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95TH CONGRESS
1st Session

COMMITTEE PRINT

DIETARY GOALS FOR THE UNITED STATES

PREPARED BY THE STAFF OF THE

SELECT COMMITTEE ON NUTRITION
AND HUMAN NEEDS
UNITED STATES SENATE

FEBRUARY 1977

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

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1977

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Stock No. 052-070-03913-2 / Catalog No. Y 4.N95:D 63/3

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FOREWORD

The purpose of this report is to point out that the eating patterns of this century represent as critical a public health concern as any now before us.

We must acknowledge and recognize that the public is confused about what to eat to maximize health. If we as a Government want to reduce health costs and maximize the quality of life for all Americans, we have an obligation to provide practical guides to the individual consumer as well as set national dietary goals for the country as a whole.

Such an effort is long over-due. Hopefully, this study will be a first major step in that direction.

I would like to thank Mr. Nick Mottern of the Committee staff for his extraordinary effort and the high degree of professionalism he used in the preparation of this publication.

GEORGE MCGOVERN,
Chairman.

In addition to acting as a practical guide to promote good eating habits, this report, hopefully, will also serve as a catalyst for Government and industry action to facilitate the achievement of the recommended dietary goals. Without Government and industry commitment to good nutrition, the American people will continue to eat themselves to poor health. Government and industry have a responsibility to respond to the findings of the report. Action is nceded to determine how changes can be made regarding the content of nutritional information provided to the public; the kinds of foods produced; how foods are processed and advertised; and the selection of foods offered by eating establishments. Our national health depends on how well and how quickly Government and industry respond.

CHARLES H. PERCY,
Ranking Minority Member.

[Press Conference, Friday, January 14, 1977, Room 457, Dirksen Senate Office Building]

STATEMENT OF SENATOR GEORGE McGOVERN ON THE PUBLICATION OF DIETARY GOALS FOR THE UNITED STATES

Good morning.

The purpose of this press conference is to release a Nutrition Committee study entitled *Dietary Goals for the United States*, and to explain why we need such a report.

I should note from the outset that this is the first comprehensive statement by any branch of the Federal Government on risk factors in the American diet.

The simple fact is that our diets have changed radically within the last 50 years, with great and often very harmful effects on our health. These dietary changes represent as great a threat to public health as smoking. Too much fat, too much sugar or salt, can be and are linked directly to heart disease, cancer, obesity, and stroke, among other killer diseases. In all, six of the ten leading causes of death in the United States have been linked to our diet.

Those of us within Government have an obligation to acknowledge this. The public wants some guidance, wants to know the truth, and hopefully today we can lay the cornerstone for the building of better health for all Americans, through better nutrition.

Last year every man, woman and child in the United States consumed 125 pounds of fat, and 100 pounds of sugar. As you can see from our displays, that's a formidable quantity of fat and sugar.

The consumption of soft drinks has more than doubled since 1960—displacing milk as the second most consumed beverage. In 1975, we drank on the average of 295, 12 oz. cans of soda.

In the early 1900's, almost 40 percent of our caloric intake came from fruit, vegetables and grain products. Today only a little more than 20 percent of calories comes from these sources.

My hope is that this report will perform a function similar to that of the Surgeon General's Report on Smoking. Since that report, we haven't eliminated the hazards of smoking, nor have people stopped smoking because of it. But the cigarette industry has modified its products to reduce risk factors, and many people who would otherwise be smoking have stopped because of it.

The same progress can and must be made in matters of nutritional health, and this report sets forth the necessary plan of action:

1. Six basic goals are set for changes in our national diet;
2. Simple buying guides are recommended to help consumers attain these goals; and

3. Recommendations are also made for action within Government and industry to better maximize nutritional health.

I hope this report will be useful to millions of Americans. In addition to providing simple and meaningful guidance in matters of diet, it should also encourage all those involved with growing, preparing, and processing food to give new consideration to the impact of their decisions on the nation's health. There needs to be less confusion about what to eat and how our diet affects us.

With me this morning are three of the country's leading thinkers in the area of nutritional health. They have very graciously assisted the staff of the Select Committee in the preparation of this report. They will explain in greater detail its purpose and goals.

First, Dr. Mark Hegsted, Professor of Nutrition from the Harvard School of Public Health. Dr. Hegsted has a long and distinguished career in science, bringing conscience as well as great expertise to his work. Dr. Hegsted has worked very closely and patiently with the committee staff on this report, devoting many hours to review and counseling. He feels very strongly about the need for public education in nutrition and the need to alert the public to the consequences of our dietary trends. He will discuss these trends and their connection with our most killing diseases.

Following his presentation, Dr. Beverly Winikoff of the Rockefeller Foundation will discuss the changes necessary in food marketing and advertising practices if the consumer is to make more healthful food choices. Dr. Winikoff, who with Dr. Hegsted and Dr. Lee testified at our hearings in July, has also been extremely helpful in assisting the committee staff in preparing this report.

Dr. Philip Lee, the Director of the Health Policy Program at the University of California in San Francico, and and a former Assistant Secretary for Health, will conclude our presentation with a discussion of the costs of our current dietary trends. Dr. Lee has also consulted with the committee staff on this report and has offered much encouragement.

Before Dr. Hegsted begins, I would also like to note that the staff has also received valuable assistance from Dr. Sheldon Margen, a nutritionist with the University of California in Berkeley, who is traveling outside the country today.

I want to thank each of these people personally for their help and their spirted concern for the public interest.

The Committee will continue its investigation into the connection between diet and health on February 1 and 2, when hearings will be held concentrating on problems of diet and heart disease and obesity.

After the presentation today we will be glad to answer questions.

[Press Conference, Friday, January 14, 1977, Room 457, Dirksen Senate Office Building]

STATEMENT OF DR. D. M. HEGSTED, PROFESSOR OF NUTRITION, HARVARD SCHOOL OF PUBLIC HEALTH, BOSTON, MASS.

The diet of the American people has become increasingly rich—rich in meat, other sources of saturated fat and cholesterol, and in sugar. There will be people who will contest this statement. It has been pointed out repeatedly that total sugar use has remained relatively constant for a number of years. We would emphasize, however, that our total food consumption has fallen even though we still eat too much relative to our needs. Thus, the proportion of the total diet contributed by fatty and cholesterol-rich foods and by refined foods has risen. We might be better able to tolerate this diet if we were much more active physically, but we are a sedentary people.

It should be emphasized that this diet which affluent people generally consume is everywhere associated with a similar disease pattern—high rates of ischemic heart disease, certain forms of cancer, diabetes, and obesity. These are the major causes of death and disability in the United States. These so-called degenerative diseases obviously become more important now that infectious diseases are, relatively speaking, under good control. I wish to emphasize that these diseases undoubtedly have a complex etiology. It is not correct, strictly speaking, to say that they are caused by malnutrition but rather that an inappropriate diet contributes to their causation. Our genetic make-up contributes—not all people are equally susceptible. Yet those who are genetically susceptible, most of us, are those who would profit most from an appropriate diet. Diet is one of the things that we can change if we want to.

There will undoubtedly be many people who will say we have not proven our point; we have not demonstrated that the dietary modifications we recommend will yield the dividends expected. We would point out to those people that the diet we eat today was not planned or developed for any particular purpose. It is a happenstance related to our affluence, the productivity of our farmers and the activities of our food industry. The risks associated with eating this diet are demonstrably large. The question to be asked, therefore, is not why should we change our diet but why not? What are the risks associated with eating less meat, less fat, less saturated fat, less cholesterol, less sugar, less salt, and more fruits, vegetables, unsaturated fat and cereal products—especially whole grain cereals. There are none that can be identified and important benefits can be expected.

Ischemic heart disease, cancer, diabetes and hypertension are the diseases that kill us. They are epidemic in our population. We cannot afford to temporize. We have an obligation to inform the public of the current state of knowledge and to assist the public in making the correct food choices. To do less is to avoid our responsibility.

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[Press Conference, Friday, January 14, 1977, Room 457, Dirksen Senate Office Building]

STATEMENT OF DR. BEVERLY WINIKOFF, ROCKEFELLER FOUNDATION, NEW YORK, N.Y.

What are the implications of these dietary goals?

The fact that the goals can be stated in nutritional terms first and then mirrored in a set of behavioral changes impels a closer look at why Americans eat the way they do. What people eat is affected not only by what scientists know, or by what doctors tell them, or even by what they themselves understand. It is affected by Government decisions in the area of agricultural policy, economic and tax policy, export and import policy, and involves questions of good production, transportation, processing, marketing, consumer choice, income and education, as well as food availability and palatability. Nutrition, then, is the end result of pushes and pulls in many directions, a response to the multiple forces creating the "national nutrition environment."

Even "personal dietary preferences" are not immutable but interact with other forces in the environment and are influenced by them. People learn the patterns of their diet not only from the family and its sociocultural background, but from what is available in the marketplace and what is promoted both formally through advertising and informally through general availability in schools, restaurants, supermarkets, work places, airports, and so forth.

It is generally recognized with regard to the overall economic climate that both what the Government does do and what it does not do shape the arena in which other forces interact. This is also true with regard to nutrition. In determining the parameters of the socioeconomic system, Government also determines the nature of the national buffet. Government policy, then, must be made with full awareness of this responsibility.

It is increasingly obvious that if new knowledge is to result in new behaviors then people must be able to act, without undue obstacles, in accordance with the information that they learn. The problem of education for health as it has been practiced is that it has been in isolation, not to say oblivion, of the real pressures, expectations, and norms of society which mold and constrain individual behavior. There must be some coordination between what people are taught to do and what they can do. Part of the responsibility for this coordination rests with the Government's evaluation and coordination of its own activities. Effective education must be accompanied by Government policies which make it easier, indeed likely, that an individual will change his or her lifestyle in accordance with the information offered.

At present, we see a situation in which the opposite is often the case. Nutrition and health education are offered at the same time as barrages of commercials for soft drinks, sugary snacks, high-fat foods, cigarettes and alcohol. We put candy machines in our schools, serve high-

fat lunches to our children, and place cigarette machines in our work places. 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 likely to improve national nutritional health.

This trend can be reversed by specific agricultural policies, pricing policies, and marketing policies, as well as the recommendations outlined in these "Dietary Goals for the United States."

In general, Americans have quite accurate perceptions of sound nutritional principles, as was demonstrated recently by a Harris poll conducted for the Mount Sinai Hospital in Chicago. However, people do lack understanding of the consequences of nutrition-related diseases. There is a widespread and unfounded confidence in the ability of medical science to cure or mitigate the effects of such diseases once they occur. Appropriate public education must emphasize the unfortunate but clear limitations of current medical practice in curing the common killing diseases. Once hypertension, diabetes, arteriosclerosis of heart disease are manifest, there is, in reality, very little that medical science can do to return a patient to normal physiological function. As awareness of this limitation increases, the importance of prevention will become all the more obvious.

But prevention is not possible solely through medical interventions. It is the responsibility of government at all levels to take the initiative in creating for Americans an appropriate nutritional atmosphere—one conducive to improvement in the health and quality of life of the American people.

[Press Conference, Friday, January 14, 1977, Room 457, Dirksen Senate Office Building]

STATEMENT OF DR. PHILIP LEE, PROFESSOR OF SOCIAL MEDICINE AND DIRECTOR, HEALTH POLICY PROGRAM, UNIVERSITY OF CALIFORNIA, SAN FRANCISCO, CALIF.

The publication of *Dietary Goals for the United States* by the Senate Select Committee on Nutrition and Human Needs is a major step forward in the development of a rational national health policy. The public health problems related to what we eat are pointed out in *Dietary Goals*. More important, the steps that can and should be taken by individuals, families, educators, health professions, industry and Government are made clear.

As a Nation we have come to believe that medicine and medical technology can solve our major health problems. The role of such important factors as diet in cancer and heart disease has long been obscured by the emphasis on the conquest of these diseases through the miracles of modern medicine. Treatment not prevention, has been the order of the day.

The problems can never be solved merely by more and more medical care. The health of individuals and the health of the population is determined by a variety of biological (host), behavioral, sociocultural and environmental factors. None of these is more important than the food we eat. This simple fact and the importance of diet in health and disease is clearly recognized in *Dietary Goals for the United States.*

The Senate Select Committee on Nutrition and Human Needs has made four recommendations to encourage the achievement of the very sound dietary goals incorporated in the report. These are:

1. a large scale public nutrition education program involving the schools, food assistance programs, the Extension Service of the Department of Agriculture and the mass media;
2. mandatory food labeling for all foods;
3. the development of improved food processing methods for institutional and home use; and
4. expanded federal support for research in human nutrition.

It is important that *Dietary Goals for the United States* be made widely available because it is the only publication of its kind and it will be an invaluable resource for parents, school teachers, public health nurses, health educators, nutritionists, physicians and others who are involved in providing people with information about the food they eat.

The recommendations, if acted upon promptly by the Congress, can help individuals, families and those responsible for institutional food services (schools, hospitals) be better informed about the consequences of present dietary habits and practices. Moreover, they provide a practical guide for action to improve the unhealthy situation that exists.

The effective implementation of the Senate Select Committee recommendations and the proposed dietary goals could have profound health and economic benefits. Not only would many people lead longer and healthier lives but the reduced burden of illness during the working lives of men and women would reduce the cost of medical care and increase productivity.

What can be done to assure sustained and effective action on these recommendations? First, the Congress can act to appropriate the needed funds for the proposed programs. In some instances, such as mandatory food labeling, it must also enact the authorizing legislation. Second, the new Secretaries of Agriculture and Health, Education, and Welfare can act as soon as they take office to create a joint policy committee to address the issues raised by the Senate Select Committee and provide a means to assure that health considerations will no longer take a back seat to economic considerations in our food and agriculture policies. Finally, our greatest bulwark against the interests that have helped to create the present problems is an informed public.

