. The over-all duration of the follow-up phase however, will depend upon the total number of patients enrolled and the dates of their entry into the program.

VII. SELECTION CRITERIA

Male and female patients of any race and age (most patients will be between 21 and 60 years of age) who have been evaluated clinically and show evidence of *pancreatic enzyme insufficiency*, which will be defined for the purpose of this study as:

1. Enzymatic evidence of decrease in pancreatic enzymes and bicarbonate secretion as measured by appropriate bio-assays.
2. Clinical evidence of malnutrition associated with increased frequency and amount of stool containing abnormal amounts of fat and undigested protein.
3. Nutritionally depleted patients with problems of digestion and adequate utilization of food associated with suspected pancreatic enzyme insufficienecy.

VIII. EXCLUSION CRITERIA

Patients with malabsorption syndromes not due to pancreatic insufficiency; patients with malabsorption syndromes associated with pancreatic insufficiency with marked hyperacidity noted in duodenal aspirates. Patients with juvenile diabetes. Patients with hypercatabolic states associated with stress and sepsis. Patients on steroid and tetracycline therapy will have this therapy *discontinued*. Patients on chronic treatment of anticoagulant drugs, pancreatic enzyme preparations, antacids, bile salts or other gastrointestinal drugs will have them *discontinued* during a control period. The investigator reserves the right to enter those cases who, by his best judgment, will best benefit from the study.

IX. CONCOMITANT TREATMENT

The only concomitant medication which will be permitted during the course of this study will be those for the treatment of cardiovascular disease such as digitalis or digitalis alkaloids and diuretics, except excluded above. However, the investigator reserves the right to prescribe any such medication necessary to secure the best care for the patients in the study.

X. DEFINITION OF DIET FOR PATIENTS ON THE STUDY

All patients will be placed on a clinically defined diet which will consist of approximately 45% carbohydrate, 15% protein, and 40% fat; and will be administered to tolerance to the patients at caloric levels of 35 kilo-calories per kilogram of body weight based on ideal body weight. Exact caloric level will be recorded for each patient. Ideal weight will be determined by using Metropolitan Life Insurance Company's height and weight tables for males and females.

XI. METHOD OF STUDY

(*A*) *Acute phase*

Patients with known pancreatic insufficiency proven by both clinical and chemical methods which include evidence of malnutrition, increased frequency (2–3 x/day and bulk of stool containing abnormal amounts of fat (8 g/24 hr.) will be sequentially entered into the study. Patients will be placed on defined diet, and pre-treatment evaluations will be carried out during the first three days of the study. Patients will receive a physical examination, including anthropometric measurements, as well as blood tests to determine over-all health as well as nutritional status. The tests include complete blood count with differentials, and tests for transferrin or total iron binding capacity, magnesium, carotene, vitamin B–12 and folic acid, as well as a routine urinalysis. Intestinal absorption state will be ascertained by stool fat and/or D-xylose and/or vitamin B–12 absorption. Skin tests for cellular immunity will contribute to determination of nutritional status. Stools will be obtained on days 1, 2, 3, and pooled, and aliquots assayed for fat, nitrogen, and total weight. Urines will be collected during the same period and aliquots will be analyzed for urinary urea and creatinine. Body weight will be measured daily. On day four, patient will receive with breakfast his dosage of J & J Digestive Enzymes, which will be administered at all meals and snacks for the next ten days. Stool will be obtained on days 12, 13, and 14, pooled, and aliquots will be assayed for fat, nitrogen, and weight. On day 15, each patient will receive a physical exam, including anthropometric measurements, as well as the hematological and biochemical tests performed on day one. Patients will be continued to be evaluated clinically for well-being and status of the gastrointestinal tract.

(*B*) *Followup phase*

Following the completion of this clinical trial (acute phase), all patients who had a positive response to treatment will be continued on treatment for eighteen (18) months. At each visit the patient will receive a complete physical exam, in-

cluding anthropometric measurements, and the same blood tests as in the acute phase. Skin-testing for cellular immunity will be performed only if the last skin tests elicited a negative response. The patient will be asked to submit a pooled stool sample (three days collection) and aliquots will be assayed for fat and nitrogen. Up to three 24-hr urines will be submitted during the same period, and aliquots will be analyzed for urea nitrogen and creatinine. Food intake diaries will be submitted by the patient to facilitate determination of diet composition.