PART I

DIETARY GOALS FOR THE UNITED STATES

INTRODUCTION

During this century, the composition of the average diet in the United States has changed radically. Complex carbohydrates—fruit, vegetables and grain products—which were the mainstay of the diet, now play a minority role. At the same time, fat and sugar consumption have risen to the point where these two dietary elements alone now comprise at least 60 percent of total calorie intake, up from 50 percent in the early 1900's.[1]

In the view of doctors and nutritionists consulted by the Select Committee, these and other changes in the diet amount to a wave of malnutrition—of both over- and under-consumption—that may be as profoundly damaging to the Nation's health as the widespread contagious diseases of the early part of the century.

The over-consumption of fat, generally, and saturated fat in particular, as well as cholesterol, sugar, salt and alcohol have been related to six of the ten leading causes of death: Heart disease, cancer, cerebrovascular disease, diabetes, arteriosclerosis and cirrhosis of the liver.

In his testimony at the Select Committee's July 1976 hearings on the relationship of diet to disease, Dr. D. Mark Hegsted of Harvard School of Public Health, said:

> 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.

The over-consumption of food in general has become a major public health problem. In testimony at the same hearings, Dr. Theodore Cooper, Assistant Secretary for Health, estimated that about 20 percent of all adults in the United States "are overweight to a degree that may interfere with optimal health and longevity."

At the same time, current dietary trends may also be leading to malnutrition through under-nourishment. Fats and sugar are relatively low in vitamins and minerals. Consequently, diets reduced to control weight and/or save money, but which are high in fat and sugar, are likely to lead to vitamin and mineral deficiencies. As will be discussed later, low-income people may be particularly susceptible to inducements to consume high-fat/high-sugar diets.

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[1] The food supply estimates are based on Department of Agriculture data showing the amounts of food that "disappear" into civilian channels. These figures, while not on an ingested basis, provide the best current measure of food use.

In testimony before the Select Committe in 1972, Dr. George Briggs, professor of nutrition at the University of California, Berkeley, estimated, based on a study by the Department of Agriculture, that improved nutrition might cut the Nation's health bill by one-third. The Department of Health, Education and Welfare's "Forward Plan for Health, Fiscal Year 1978–82," reports that health care expenditures in the United States in fiscal year 1975 totalled about $118.5 billion and predicts the cost could exceed $230 billion by fiscal year 1980.

Beyond the monetary saving, it is obvious then that improved nutrition also offers the potential for prevention of vast suffering and loss of productivity and creativity.

One in three men in the United States can be expected to die of heart disease or stroke before age 60 and one in six women. It is estimated that 25 million suffer from high blood pressure and that about 5 million are afflicted by diabetes mellitus.[2]

Furthermore, a Department of Agriculture report prepared in 1971 suggests that substantial improvement in the Nation's health may be derived from improved nutrition, estimating, for example, a 25-percent reduction in heart and vasculatory problems through dietary changes (Appendix A).

Given the wide impact on health that has been traced to the dietary trends outlined, it is imperative, as a matter of public health policy, that consumers be provided with authoritative dietary guidelines or goals that will encourage the most healthful selection of foods.

Such goals may be controversial. First, they must be based primarily on epidemiological evidence, findings of associations between certain dietary factors and incidence of disease. In addition, it would be helpful to base these goals on more current data on food consumption and health in the United States. Unfortunately, the nutrition surveys being conducted by the Departments of Agriculture, and Health, Education, and Welfare will not report findings until 1978 at the earliest. It is also doubtful that the surveys, because of their structures, timing and lack of funding and coordination, will be able to make useful correlations between food consumption patterns and health. Finally, regardless of epidemiological findings and survey results there will be honest professional disagreement over prescribed action.

Marc LaLonde, Canada's Minister of National Health and Welfare, speaks to this kind of problem in "A New Perspective on the Health of Canadians," published in 1974:

> 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 promotors to sit on their hands; it certainly makes it easy for those who abuse their health to find a real "scientific" excuse.
>
> But many of Canada's health problems are sufficiently pressing that action has to be taken even if all scientific evidence is not in.

Based on (1) the Select Committee's July 1976 hearings on the relationship of diet to disease and its 1974 National Nutrition Policy hearings, (2) guidelines established by governmental and professional bodies in the United States and at least eight other nations (Appendix

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[2] Statistics from reports and testimony presented to the Select Committee's National Nutrition Policy hearings, June 1974, appearing in National Nutrition Policy Study, 1974, Pt. 6, June 21, 1974, heart disease, p. 2633; high blood pressure, p. 2529, diabetes, p. 2523.

B), and (3) a variety of expert opinion, the following dietary goals are recommended for the United States. Although genetic and other individual differences mean that these guidelines may not be applicable to all, there is substantial evidence indicating that they will be generally beneficial.

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U.S. DIETARY GOALS

1. Increase carbohydrate consumption to account for 55 to 60 percent of the energy (caloric) intake.

2. Reduce overall fat consumption from approximately 40 to 30 percent of energy intake.

3. Reduce saturated fat consumption to account for about 10 percent of total energy intake; and balance that with poly-unsaturated and mono-unsaturated fats, which should account for about 10 percent of energy intake each.

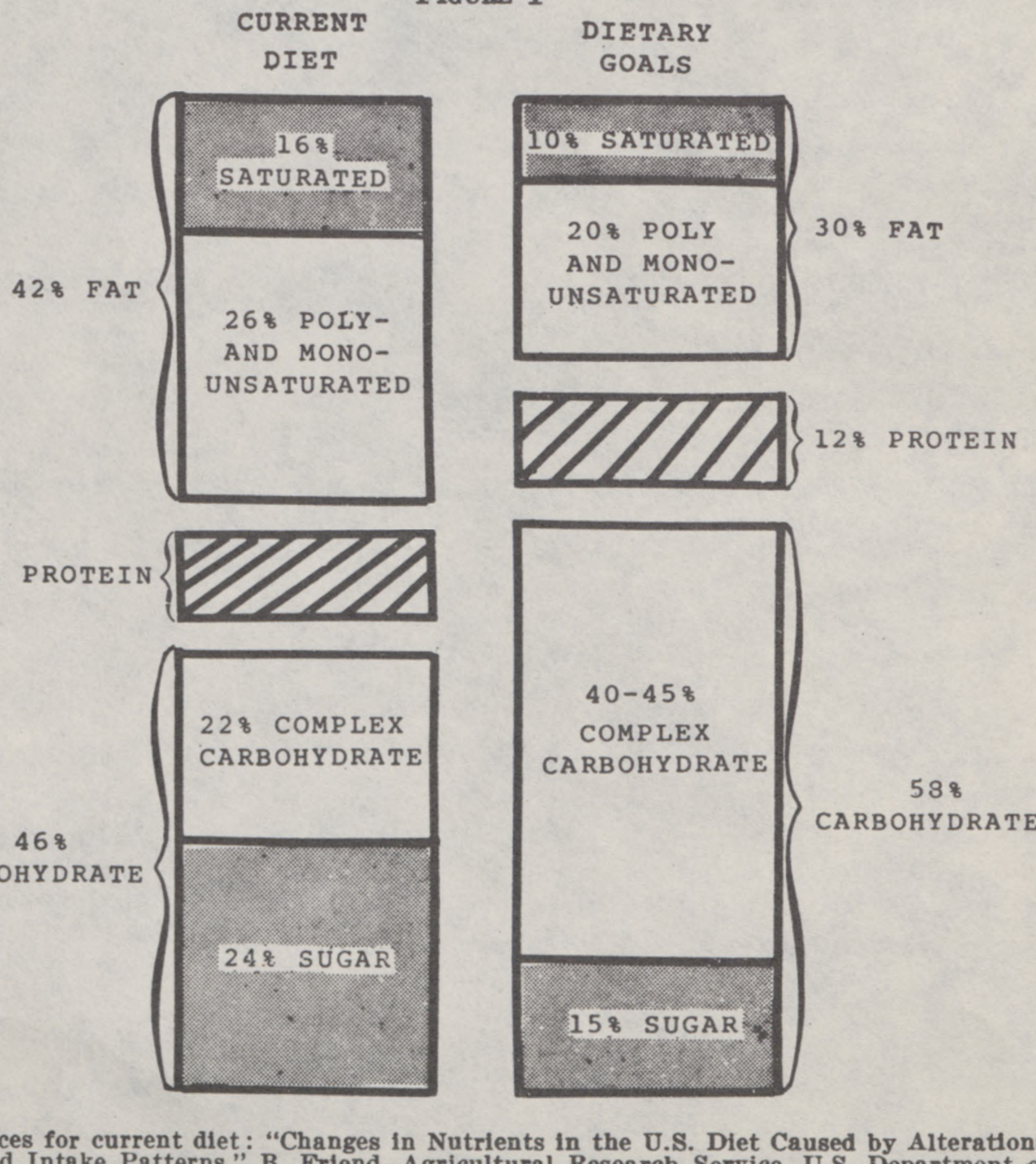
4. Reduce cholesterol consumption to about 300 mg. a day.

5. Reduce sugar consumption by about 40 percent to account for about 15 percent of total energy intake.

6. Reduce salt consumption by about 50 to 85 percent to approximately 3 grams a day.

The goals are expressed graphically in Figure 1.

FIGURE 1



Sources for current diet: "Changes in Nutrients in the U.S. Diet Caused by Alterations in Food Intake Patterns." B. Friend. Agricultural Research Service. U.S. Department of Agriculture, 1974. Proportions of saturated versus unsaturated fats based on unpublished Agricultural Research Service data.

The Goals Suggest the Following Changes in Food Selection and Preparation

1. Increase consumption of fruits and vegetables and whole grains.
2. Decrease consumption of meat and increase consumption of poultry and fish.
3. Decrease consumption of foods high in fat and partially substitute poly-unsaturated fat for saturated fat.
4. Substitute non-fat milk for whole milk.
5. Decrease consumption of butterfat, eggs and other high cholesterol sources.
6. Decrease consumption of sugar and foods high in sugar content.
7. Decrease consumption of salt and foods high in salt content.

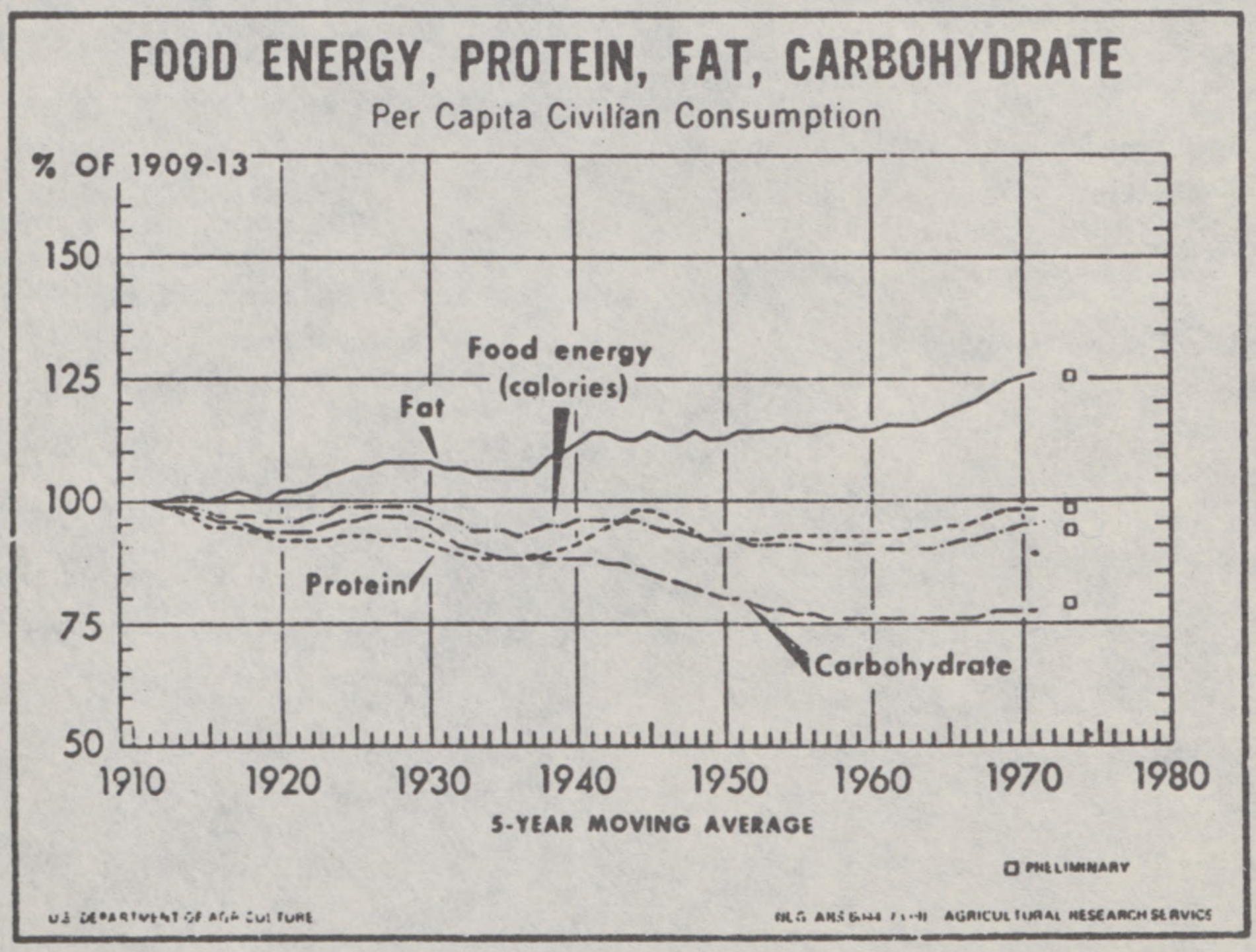
EXPLANATION OF GOALS

GOAL 1. INCREASE CARBOHYDRATE CONSUMPTION TO ACCOUNT FOR APPROXIMATELY 55 TO 60 PERCENT OF THE ENERGY (CALORIC) INTAKE

Carbohydrates have until relatively recently been the principal source of human energy. Of the two basic carbohydrate energy providers—starch and sugar—starch was the main energy source.