NUTRITIONAL SUPPORT OF PATIENTS WITH ADVANCED GASTRIC AND LOCALLY UNRESECTABLE PANCREATIC CANCER TREATED BY MULTIMODALITY THERAPIES

(By H. O. Douglass, Jr., L. Kvols, G. Blackburn, M. Kalsner)

2.0 Objectives of the study

This program will attempt to provide the information needed to obtain answers to the following problems.

2.1 Whether nutritional support as an adjuvant to the antineoplastic therapy of patients with carcinomas of the upper gastrointestinal tract will:
- 2.11 Improve the patient's quality of life
- 2.12 Improve the patient's tolerance of antineoplastic therapy
- 2.13 Alter the response of the tumor to antineoplastic therapy

2.2 Whether the anorexia of cancer, and its associated food aversion can be reversed by reestablishing an anabolic state. Evaluation shall include:
- 2.21 The eating behavior of patients with cancers of the upper gastrointestinal tract can be characterized by food groupings, and whether this behavior is altered by placing the patient back in an anabolic state.
- 2.22 Changes in taste (particularly sweet and bitter) seen in cancer patients with determinations as to whether or not these are corrected by nutritional support therapy.

2.3 Whether changes in body composition in patients with neoplastic disease (lean body mass, secretory proteins of the liver, vitamin and trace mineral metabolism, etc.) can be reversed by nutritional repletions.

2.4 Whether changes in immunologic reactivity are functions of the extent of the cancer or of the weight loss, and whether further depression of immunologic status produced by antineoplastic thearpy can be averted by nutritional support.

3.0 Patient Selection

3.1 *Eligibility.* All patients eligible for treatment in GITSG protocols involving prolonged intensive therapy for control of locally unresected but nonmetastatic neoplasms of the pancreas and of advanced gastric neoplasia are eligible for inclusion in this study. Specifically, patients receiving combined radiation and chemotherapy for cancer of the pancreas, and chemotherapy for metastatic gastric cancer, are to be included.

3.2 *Limitation of eligibility.* As specified in the treatment protocols, patients must:
- 3.21 Have recovered from the effects of recent surgery.
- 3.22 Be free of infection.
- 3.23 Be able to ingest 1500 calories per day.

3.3 *Exclusions.*
- 3.31 Patients requiring intravenous fluid or nutritional support are ineligible for inclusion in this study.
- 3.32 Patients with a Physical Status of 4 will be excluded.

3.4 *Consent.* All DHEW and institutional requirements for informed consent shall be required before a patient may be included in this study.

3.5 *Stratification of patients.*
- 3.51 Disease and treatment protocol
  - Stomach
  - Pancreas
- 3.52 Physical Status
  - 0–1 (Ambulatory)
  - 2–3 (Semi-ambulatory)
- 3.53 Primary tumor status
  - Resected
  - Non resected

3.6 *Randomization.* Patients will be randomized to treatment or control groups by calling the Operations Office (716–831–1591) and supplying the following information:

Patient's name
Institution
Disease and treatment protocol
Physical status of patient
Primary tumor status
Date of surgery, types of prior treatment
Investigator's name

4.0 Therapeutic modalities

4.1 Pancreatic Cancer

4.11 Control Group. Patients randomized to control will be observed for nutritional intake and shall be required to keep the Activity and Dietary Diary. Between meal feedings and supplements will be offered and encouraged according to customery institutional routine. All food intake, including supplements, will be recorded in the Activity and Dietary Diary. When hospitalized, caloric intake will also be determined by the research dietitian. Nitrogen excretion and other studies shall be performed at the same intervals as in the nutritionally supplemented group.

4.12 Nutritional support. Patients randomized to the nutritionally supported group will receive a basic diet to provide a minimum of 30 calories per kilogram of body weight or ideal body weight (whichever is greater) per day. In addition, a 1000 calorie dietary supplement must be taken by all patients, and total caloric intake, including the supplement, shall not be allowed to fall below 30 calories per kilogram per day. The Activity and Dietary Diary will be kept by all patients.

4.121 Diet composition. The calories of the diet (including the supplement) must provide a minimum of 2.0 gm of protein per kilogram of body weight. Amino acid nitrogen must comprise ⅙ of the protein weight. Osmolarity of supplements should be kept below 500 milliosmoles/ml. Water is allowed ad libitum. Vitamins shall be given in tablet, capsule or liquid form to provide a minimum of one RDA of each vitamin for which the RDA has been established. Pancreatic extract will be provided in capsule or tablet form with each meal.

4.122 Intolerance to diet or inability to consume 30 cal/kg/day shall result in a trial of tube feeding. If change is mandatory following 48 hour nitrogen balance studies (which must be performed each time nutritional therapy is changed) or if a patient is unable to take 30 cal/kg/day for three consecutive days. The patient will be changed to intravenous hyperalimentation.