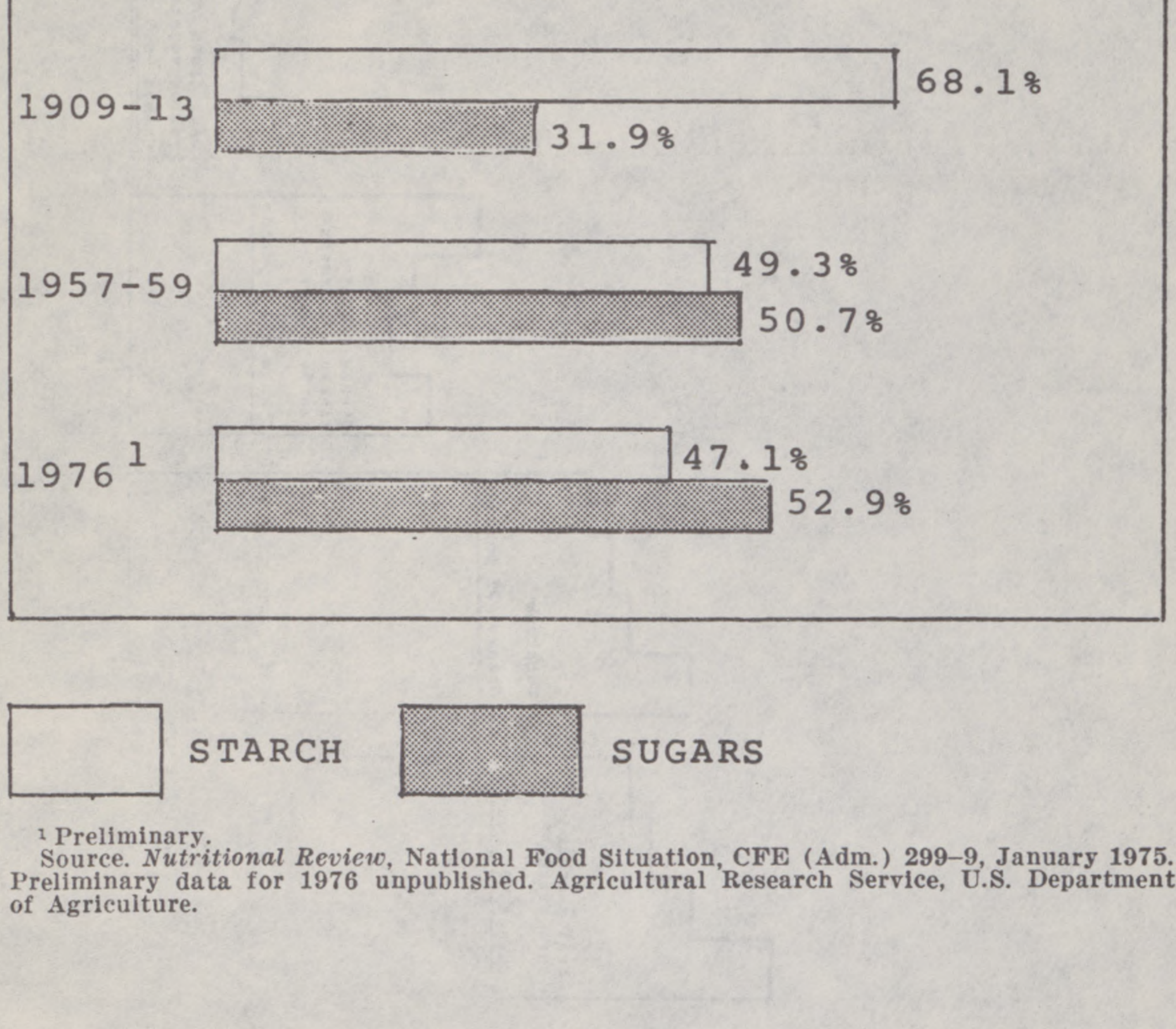
However, as Figures 2 and 3 show, carbohydrates, and starch (or complex carbohydrates) within that grouping, have lost their predominant place in the diet. Figure 4 shows the declines in consumption of specific complex carbohydrate sources since World War II. (These estimates of consumption are based on Department of Agriculture "disappearance" data, that is, reports of amounts of commodities sold rather than direct food consumption survey data.)

FIGURE 2



Source: "Changes in Nutrients in the U.S. Diet Caused by Alterations in Food Intake Patterns," B. Friend. Agricultural Research Service. U.S. Department of Agriculture.

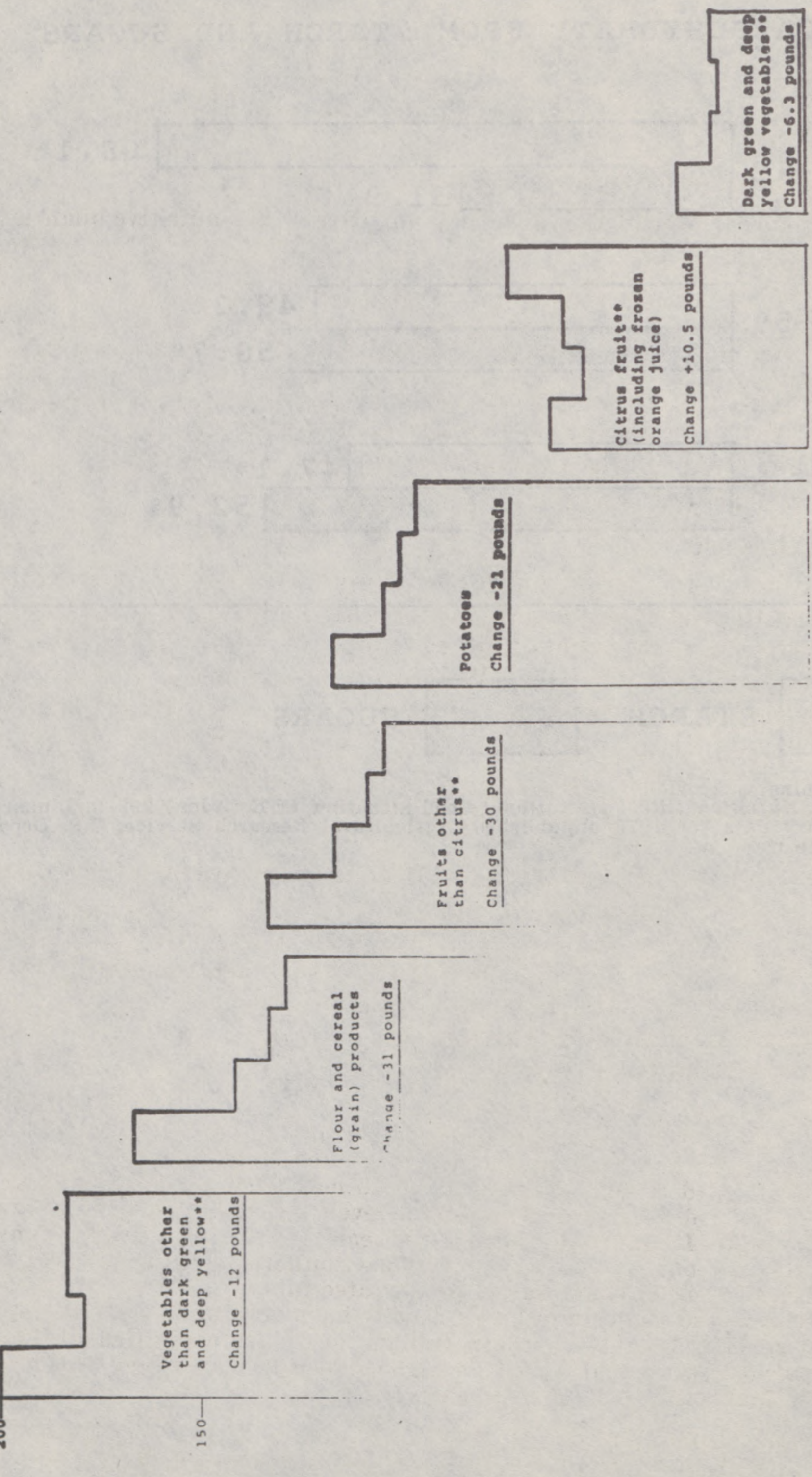
FIGURE 3



[1] Preliminary.

Source. *Nutritional Review*, National Food Situation, CFE (Adm.) 299–9, January 1975. Preliminary data for 1976 unpublished. Agricultural Research Service, U.S. Department of Agriculture.

FIGURE 4.—Changes in pounds (per capita, per year) of complex carbohydrates consumed between 1947–49 and 1976.



*Estimate.
**Fresh plus processed.

Source: Based on statistics in Nutritional Reviews CFE (Adm.) 299–11. January 1977. Agricultural Research Service, U.S. Department of Agriculture.

There are several apparent reasons for the decreasing consumption of complex carbohydrates. A key factor may be the rise in real income, permitting a movement away from diets high in greens, beans and whole grains which had been enforced by economics.

In addition, there is a relatively small amount of advertising of fruits, vegetables and whole grains. This point was raised by Dr. Joan Gussow, chairperson of the Program in Nutrition at Teachers College, Columbia University, at the Select Committee hearings in 1974 on National Nutrition Policy:

> No amount of information about the nutritive or non-nutritive qualities of the foods advertised will compensate for the total imbalance in the nature of the foods advertised on television. The nature of the foods advertised is largely highly processed foods, many of them snack foods, highly sugared, highly salted . . . We should have advertising of fruits and vegetables. They should be public service announcements selling people on those components of the diet which, in fact, they are not currently being sold on—dairy products, beans and rice and grains, and other forms of protein foods . . . And all these foods don't get sold because they do not have a high enough mark-up.

The emphasis of food advertising is discussed in detail in Part II of this report.

Heart Disease

The displacement of complex carbohydrates—fruit, vegetables and whole grains—may be a danger to health for several reasons. First, there is evidence that diets high in complex carbohydrates may reduce the risk of heart disease. Drs. William E. and Sonja J. Connor, writing in "Present Knowledge in Nutrition," published in 1976 by the Nutrition Foundation, report:

> Most population groups with a low incidence of coronary heart disease consume from 65 percent to 85 percent of their total energy in the form of carbohydrate derived from whole grains (cereals) and tubers (potatoes).

This point is made also by Dr. Jeremiah Stamler, chairman of the Department of Community Health and Preventive Medicine at Northwestern University, in "Atherosclerosis," a publication designed to educate doctors on the relationship of diet to heart disease. He argues that moderate carbohydrate consumption does not elevate blood triglyceride and cholesterol levels but, in fact, apparently results in reduction in these risk factors. He reports:

> My research colleague, Mario Mancini, has demonstrated that blood triglyceride and cholesterol levels are lower in southern Italians than in Britons, Swedes or Swiss despite the fact that their carbohydrate intake is higher—55 to 60 percent of calories instead of 40 to 55 percent—with most of it coming from starch.
>
> Diet makes a difference in cholesterol levels as evidenced by the low levels among southern Italian workingmen who eat very little saturated (animal or dairy) fats, as compared to the upper-income southern Italians, northern Italians and Americans—all of whom eat more saturated fats.
>
> Triglyceride and cholesterol levels usually have nothing to do with population or racial genetics because southern Italians who have emigrated to the United States develop the typical American higher blood levels as they become able to afford the high-saturated fat, high-cholesterol American diet.

In their report, Drs. Connor conclude that: high carbohydrate diets are quite appropriate for both normal individuals and for most of those with hyperlipidemia (high levels of fat in the blood), provided that the carbohydrate is largely derived from grains and tubers, that an energy excess is not consumed and that adiposity does not result.

The use of high carbohydrate diets by civilized man has an historical basis, is economically sound and shows clear indications of causing less, rather than more, disease, especially in the coronary heart disease-hyperlipidemia area.

Diabetes

The Connors also report that the high complex carbohydrate diet is important in the treatment of diabetics because it reduces the threat of atherosclerosis and hyperlipidemia, which are common to diabetics, by lowering cholesterol and saturated fat levels. The Connors note that some diabetics find a high carbohydrate diet also results in improved glucose tolerance; in others insulin requirements have been stabilized.

Fiber

A diet high in carbohydrate may also be beneficial with respect to fiber. Fiber may be divided generally into two categories, according to Dr. P. J. Van Soest, of the Department of Animal Science at Cornell University, the more mature, less fermentable and digestible bran fiber from grains, and the less mature, more fermentable and digestible fiber from fruits and vegetables. It is probable, he says, that both kinds of fiber are important to nutrition, but relatively little is known about the properties of fiber and its role in nutrition.

Dr. Denis P. Burkitt, among the first advocates of the high fiber diet, has postulated that an increase in fiber consumption, preferably natural fiber rather than fiber added to refined products such as white bread, will markedly reduce the incidence of bowel cancer and other diseases, primarily those of the intestine.

Vitamin and Mineral Sources

Increased consumption of fruit, vegetables and whole grains is also important with respect to supplying adequate amounts of micro-nutrients, vitamins and minerals. This is particularly important for those who are limiting their food intake to control weight or save money. For many people consumption may be reaching a critical level below which it may be difficult to obtain adequate levels of micro-nutrients from the volumes of food consumed. Under these circumstances, it is essential to eat foods that maximize the potential for consuming a broad range of micro-nutrients.

Fats and sugars, the principal dietary elements that have displaced complex carbohydrates, are, as Table 1 shows, relatively poor sources of micro-nutrients, particularly in view of the levels of calories they induce.

TABLE 1.—NUTRIENT LEVELS IN FATS AND SUGARS

[Nutrients in edible portion of 1 pound of food as purchased]

	Food energy (calories)	Proteins (grams)	Fat (grams)	Carbohydrates (grams)	Calcium (milligrams)	Phosphorus (milligrams)	Iron (milligrams)	Sodium (milligrams)	Potassium (milligrams)	Vitamin A (I.U.)	Thiamine (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)	Asorbic acid (milligrams)
Fats:														
Butter	3,248	2.7	367.0	1.8	91	73	0	4,477	104	15,000				0
Lard	4,091	0	454.0	0	0	0	0	0	0	0	0	0	0	0
Cooking and salad oils	4,010	0	454.0	0	0	0	0	0	0	----------	0	0	0	0
Sugars:														
Beet or cane, brown	1,692	0	0	437.3	386	86	15.4	136	1,560	0	0.05	0.15	0.8	0
Granulated	1,746	0	0	451.3	0	0	.5	5	14	0	0	0	0	0
Powdered	1,746	0	0	451.3	0	0	.5	5	14	0	0	0	0	0
Dextrose crystallized	1,520	0	0	413.0			Trace			0	0	0	0	0
Maple	1,579			408.0	649	50	6.4	64	1,098					0
Apple (fresh)	252	.8	2.5	60.5	29	42	1.3	4	459	380	.12	.08	.3	16
Orange (fresh)	180	5.8	1.3	69.6	314	99	3.6	9	880	1,120	.45	.22	2.2	319

Source: U.S. Department of Agriculture, Handbook 8.

It is important to note that knowledge of the full range of micronutrients has not been developed. For example, inquiry is only beginning into the function of elements such as chromium, selenium, vanadium and others, which appear to have important regulatory functions in and between cells. Furthermore, there is only limited knowledge of human requirements for most nutritients, as shown in Appendix C, prepared by the Department of Agriculture.

Consequently, although vitamin and mineral supplements and nutrient fortification may improve chances for obtaining micro-nutrients, they cannot be seen as substitutes for food. Nor should they be seen as a means of continuing a high-fat, high-sugar diet. This course not only maintains a pattern shown to be dangerous with respect to fat intake but one which may mean loss of important micro-nutrients.

Obesity

Finally, an increase in the consumption of complex carbohydrates is likely to ease the problem of weight control. As suggested above, displacing fat and sugar reduces the risk of obesity. Furthermore, the high water content and bulk of fruits and vegetables and bulk of whole grain can bring satisfaction of appetite more quickly than do foods high in fat and sugar.

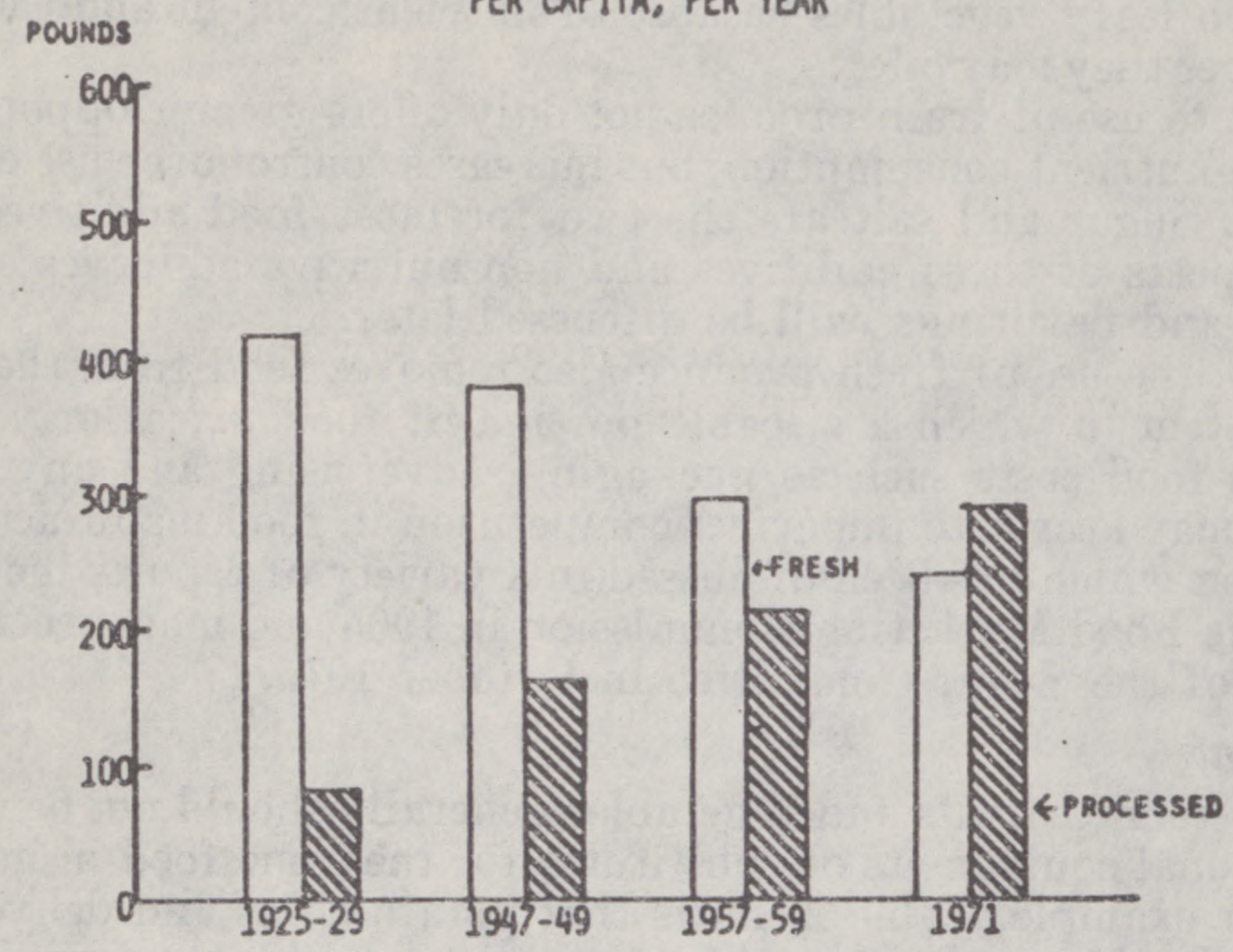
Guide to Increasing Complex Carbohydrate Consumption

1. FRUIT AND VEGETABLES

A Department of Agriculture report published in 1972 found that nutrient availability from fruits and vegetables had declined with increased use of canned, frozen and dried produce and shifts in consumption away from such vegetables as white and sweet potatoes, dark green and yellow vegetables, dry beans and dry peas, and grain products. The report, entitled "Trends in Fresh Fruit and Vegetable Consumption and Their Nutritional Implications," said:

The shift from the uses of fresh fruits and vegetables to processed (shown in Figure 5), as well as changes in selection among different fruits and vegetables, have resulted in some significant trends in nutrients obtained from this food group. The amount of vitamin A obtained from fruits and vegetables has declined 11 percent since 1925–29, and 18 percent since 1947–49. Vitamin B_6 and magnesium declined by nearly 20 percent since 1925–29, while the amount of thiamin obtained from fruits and vegetables declined almost 10 percent.

FIGURE 5.—Trends in consumption of fresh and processed fruits and vegetables.[1]



[1] Includes potatoes and sweet potatoes.

Source: "Trends in Fresh Fruit and Vegetable Consumption, Nutritional Qualities of Fresh Fruits and Vegetables," Futura Publishing Co., Mount Kisco, N.Y., 1974.

It appears that increased consumption of fresh fruits and vegetables, particularly the high nutrient forms, would be beneficial for many persons in need of dietary improvement. Educating consumers, particularly those of low incomes, to the greater advantage of the most economical and most nutritious fruits and vegetables, would offer a great potential for dietary improvement.

If fruits and vegetables are used directly from the garden, it is likely that their nutrient content will exceed that of their processed counterparts, as indicated in a report by Dr. Owen Fennema, professor of Food Chemistry at Northwestern University, appearing in "Nutritional Evaluation of Food Processing." However, he and other experts say that fresh fruits and vegetables in the supermarket may have undergone nutrient-depletion in shipping and storage, and consequently frozen varieties may provide equivalent or better nutritional values. A similar position is taken in "Diet and Exercise," published by the Swedish government to promote its nutrition and physical fitness program, which says: "Deep frozen and fresh vegetables are of equal value from a nutritional point of view."

On the other hand, it is also true that although considerable knowledge has been gathered about the nutritional impact of freezing, canning and other processing, this knowledge is not held for all nutrients, all foods or all processes. Furthermore, it is important to understand the degree of our ignorance about what constitutes food value. Out of more than 50 known nutrients, Recommended Dietary Allowances have been established for only 17. In addition, there is no definitive evidence that food composition described solely in terms of all known nutrients would be an accurate measure of total food value.

Consequently, it would seem advisable to create at least an even balance in the diet between the fresh and frozen produce. (Canned produce has significant nutritional value but is generally thought to

have retained less nutrients than frozen or fresh.)[2] In addition, it would appear to be prudent to increase consumption of potatoes and dark green leafy vegetables because of nutrient content and the varieties of fiber they may offer.

A shift to use of fresh produce not only offers greater opportunity for micro-nutrient consumption, but increases control over use of food additives. Sugar and salt are the two foremost food additives. The health aspects of these additives and non-nutritive additives such as colorings and flavorings, will be discussed later.

Finally, the use of fresh produce also removes food from the processing system in which a sizeable portion of food prices may result from non-food costs such as packaging, advertising and any added cost that may accrue to imperfect competition in food manufacturing, a condition which has been discussed in a variety of reports including that of the Food Marketing Commission in 1965 and more recently at hearings of the Select Committee in October 1975.

Refinement

Highly-refined fruits and vegetables generally should not be viewed as nutritional equivalents or substitutes for the same food in its fresh form. For example, Table 2 shows that potato chips and dehydrated potatoes should not be thought of as the nutritional equivalent of fresh, baked potatoes. In addition, it is apparent that potato chips carry significantly more fat than the baked or mashed form: potato chips are 40 percent fat compared to .1 percent fat in baked potatoes.

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[2] "Nutritional Evaluation of Food Processing," 1975. Nutritional Aspects of Food Processing Methods, pp. 11–15; Effects of Freeze-Preservation on Nutrients, pp. 244–288.

TABLE 2.—NUTRITIVE VALUES FOR VARIOUS FORMS OF POTATOES

Fresh	Grams	Water (percent)	Food energy (calories)	Protein (grams)	Carbo-hydrate (grams)	Fat (grams)	Iron (milligrams)	Thiamin (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)	Vitamin C (milligrams)
Baked (1 potato)	202	75.1	145	4.0	32.8	0.2	1.1	0.15	0.07	2.7	31
Mashed (1 cup, milk added)	210	82.8	137	4.4	27.3	1.5	.8	.17	.11	2.1	21
French fries (10 strips, frozen, oven heated.)	78	52.9	172	2.8	26.3	6.6	1.4	.11	.02	2.0	16
Dehydrated:											
(a) Flakes (1 cup, dry form)	45	5.2	164	3.2	37.8	.3	.8	.10	.03	2.4	14
(b) Flakes (1 cup, prepared with milk, water, table fat, salt.)	210	79.3	195	4.0	30.5	6.7	.6	.08	.08	1.9	11
Potato chips (10 chips)	20	1.8	114	1.1	10.0	8.0	.4	.04	.01	1.0	3

Source: "Nutritive Value of American Foods in Common Units; Agriculture Handbook No. 456," Agricultural, Research Service. U.S. Department of Agriculture.

Although it would be possible to restore vitamin C and certain other nutrients through fortification, it is doubtful that the numbers and balance of nutrients in the fresh form could ever be duplicated. In addition, it is not known how processing may affect fiber composition.

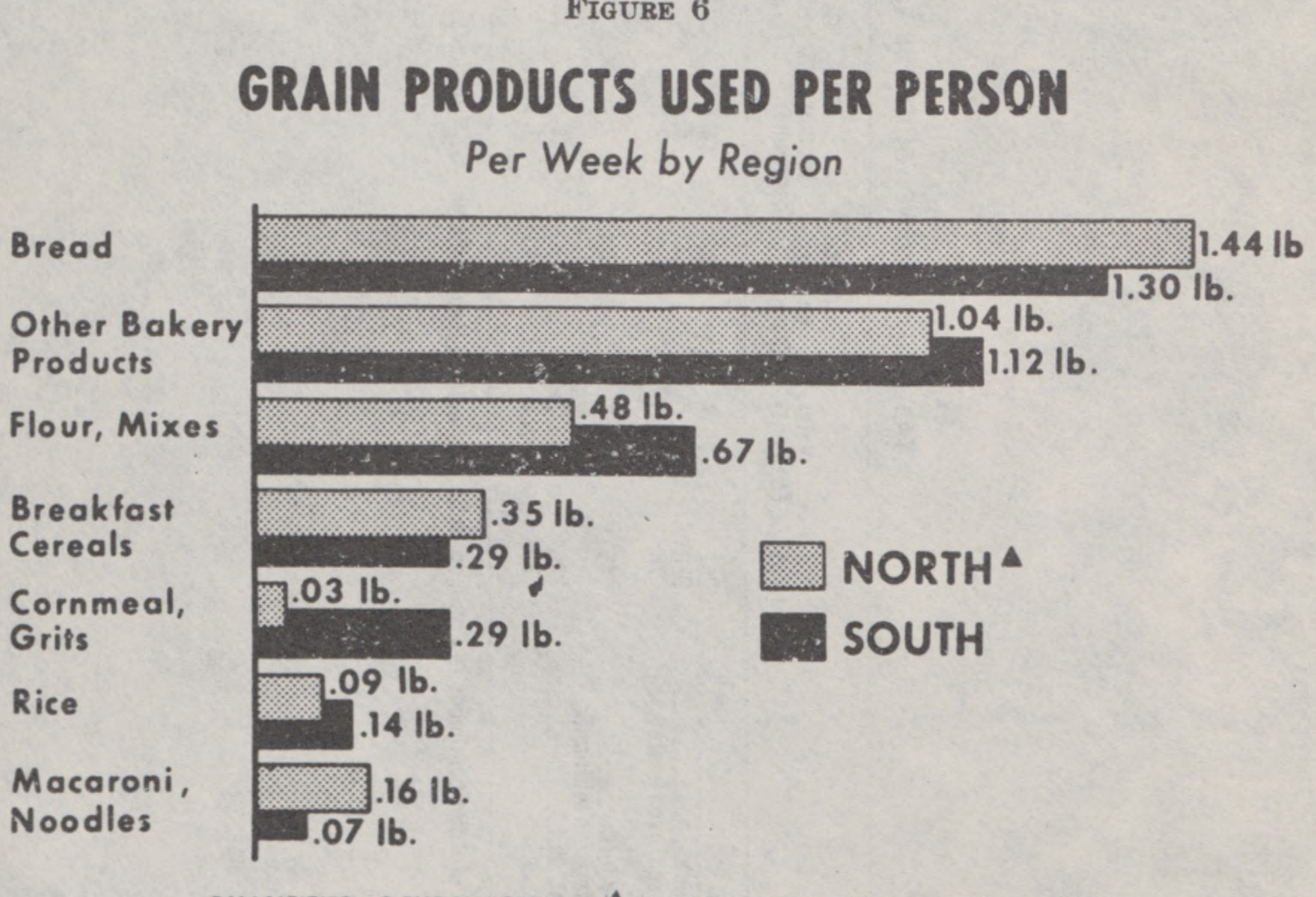
Several nutritionists and food technologists interviewed in preparation of this report said that the decline in nutrient content in various individual food items may not be important because the nutrients needed for optimal health are likely to be readily available in the great abundance of food in the marketplace.