4.123 Parenteral hyperalimentation must also provide 30 cal/kg/day including 2.0 grams/kg or more of protein per day of which ⅙ will be amino acid nitrogen (note that slightly more of some protein solutions than of others will be needed, because of variations in nitrogen content). If lipid cannot be taken orally, (5 ml of safflower oil or corn oil daily) the patient will be given 500 ml of Intralipid weekly. Parenteral hyperalimentation can be given as a 24 hour per day, or on a 16 hour intermittant schedule (including 2 hours with reduced infusion rate: I. Med. pump), freeing the patient of I.V. tubing, bottles and pumps during the day (use heparin lock). Osmolarity, tri weekly electrolytes and BUN, urine glucose and acetone and other monitoring are performed in accord with proper standards of parenteral hyperalimentation.

4.124 Sample modular defined diet.

Poly cose (Starch, Ross Labs)
Medium chain triglycerides mixed ½ and ½ with polyunsaturated corn oil (Mazzola) Enzymatically hydrolyzed collagen (EMF, Control Drug Co., Port Redding, N.J.) is a hydrolyzed preparation from sheep hoof (gelatine) fortified with tryptophan and containing 50% free amino

acids and 50% small polypeptides (of up to 10 amino acid linkages), providing absorbtion of di- and tripeptides. Can be administered in a small volume (e.g., "shot glass") three times daily.

Other solutions to provide the 1000 cal supplement must include Isocal, Ensure or diluted Vivonex H–N. All need reinforcement with EMF, "Liquid predigested protein" or the equivalent to meet the minimum protein requirement. Patients whose religious or dietary habits restrict protein sources will require soy protein, egg albumin or Vivonex H–N.

Patients will be asked to add Lithium chloride solution (300 mg) to each 1000 calories of supplement. If hospitalized, this will be added by the research dietitian. Blood levels of Lithium will be utilized to determine that the material has been ingested.

4.2 Gastric Cancer

4.21 Control Group—no nutritional supplement. These patients are managed as in Section 4.11 above.

4.211 Control Group—Nutritionally supplemented. These patients are managed as in Section 4.12–4.124 above, except that a pancreatic extract supplement will not be given. Lithium will added.

4.22 Parenteral hyperalimented. Parenteral hyperalimentation will be administered as per Section 4.163 above. One liter will be administered during the first 24 hours, two or more liters (for a total of 30 cal/kg) thereafter. Patients will be encouraged to consume a full diet as well. All patients will keep the Activities and Dietary Diary. Hyperalimentation will be recorded by members of the professional staff in that Diary.

4.221 Duration of hyperalimentation. Patients with a history or documentation of weight loss of 8 percent in 2 weeks, 10 percent in one month, 15 percent in 2 months or 20 percent in 3 months from their usual weight, and who have not since regained that weight will be considered severly malnourished and will receive parenteral hyperalimentation for a total of 5 days prior to chemotherapy and during the 5 days of chemotherapy. Balance studies (48 hours) will be performed prior to study and again after 3 days of hyperalimentation.

Patients with lesser degrees of malnutrition will have hyperalimentation start 48 hours before chemotherapy, and will be required to have prehyperalimentation but not prechemotherapy balance studies.

All patients who receive parenteral hyperalimentation will have 48 hour balance studies beginning on the fourth day of chemotherapy.

4.222 Patients will continue intravenous hyperalimentation for 48 hours after chemotherapy if unable to ingest 30 cal/kg during this time, due to nausea of antineoplastic therapy.

4.223 Subsequent therapy.

4.2231 Patients randomized to no further nutritional support will receive only usual dietary advice and encouragement on completion of chemotherapy.

4. 2232 Patients randomized to nutritional supplements will receive the 1000 cal daily supplement, similar to that given to patients in Section 4.211. This will begin on the first day of chemotherapy. Lithium will be added to this solution as above.

4.23 Patients will be followed through one complete six weeks cycle of therapy. Beyond the initial cycle, protocol directed nutritional support will cease after balance studies are completed.

5.0 Parameters of Measurement and Therapy Modifications

5.1–5.2 *Pretreatment studies*

5.11 Dietary history, including food aversions. Taste testing (dilution test panel of bitter, sweet, salt). Blood sugar.

5.12 Weight-height ratio, triceps skin-fold double t hickness, triceps-biceps muscle circumference.

5.13 Performance status, exercise tolerance (grip ergometer, incentive spirometric measurements—pressure and time maintained).
5.14 Serum albumin level, total protein, cholesterol.
5.15 Iron binding and transferrin.
5.16 Total lymphocyte count, T and B cell counts, killing power of leukocytes (NTB).
5.17 Delayed hypersensitivity skin testing, per GITSG protocols.
5.18 Immunoglobulin electrophoresis.
5.19 48 hour urine determinations for creatinine height, creatinine clearance, urine urea nitrogen, Sodium loss, urinary potassium. Nitrogen balance, ketone screening.
5.20 Dietary balance studies for 48 hours: calorie, nitrogen, sodium, potassium.
5.21 Serum Vitamin A levels, ascorbic acid levels and levels of copper, zinc, magnesium and Lithium.

5.3 *Post treatment studies*—repeat of pretreatment studies.

5.4 *Studies during treatment.*
5.41 Intake monitoring and calorie expenditure analysis. Patients must record daily activities and diet in an Activity and Diet Diary every day while on study.
5.42 Weight three times weekly.
5.43 Creatinine, blood urea nitrogen, albumin, blood sugar complete blood count twice weekly. See section 4.222.

5.5 Studies when changing from control to nutritionally supported, or when changing from enteric hyperalimentation to parenteral hyperalimentation.
5.51 Accurate dietary history for 3 days when changing from supplemented to enteric defined diet, 3 days when changing from enteric to parenteral nutrition.
5.52 48 hour urine analyses and other studies included in sections 5.1–5.2 (except skin tests).

5.6 Removal from intravenous hyperalimentation.
5.61 Septic, osmolar, vascular and pulmonary complications of intravenous hyperalimentation: resume enteric alimentation.
5.62 Improvement in appetite and physical status.
5.621 Minimum duration of intravenous hyperalimentation shall be 7 days.
5.622 When patient shows consistent enteral feeding of more than 1500 cal per day for more than 3 days, intravenous hyperalimentation may be reduced by 1000 calorie amounts. Enteric feeding of defined diet is to be resumed.
5.6221 When intravenous hyperalimentation is discontinued, plug catheter with heparin lock for 2–5 days until it is certain that I.V. hyperalimentation will not be needed again.
5.6222 Repeat all studies listed in section 5.5 (except skin test) above prior to each decrease.

6.0 Evaluation criteria.

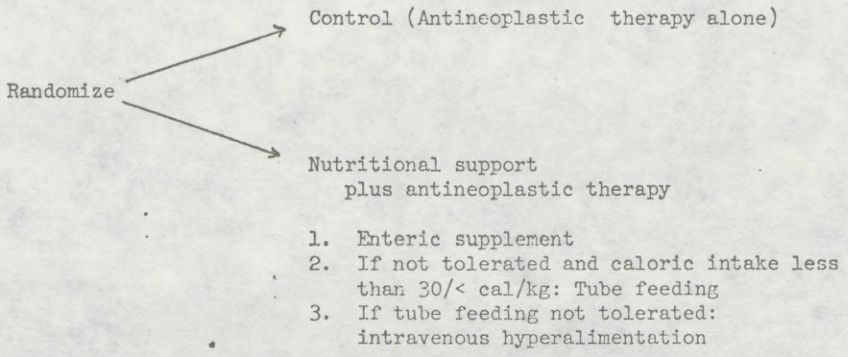
6.1 Patients will be followed for survival data. The following are to be recorded:
6.11 Survival from onset of treatment.
6.12 Number of hospital-free days.
6.13 Length of the terminal event.
6.14 Patients who continue on nutritional supplements after completion of protocol therapy will have this factor recorded.

6.2 Response to antineoplastic therapy according to therapy protocol criteria.
6.21 Comparison of toxicity resulting from therapy in control and nutritionally supported groups.

6.3 Response to nutritional criteria.
6.31 Maintenance of weight and physical status.
6.32 Evaluation of anorexia and food aversion as a function of nutrition.
6.33 Nitrogen balance after nutritional support in antineoplastic therapy.
6.34 Alterations in trace electrolyte body composition.
6.35 Alteration in gastrointestinal absorptive capacity after nutritional support and radiotherapy.
6.36 Maintenance of immunologic reactivity.

SCHEMA

PANCREATIC CANCER LOCALLY UNRESECTABLE, NON METASTATIC



All patients in both groups must keep the Activities and Diet Diary. Patients with physical status of 4 (ECOG criteria) at beginning of therapy are ineligible.

[Whereupon, at 12:55 p.m., the hearing was adjourned, subject to call of the Chair.]

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