It is important to understand, however, that several studies suggest that more than 50 percent of the United States diet undergoes some form of processing before it enters the home.[3] Given the need to maximize micro-nutrient availability for those on reduced diets; the need to ensure adequate nutrient availability to those who do not widely vary their diets; and the need to maximize the nutritional power of the food supply; it would seem prudent not only to increase use of fresh foods but also those undergoing the least processing.

2. GRAIN PRODUCTS

Of the grain products, bread is the most widely consumed (Figure 6). However, bread consumption has been declining in the United States, in part perhaps because it has been viewed, incorrectly, as fattening. Bread is of intermediate caloric density, and a relatively good protein source. Professor Olaf Mickelsen of Michigan State University, reports in "Cereal Foods World," of July 1975:

FIGURE 6



[3] "Human Nutrition," Jean Mayer, 1972, pg. 657. "Total Consumer Buying of Fresh Versus Processed Foods Remains Stable." Alden C. Manchester. Economic Research Service, U.S. Department of Agriculture, NFS–144, May 1973 (Unpublished 1975 figures show trend stable.) "Anticipating Public Policy Issues: Nutrition Diet, Health and Food Quality." Graham T. T. Molitor. Unpublished report prepared for the General Accounting Office. July 1976, pg. 164.

Contrary to what most people think, bread in large amounts is an ideal food in a weight reducing regimen. Recent work in our laboratory indicates that slightly overweight young men lost weight in a painless and practically effortless manner when they included 12 slices of bread per day in their program. That bread was eaten with their meals. As a result, they became satiated before they consumed their usual quota of calories. The subjects were admonished to restrict those foods that were concentrated sources of energy : otherwise, they were free to eat as much as they desired. In eight weeks, the average weight loss for each subject was 12.7 pounds.

Another study by Mickelsen found that 12 young men could obtain 90 to 95 percent of their protein needs from white enriched bread. In some countries bread may contribute as much as 80 percent of protein needs.

There are also arguments, though somewhat less conclusive, suggesting not only that increased bread consumption is warranted but that more whole wheat bread should be eaten. There have been no studies that have found whole wheat flour to be superior nutritionally to white flour when consumed in a normal diet, and surprisingly few studies have even considered the question. However, whole wheat bread may provide more micronutrients and definitely provides more fiber than white bread.

White bread is made from wheat that has undergone a degree of milling that removes large amounts of bran and wheat germ. A report at the 1976 Convention of the American Association of Cereal Chemists [4] estimated that the average milling level in the United States is 76 percent extraction, meaning that about 76 percent of the wheat kernel has been retained. One hundred percent extraction flour is whole wheat flour. Figure 7 shows how various levels of milling affect various micronutrients, and Table 3 from an unpublished report by Doris Baker, of the Department of Agriculture, shows the degree to which milling may reduce fiber content.

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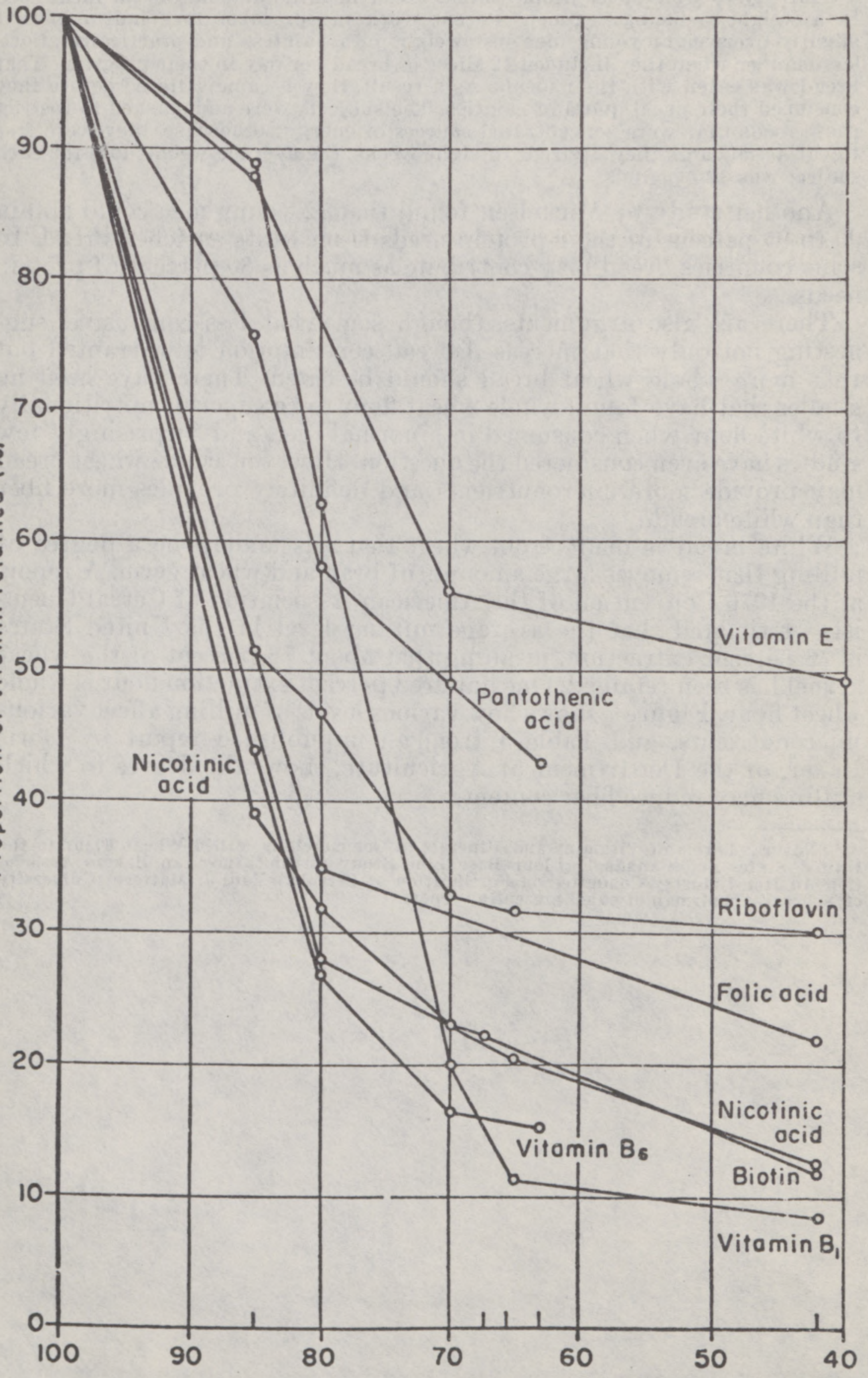
[4] "Natural Levels of Vitamins and Minerals in Commercially Milled Wheat Flour in the United States and Canada." (Flour Base Line Study for the American Bakers Association Ad Hoc Industry Commitee on Fortification of Cereals.) Paul J. Mattern, University of Nebraska, chairman of panel presenting report.

FIGURE 7



Relation between extraction rate and proportion of total vitamins of the grain retained in flour. Source: "Wheat in Human Nutrition," Food and Agriculture Organization, Rome, 1970.

TABLE 3.—FIBER CONTENT IN WHITE VS. WHOLE WHEAT BREAD

Type bread	Fiber content by various determinations			
	Crude fiber	Acid	Buffered	Neutral
White:				
No. 1	1.3	1.2	8.8	2.8
No. 2	.9	1.5	9.3	2.9
Whole:				
No. 1	2.7	2.8	12.3	6.6
No. 2	2.6	2.6	12.9	5.1
No. 3	3.2	3.1	11.5	7.3

Source: U.S. Department of Agriculture. "Fiber in Wheat Foods," a study presented by Doris Baker at 1976 Convention of the American Association of Cereal Chemists.

In bread, as with other foods undergoing processing, there is the danger that, as the degree of processing increases, nutrients, known and unknown, are removed or altered in ways not currently understood.

Conserving Resources

The reduction of milling also acts to conserve food resources, as pointed out in a compendium on bread, prepared for classroom use by Dr. Paul Seib, Associate Professor in the Department of Grain Science and Industry at Kansas State University:

> White bread represents a less efficient use of the nutrients in wheat than whole wheat. If one uses whole wheat flour instead of white flour for every 100 gm. of wheat we gain 30 g of material containing: (a) 93 kcal in bread of which 73 percent is digestible energy for a net gain of 63 kcal, and (b) 4.65 g of protein of which 73 percent is digestible for a net gain of 3.4 g of protein. Since flour-milling by-products go to animal feeds in the U.S., where they are converted to meat at an efficiency of about 10–25 percent, a loss in energy and protein value is sustained by not eating whole wheat bread.

Even greater conservation of resources might be possible if grains carried a larger share of the protein burden, as they did earlier in the century.

Selecting Grain Products

Table 4 compares nutrients offered in various grains and grain products. Table 5, from Frances Moore Lappe's "Diet for a Small Planet," offers a comparison of costs of grain protein versus other protein sources.

As is apparent in Table 4, the common sidedish rice suffers considerably in processing. The hierarchy of nutrient value in rice, from most to least, is:

Brown rice.
Parboiled (converted) rice.
Common white enriched rice.
Instant rice.

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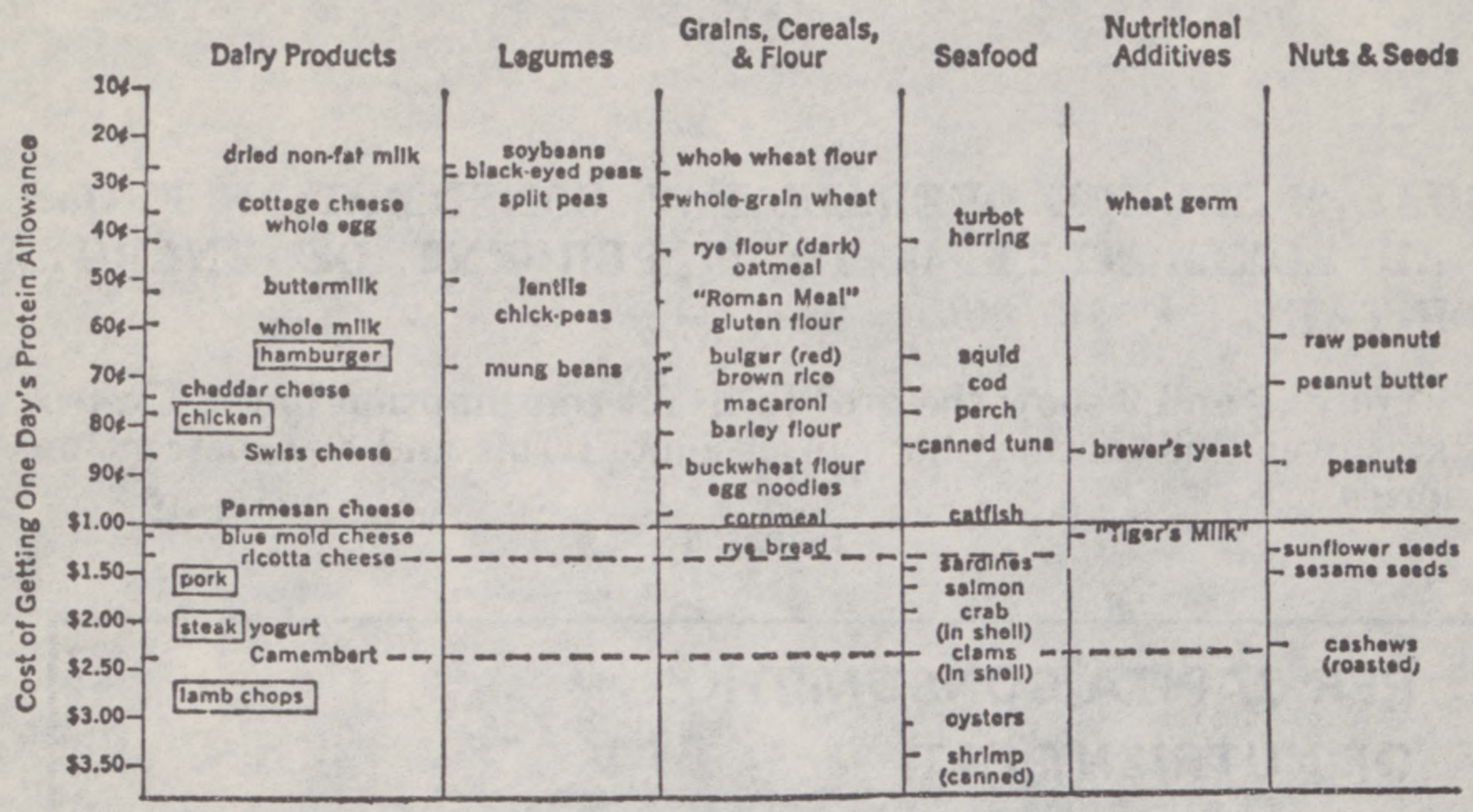
TABLE 4.—NUTRIENT CONTENT OF SELECTED GRAINS

	Water (percent)	Food energy (calories)	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Calcium (milligrams)	Phosphorus (milligrams)	Iron (milligrams)	Sodium (milligrams)	Potassium (milligrams)	Vitamin A (milligrams)	Thiamine (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)	Vitamin C (milligrams)
Whole grain wheat (Hard Red Spring)	13.0	330	14.0	2.2	69.1	36	383	3.1	(3)	370	(0)	0.57	0.12	4.3	(0)
Whole wheat flour (hard wheats)	12.0	333	13.3	2.0	71.0	41	372	3.3	3	370	(0)	.55	.12	4.3	(0)
80 percent extraction wheat flour (hard wheats)	12.0	365	12.0	1.3	74.1	24	191	1.3	2	95	(0)	.26	.07	2.0	(0)
Bread flour enriched (hard wheats)	12.0	365	11.8	1.1	74.7	16	95	[1] 2.9	2	95	(0)	[1] .44	[1] .26	[1] 3.5	(0)
Brown rice cooked	70.3	119	2.5	.6	25.5	12	73	.5	282	70	(0)	.09	.02	1.4	(0)
White rice cooked (enriched)	72.6	109	2.0	.1	24.2	10	28	[2] .9	374	28	(0)	[2] .11	([3])	[2] 1.0	(0)
White rice instant cooked (enriched)	72.9	109	2.2	Trace	24.2	3	19	[2] .8	273	Trace	(0)	[2] .13	2	[2] 1.0	(0)
Cornmeal, white or yellow unbolted (whole grain)	12	355	9.2	3.9	73.7	20	256	2.4	(1)	(284)	[4] 510	.38	.11	2.0	(0)
Cornmeal, degermed dry enriched	12	364	7.9	1.2	78.4	6	99	[1] 2.9	1	120	[4] 440	[1] .44	[1] .26	[1] 3.5	(0)
Rye (whole grain)	11	334	12.1	1.7	73.4	(38)	376	3.7	(1)	467	(0)	.43	.22	1.6	(0)
Rye flour (light)	11	357	9.4	1.0	77.9	22	185	1.1	(1)	156	(0)	.15	.07	.6	(0)

[1] Based on product with minimum level of enrichment.
[2] Values for iron, thiamin and niacin are based on the minimum levels of enrichment specified in standards of identity.
[3] Riboflavin enrichment standard pending further hearings.
[4] Based on yellow varieties.

Source: Agriculture Handbook 8. U.S. Department of Agriculture, 1963.

TABLE 5.—Protein cost



Source: Frances Moore Lappe, "Diet for a Small Planet," 1971.

Hot cooked breakfast cereals are generally less refined and processed and less expensive than ready-to-eat cereals. Of the hot cereals (wheat, rye or oat), whole grained cereals are most nutritious, according to Ruth Fremes and Dr. Zak Sabry in "NutriScore" (Fremes is a Canadian home economist and Sabry headed Nutrition Canada, that nation's recent nutrition survey). Less nutritious are cream of wheat and corn meal. The authors point out also that "instant" and "quick" hot cereals may have less nutrients than their longer-cooking counterparts.

In ready-to-eat cereals, sugar-coated cereals should be avoided, and "NutriScore" explains that granola also offers high caloric intake for the amounts of nutrients available. The book says:

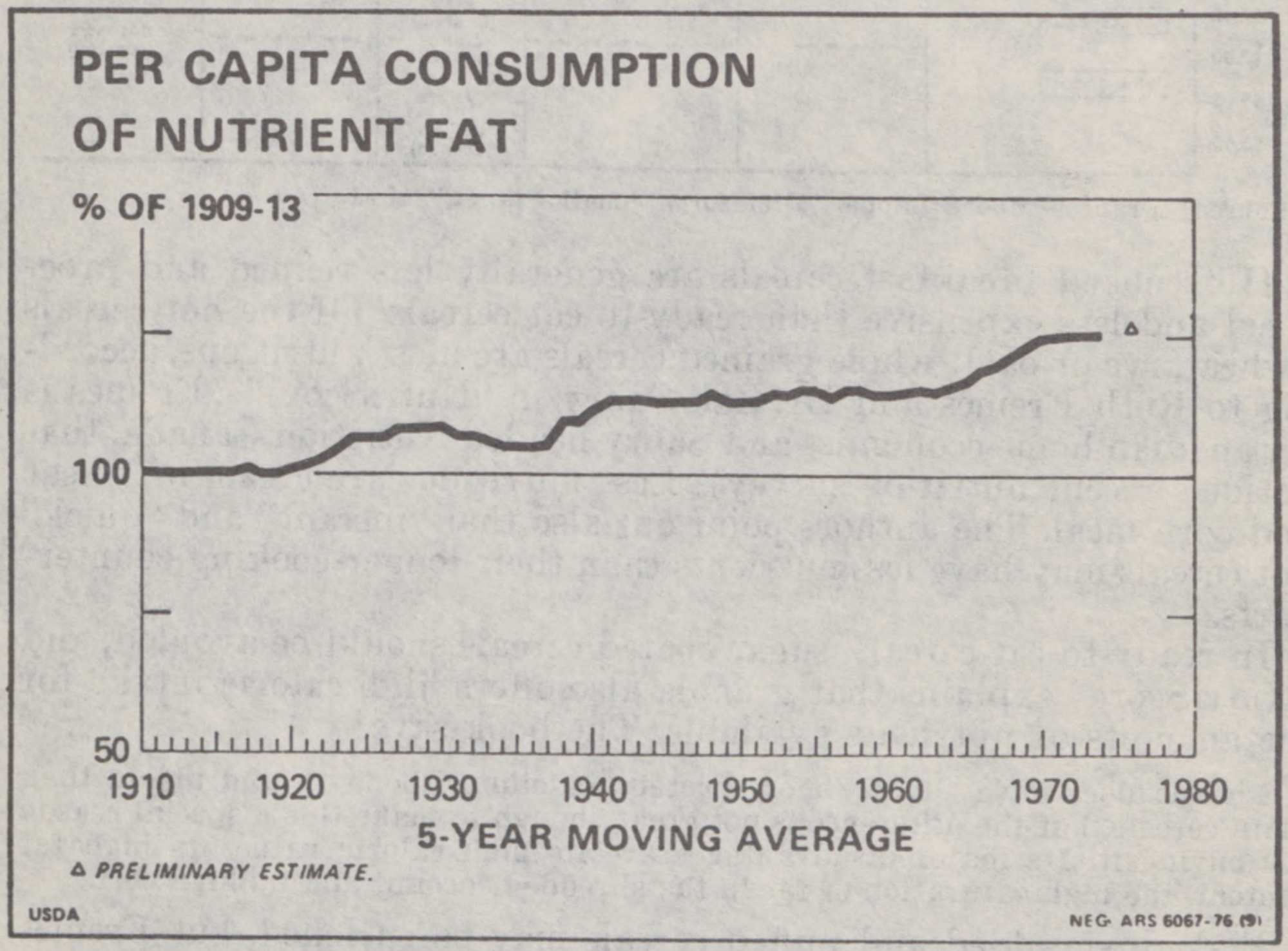
> Granola does have slightly more protein, calcium, riboflavin and niacin than plain cereals, but the difference is not great enough to make this a special reason for buying it. Its major disadvantages are its high caloric value, its high fat content, the high saturation of fat in the shredded coconut and its high cost.

Flaked, shredded and puffed cereals may be enriched, but Fremes and Sabry note that many trace elements are not added, nor is fiber, and "So, the enriched refined cereal is never as good nutritionally as the wholesome unrefined cereal."

GOAL 2. REDUCE OVERALL FAT CONSUMPTION FROM APPROXIMATELY 40 TO 30 PERCENT OF ENERGY INTAKE

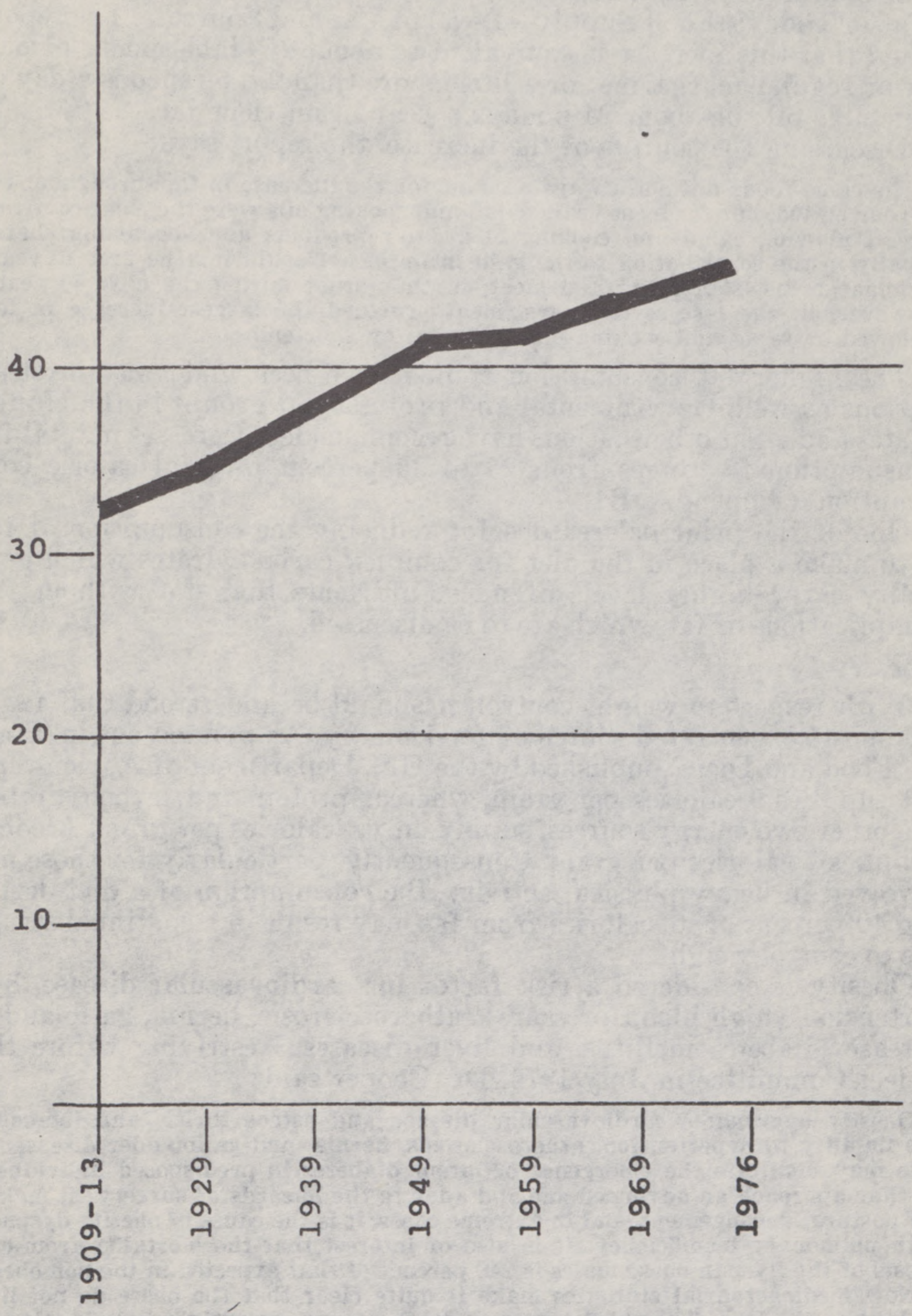
Figures 8 and 9 show the growth in fat consumption in the United States over this century, both in absolute terms and as a percent of calories.

FIGURE 8



Source: Handbook of Agricultural Charts, Agricultural Handbook No. 504, U.S. Department of Agriculture, 1976.

FIGURE 9.—Fat as a percent of calories, 1909–76



Source: *Nutrients in United States Food Supply, Review of Trends, 1909–13 to 1965.* B. Friend. The American Journal of Clinical Nutrition. Vol. 20, No. 8, August 1967, pp. 907–914. Data after 1965 unpublished, Agricultural Research Service, U.S. Department of Agriculture.

Between the beginning of the century and 1973, the amount of nutrient fat available per person per day rose from about 125 to 156 grams, according to a report by the Agricultural Research Service, "Fat in Today's Food Supply—Level of Use and Sources." The report noted that this increase is equivalent to about 2½ tablespoons of butter or regular margarine; or a little more than 2 tablespoons a day of vegetable oil; or about 24 pounds a year in nutrient fat.

Discussing the sources of the increase, the report says:

> The same foods did not always account for the increase in fat throughout the 60-year period, but for most years salad and cooking oils were the chief contributors. Following salad and cooking oils, dairy products and shortening shared equally in the contribution to the gain in nutrient fat during the first 15 years and margarine, shortening and meat, in that order during the next 40 years. However, in the last seven years, meat provided the largest increase in fat, followed by salad and cooking oils and then by shortening.

The higher fat consumption trends have been underway in other nations as well. Governmental and professional groups in the United States and eight other nations have recommended decreases in total fat consumption to ranges from 25 to 35 percent of total calorie consumption (Appendix B).

One of the principal reasons for reducing the consumption of fat is to make a place in the diet for complex carbohydrates which generally carry higher levels of micro-nutrients than fat without the complications of fat, which are to be discussed.

Obesity

With respect to weight control, it should be understood that fat is the most concentrated source of food energy. As pointed out in "Fats in Food and Diet," published by the U.S. Department of Agriculture, fat supplies 9 calories per gram, whereas protein and carbohydrates, the other two energy sources, supply only 4 calories per gram. Alcohol supplies 7 calories per gram. Consequently, particularly for those not involved in heavy physical activity, the consumption of a diet deriving 40 percent of its calories from fat may result in a continual struggle to control weight.

Obesity is considered a risk factor in: cardiovascular disease, hypertension (high blood pressure), atherosclerosis, hernia, gallbladder disease, diabetes mellitus, and liver diseases. Testifying before the Select Committee in July 1976, Dr. Cooper said:

> 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 pulmonary insufficiency. It is also of interest that the mortality from cirrhosis of the liver in obese males is 249 percent of that expected in the non-obese.
>
> Now medioactuarial 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 (the gallbladder).

Drs. Henry C. McGill and Glen E. Mott note in "Present Knowledge in Nutrition" that hyperuricemia (high levels of uric acid in the blood) has been related to obesity, and they report: "Reduction in obesity usually leads to reduction in serum lipid concentrations (reducing threat from heart disease), reduction of blood pressure

(reducing threat of stroke), and improvement in glucose tolerance (reducing the threat of diabetes).

There is strong evidence suggesting that, for those overweight, the best protection against heart disease is weight reduction. Quoting a study by Drs. Franz Ashley and William Kannel, "Relation of Weight Change to Changes in Atherogenic Traits: The Framingham Study," Dr. Beverly Winikoff of the Rockefeller Foundation, told the Select Committee at its hearings in July 1976:

> 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 the incidence of coronary disease.
>
> Conversely, each 10 percent increase in weight would result in a 30 percent increase in coronary disease.

Based on the estimate that 700,000 die in the United States each year of heart disease, Dr. Winikoff observed that a 20 percent decrease in incidence of coronary disease might save 140,000 lives a year.

Discussing the importance of obesity on heart disease, the Ashley-Kannel report says:

> The clinical and preventive implications seem clear. Weight gain is accompanied by atherogenic alterations in blood, lipids, blood pressure, uric acid and carbohydrate tolerance. It is uncertain whether the nutrient composition of excess calories, derived largely from saturated calories accompanied by cholesterol and simple carbohydrates, or the positive energy balance per se, is important. But whatever the cause, development of ordinary obesity encountered in the general population is associated with excess development of coronary heart disease.

Dr. Ernst Wynder, of the American Health Foundation, also testifying at the July hearing, noted that obesity has been found to increase the risk of cancer of the womb as well as female kidney cancer.

Cancer

In addition to the relationship of fat intake to obesity, and its apparent consequences, there is also evidence suggesting a connection between dietary fat and cancer of the breast and colon. Testifying before the Select Committee in July 1976, Dr. Gio Gori, Deputy Director of the National Cancer Institute, said:

> There is 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.

And Dr. Gori said:

> 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 are 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.

Dr. Wynder, testifying at the hearing, said that incidence of cancer seems to be related as much to unsaturated as saturated fats. As an example, he cited studies indicating that both types of fat, and cholesterol, may cause increased secretion in the breast of the hormone prolactin and that this section may induce tumors. A four-week

vegetarian diet in a group of American women resulted in a 40 to 60 percent decrease in prolactin secretion, he said.

The September 10, 1976, Washington Post noted that Dr. Bruce K. Armstrong, of Perth Medical Centre, Australia, presented to a conference at Cold Spring Harbor Laboratory in New York a report suggesting that diets high in animal fat might increase the risk of womb cancer.

Dr. Armstrong said principal risk factors included obesity, early onset of puberty, late onset of menopause, a mild case of diabetes and high blood pressure. With respect to high intake of fat, he said it may cause excessive secretion of estrogens that either cause cancer or stimulate other cancer-causing agents. He also discussed findings suggesting that vegetarian women appeared to be at reduced risk, generally experiencing earlier menopause and lower blood pressure than non-vegetarians.

A guide to reducing fat consumption follows the explanations of the saturated fat and cholesterol goals.

GOAL 3. REDUCE SATURATED FAT CONSUMPTION TO ACCOUNT FOR ABOUT 10 PERCENT OF TOTAL ENERGY INTAKE; AND BALANCE THAT WITH POLY-UNSATURATED AND MONO-UNSATURATED FATS, WHICH SHOULD ACCOUNT FOR ABOUT 10 PERCENT OF ENERGY INTAKE EACH

Figure 10, from the Department of Agriculture report, "Fat in Today's Food Supply—Level of Use and Sources," cited earlier, shows the trends in saturated, oleic (mono-unsaturated) and linoleic (poly-unsaturated fat) consumption in this century.

FIGURE 10

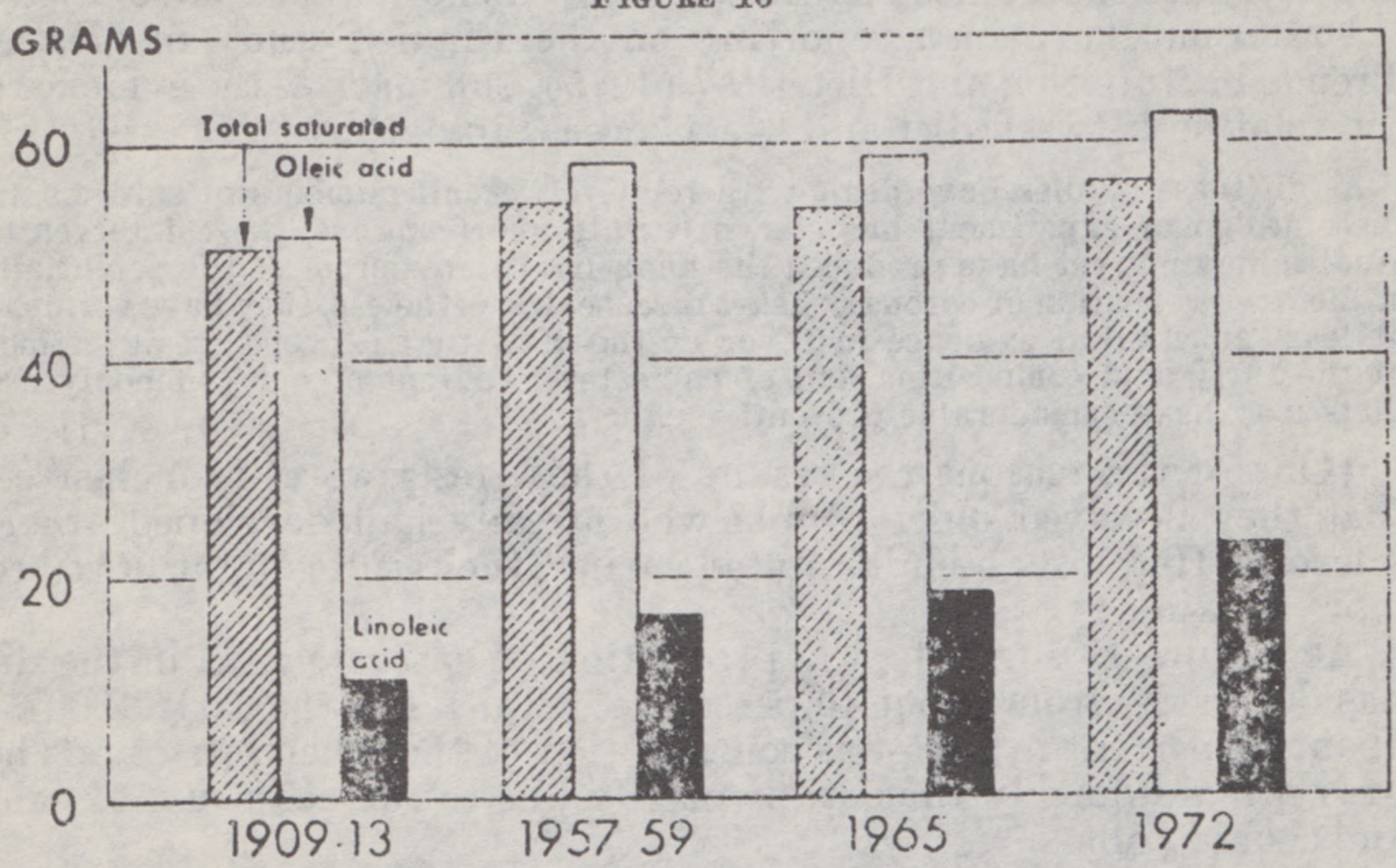


FIG. 10. Fatty acids. Per capita civilian consumption. △=preliminary.

Source: "Fat in Today's Food Supply—Level of Use and Sources." Journal of the American Oil Chemists' Society, vol. 51, No. 6, pp. 244–250, 1974.

Heart Disease

The level of saturated fat in the diet is of concern because it has been directly linked to excessive levels of cholesterol in the blood and therefore to heart disease. Feeding studies in animals in the early 1900's linked high cholesterol intake to atherosclerosis. Evidence that cholesterol could affect the same arterial lesions in man came from Scandinavian countries where atherosclerotic diseases appeared to decline during the war years when consumption of calories and animal fat declined.

The implication of cholesterol in heart disease became more clear in the 1950's. As reported by Drs. McGill and Mott in "Present Knowl-

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edge in Nutrition," the Framingham study, mentioned earlier, determined that of all risk factors in heart disease, "the strongest and most consistent risk factor was elevated serum cholesterol concentration. This finding has been confirmed in the United States and Western Europe in the past two decades." The authors note that in the early 1950's researchers discovered that serum cholesterol levels were lowered by substituting vegetable for animal fats.

A twelve-year study of patients in two hospitals in Finland, started in 1958, reinforces this view. During the first six years, the patients in the trial hospital were fed an experimental diet which involved an overall reduction in fats and a reduction of the proportion of saturated fat. For that same time period, the patients in the control hospital were given a normal diet. During the next six years, the two diets were continued, but the two hospitals reversed their experimental roles. In both hospitals the coronary heart disease (CHD) mortality rate was dramatically reduced on the low-fat diet. The overall CHD incidence rate per 1,000 man-years for the experimental diet was 14.4 as opposed to a 33.0 rate experienced by those eating the normal or control diet.

Dr. Osmo Turpeinen reporting on the Finnish study in "Future Trends in Nutrition and Dietetics" (1975), summarizes the evidence of the relation between diet and heart disease to date:

> As all these studies have dealt with relatively small numbers of subjects and their design of experiment has shown certain shortcomings, these intervention studies may not yet have produced the final, irrefutable proof of the potentiality of dietary prevention of coronary heart disease. Nevertheless, they have furnished at least substantial evidence in favor of the view that a proper re-adjustment of the fatty acid composition and of cholesterol content of our commonly used diets may have considerable preventive effect.

(One of the reasons the results of these tests were inconclusive is that they involved older people who already had developed atherosclerosis. Had tests been instituted earlier, the results might have been more striking.)

As Figure 10 suggests, the proportion of saturated fat in the diet has declined—from about 40 percent of total fat in the early 1900's to about 38 percent in 1975—as consumption of the other fatty acids has grown more quickly than it, primarily due to increased use of salad and cooking oils.

Although saturated fat may be a declining proportion of total fat consumption, its level, and that of the other fatty acids, remains higher than recommended by the Inter-Society Commission for Heart Disease Resources, a body coordinating the development of guidelines for caring for cardiovascular patients.

Preliminary figures for 1976 indicate that saturated fat currently comprises about 16 percent of total calories, poly-unsaturated fat accounts for about 7 percent and mono-unsaturated, 19 percent. The Commission recommends that daily intake of saturated fat be less than 10 percent of total calories. Up to 10 percent of total calories should be derived from poly-unsaturated fat, with the remaining 10 percent coming from mono-unsaturated fats. The limits conform generally with the recommendations of other United States and international agencies (Appendix B), and provide a prudent balance among fat types.

Achieving this balance requires partial substitution of poly-unsaturated for saturated fat and the overall reduction of all fatty acids. A guide to these changes follows discussion of the next goal, reduction of cholesterol.

GOAL 4. REDUCE CHOLESTEROL CONSUMPTION TO ABOUT 300 MG. A DAY

There is evidence not only that fat and saturated fat tend to increase serum cholesterol levels but that direct consumption of cholesterol does so as well.

Drs. McGill and Mott report in "Present Knowledge in Nutrition":

> **The average American ingests 600 mg. of cholesterol per day, well above the 400 mg. limit below which there is a linear relationship with serum cholesterol. As in the controlled experiments, comparisons among populations with wide ranges of average cholesterol intake show a close relationship between dietary cholesterol and serum cholesterol concentrations. It is now widely accepted that a high dietary cholesterol intake is a major determinant of the high cholesterol concentrations found in the U.S. population as well as in other technically developed countries.**

Professional and governmental bodies in the United States and other countries have generally recommended that cholesterol intake be decreased to 300 mg. a day or less (Appendix B).

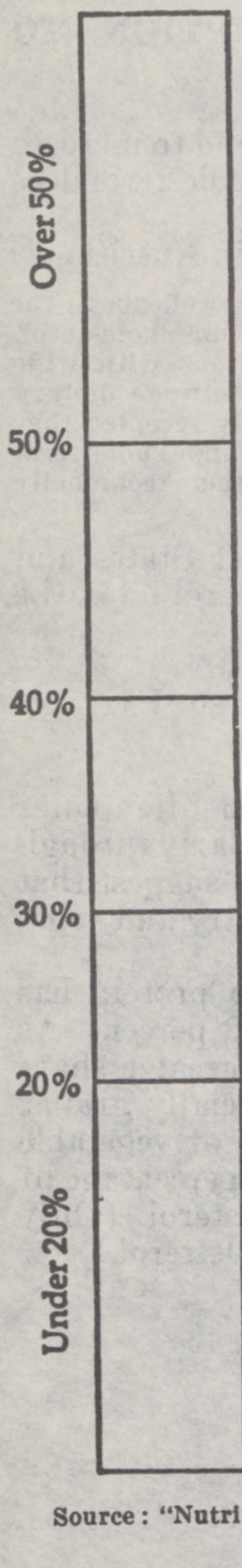
Guide To Reducing Consumption of Fat, Saturated Fat and Cholesterol

High levels of fat, saturated fat and cholesterol most often enter our diets in the process of acquisition of protein, particularly through red meat. Consequently, the foregoing recommendations suggest that more of our protein needs be satisfied from fish and poultry and vegetable sources.

The proportion of calories in our diet derived from protein has remained relatively constant in this century at about 12 percent. As noted earlier, prior to increased meat consumption, a greater share of our protein was drawn from vegetable sources, especially grains. Tables 6, 7 and 8, show that, in general, increased use of vegetable source proteins will aid greatly in reducing not only the percentage of calories from fat but levels of saturated fat and cholesterol. (Only foods of animal origin have significant amounts of cholesterol.)

TABLE 6

Percentage of Calories from Fat in Foods



Cream Cheese
Weiners
Peanuts and peanut butter
Pork Lunch meats
Most cheese and cheese spreads
Tongue
Eggs
Ground beef — regular
Salmon, tuna (canned in oil)
Pork — loin and butt
Granola

Chicken — roasted, flesh & skin
Beef — porterhouse, T-bone, round rump, lean ground, kidney
Pork — fresh & cured ham & shoulder
Lamb — shoulder, rib
Salmon — red sockeye, canned

Whole milk
Ice cream
Cream cheese sandwich
Peanut butter sandwich

Beef — sirloin, arm, flank, heart
Turkey — flesh & skin, dark meat
Lamb — leg, loin
Pork — heart, kidney
Chicken — dark meat, roasted flesh

Creamed cottage cheese
Lunch meat or Cheese spread sandwich

Beef — heel of round, pot roast
Liver — pork, chicken, lamb, beef
Fish — bass, ciscoe, oysters, salmon (pink)
Chicken — roasted, light meat broilers — no skin

Fish — haddock, cod, tuna, (water pack) ocean perch, halibut, smelt, sole
Shellfish — most
Porridge
Bread
Most peas, beans and lentils
Skim milk cheese
Uncreamed cottage cheese
Skim milk
Most breakfast cereals (other than Granola type)

Source : "NutriScore," Fremes, Sabry, 1976.

TABLE 7.—FAT CONTENT AND MAJOR FATTY ACID COMPOSITION OF SELECTED FOODS (IN DECREASING ORDER OF TOTAL SATURATED FATTY ACID CONTENT WITHIN EACH GROUP OF SIMILAR FOODS)

[In percent]

Food	Total fat	Fatty acids		
		Total saturated	Total monounsaturated	Total polyunsaturated
Animal fats:				
Chicken	100.0	32.5	45.4	17.6
Lard	100.0	39.6	44.3	11.8
Beef tallow	100.0	48.2	42.3	4.2
Avocado	15.0	2.0	9.0	2.0
Beef products:				
T-bone steak (cooked, broiled—56 percent lean, 44 percent fat)	43.2	18.0	21.1	1.6
Chuck, 5th rib (cooked or braised—69 percent lean, 31 percent fat)	36.7	15.3	17.5	1.5
Brisket (cooked, braised, or pot roasted—69 percent lean; 31 percent fat)	34.8	14.6	16.7	1.4
Wedge and round-bone sirloin steak (cooked or broiled—66 percent lean; 34 percent fat)	32.0	13.3	15.6	1.2
Rump (cooked or roasted—75 percent lean; 25 percent fat)	27.3	11.4	13.1	1.2
Round steak (cooked or broiled—82 percent lean; 18 percent fat)	14.9	6.3	6.9	.7
Cereals and grains:				
Wheat germ	10.9	1.9	1.6	6.6
Oats (puffed, without added ingredients)	5.5	1.0	1.9	2.2
Oats (puffed, with added nutrients, sugar covered)	3.4	.6	1.2	1.4
Barley (whole grain)	2.8	.5	.3	1.3
Domestic buckwheat (dark flour)	2.5	.5	.8	.9
Cornmeal, white or yellow (whole-ground, unbolted)	3.9	.5	.9	2.0
Shredded wheat breakfast cereal	2.5	.4	.4	1.3
Wheat (whole grain, Hard Red Spring)	2.7	.4	.3	1.3
Wheat flakes breakfast cereal	2.4	.4	.3	1.2
Rye (whole grain)	2.2	.3	.2	1.1
Wheat meal breakfast cereal	1.4	.3	.1	.7
Wheat flour, all purpose	1.4	.2	.1	.6
Rice (cooked brown)	.8	.2	.2	.3
Bulgur from Hard Red Winter wheat	1.5	.2	.2	.7
Oatmeal or rolled oats, cooked	1.0	.2	.4	.4
Rye flour	1.4	.2	.1	.6
Cornstarch	.6	.1	.1	.3
Rice (cooked white)	.2	.1	.1	.1
Farina (enriched, regular, cooked)	.2	----	----	.1
Corn grits, cooked	.1	----	----	.1
Dairy products:				
Nondairy coffee whitener (powder)	35.6	32.6	1.0	----
Cream cheese	33.8	21.2	9.4	1.2
Cheddar cheese	32.8	20.2	9.8	.9
Light whipping cream	32.4	20.2	9.6	.9
Muenster cheese	29.8	19.0	8.7	.7
American pasteurized cheese	28.9	18.0	8.5	1.0
Swiss cheese	27.6	17.6	7.7	1.0
Mozzarella cheese	19.4	11.8	5.9	.7
Ricotta cheese (from whole milk)	14.6	9.3	4.1	.4
Vanilla ice cream	12.3	7.7	3.6	.5
Half and half cream	11.7	7.3	3.4	.4
Chocolate chip ice cream	11.0	6.3	2.6	.4
Canned condensed milk (sweetened)	8.7	5.5	2.4	.3
Ice cream sandwich	8.2	4.7	2.6	.5
Cottage cheese (creamed)	4.0	2.6	1.1	.1
Yogurt (from whole milk)	3.4	2.2	.9	.1
Cottage cheese (uncreamed)	.4	.2	.1	----
Eggs:				
Fried in margarine	15.9	4.2	7.2	1.9
Scrambled in margarine	12.6	3.7	5.5	1.4
Fresh or frozen	11.3	3.4	4.5	1.4
Fish:				
Eel, American	18.3	4.0	9.0	2.7
Herring, Atlantic	16.4	2.9	9.2	2.4
Mackerel, Atlantic	9.8	2.4	3.6	2.4
Tuna, albacore (canned, light)	6.8	2.3	1.7	1.8
Tuna, albacore (white meat)	8.0	2.1	2.1	3.0
Salmon, sockeye	8.9	1.8	1.5	4.7
Salmon, Atlantic	5.8	1.8	2.7	.5
Carp	6.2	1.3	2.7	1.4
Rainbow trout (United States)	4.5	1.0	1.5	1.4
Striped bass	2.1	.5	.6	.7
Ocean perch	2.5	.4	1.0	.7
Red snapper	1.2	.2	.2	.4
Tuna, skipjack (canned, light)	.8	.2	.2	.2
Halibut, Atlantic	1.1	.2	.2	.4
Cod, Atlantic	.7	.1	.1	.3
Haddock	.7	1	.1	.2

TABLE 7.—FAT CONTENT AND MAJOR FATTY ACID COMPOSITION OF SELECTED FOODS (IN DECREASING ORDER OF TOTAL SATURATED FATTY ACID CONTENT WITHIN EACH GROUP OF SIMILAR FOODS)—Continued

[In percent]

Food	Total fat	Fatty acids		
		Total saturated	Total monounsaturated	Total polyunsaturated
Fowl:				
Chicken (broiler/fryer, cooked or roasted dark meat)	9.7	2.7	3.2	2.4
Turkey (cooked or roasted dark meat)	5.3	1.6	1.4	1.5
Chicken (broiler/fryer, cooked or roasted light meat)	3.5	1.0	.9	.9
Turkey (cooked or roasted light meat)	2.6	.7	.6	.7
Lamb and veal:				
Shoulder of lamb (cooked or roasted, 74 percent lean; 26 percent fat)	26.9	12.6	11.0	1.6
Leg of lamb (cooked or roasted, 83 percent lean; 17 percent fat)	21.2	9.6	8.5	1.2
Veal foreshank (cooked or stewed, 86 percent lean; 14 percent fat)	10.4	4.4	4.2	.7
Nuts:				
Coconut	35.5	31.2	2.2	.7
Brazil nut	68.2	17.4	22.5	25.4
Peanut butter	52.0	10.0	24.0	15.0
Peanut	49.7	9.4	22.9	15.0
Cashew	45.6	9.2	26.4	7.4
Walnut, English	63.4	6.9	9.9	41.8
Pecan	71.4	6.1	43.1	17.9
Walnut, black	59.6	5.1	10.8	40.8
Almond	53.9	4.3	36.8	10.1
Pork products:				
Bacon	49.0	18.1	22.8	5.4
Sausage, cooked	32.5	11.7	15.1	3.9
Deviled ham, canned	32.3	11.3	15.2	3.5
Liverwurst, braunschweiger, liver sausage	32.5	11.0	15.5	4.1
Bologna	27.5	10.6	13.3	2.1
Pork loin (cooked or roasted, 82 percent lean; 18 percent fat)	28.1	9.8	13.1	3.1
Ham (cooked or roasted, 84 percent lean; 16 percent fat)	22.1	7.8	10.4	2.4
Fresh ham (cooked or roasted, 82 percent lean; 18 percent fat)	20.2	7.1	9.5	2.2
Canadian bacan (cooked and drained)	17.5	5.9	7.9	1.8
Chopped ham luncheon meat	17.4	5.7	8.3	2.2
Canned ham	11.3	4.0	5.3	1.2
Salad and cooking oils:				
Coconut	100.0	86.0	6.0	2.0
Palm	100.0	47.9	38.4	9.3
Cottonseed	100.0	26.1	18.9	50.7
Peanut	100.0	17.0	47.0	31.0
Sesame	100.0	15.2	40.0	40.5
Soybean, hydrogenated	100.0	15.0	23.1	57.6
Olive	100.0	14.2	72.5	9.0
Corn	100.0	12.7	24.7	58.2
Sunflower	100.0	10.2	20.9	63.8
Safflower	100.0	9.4	12.5	73.8
Shellfish:				
Eastern oyster	2.1	.5	.2	.6
Pacific oyster	2.3	.5	.4	.9
Ark shell claim	1.5	.4	.3	.3
Blue crab	1.6	.3	.3	.6
Alaska king crab	1.6	.2	.3	.6
Shrimp	1.2	.2	.2	.5
Scallop	.9	.1	----------	.4
Soups:				
Cream of mushroom (diluted with equal parts of water)	3.9	1.1	.7	.8
Cream of celery (diluted with equal parts of water)	2.3	.6	.5	1.0
Beef with vegetables (diluted with equal parts of water)	.8	.3	.3	----------
Chicken noodle (diluted with equal parts of water)	1.0	.3	.4	.2
Minestrone (diluted with equal parts of water)	1.1	.2	.3	.5
Vegetable (diluted with equal parts of water)	.9	.2	.3	.4
Clam chowder, Manhattan style (diluted with equal parts of water)	.9	.2	.2	.5
Table spreads:				
Butter	80.1	49.8	23.1	3.0
Margarine (hydrogenated soybean oil, stick)	80.1	14.9	46.5	14.4
Margarine (corn oil, tub)	80.3	14.2	30.4	31.9
Margarine (corn oil, stick)	80.0	14.0	38.7	23.3
Margarine (safflower oil, tub)	81.7	13.4	16.1	48.4
Vegetable fats (household shortening)	100.0	25.0	44.0	26.0

Source: Consumer and Food Economics Institute, U.S. Department of Agriculture, Agricultural Research Service, Hyattsville, Maryland. "Comprehensive Evaluation of Fatty Acids in Foods," *Journal of The American Dietetic Association,* May 1975; July 1975; August 1975; October 1975; March 1976; April 1976; July 1976; September 1976; November 1976; January 1977; unpublished data on shellfish and margarine.

TABLE 8.—CHOLESTEROL CONTENT OF COMMON MEASURES OF SELECTED FOODS
[In ascending order]

Food	Amount	Cholesterol (milligrams)
Milk, skim, fluid or reconstituted dry	1 cup	5
Cottage cheese, uncreamed	½ cup	7
Mayonnaise, commercial	1 tablespoon	10
Lard	do	12
Yogurt, made from fluid and dry nonfat milk, plain or vanilla	Carton (227 grams) [1]	17
Cream, light table	1 fluid ounce	20
Cottage cheese, creamed	½ cup	24
Cheese, pastuerized, processed American	28 grams	(25)
Cheese, pastuerized, processed Swiss	do	(26)
Cream, half and half	¼ cup	26
Ice cream, regular, approximately 10 percent fat	½ cup	27
Cheese, cheddar	1 ounce	28
Milk, whole	1 cup	34
Sausage, frankfurter, all meat, cooked	1 frank	34
Butter	1 tablespoon	35
Beef and vegetable stew, canned	1 cup	36
Cake, baked from mix, yellow 2 layer, made with eggs, water, chocolate frosting.	75 grams	36
Oysters, salmon	3 ounces, cooked	40
Clams, halibut, tuna	do	55
Chicken, turkey, light meat	do	67
Beef, pork, lobster, chicken, turkey, dark meat	do	75
Lamb, veal, crab	do	85
Tuna, canned in oil, drained solids	184 grams	116
Lobster, cooked, meat only	145 grams	123
Shrimp	3 ounces, cooked	130
Heart, beef	do	230
Egg	1 yolk or 1 egg	250
Liver, beef, calf, hog, lamb	3 ounces, cooked	370
Kidney	do	680
Brains	3 ounces, raw	>1,700

[1] Estimates in parenthesis imputed.

Source: "Cholesterol Content of Foods," R. M. Feeley, P. E. Criner, and B. K. Watt., J. American Dietetic Association 61:134, 1972.

Although the changes just described will assist in approaching the goals outlined, it is necessary also to (1) select foods from within the fish, poultry and vegetable groups that are relatively low in fat, saturated fat and cholesterol; (2) reduce fat use and consumption of foods high in fat; and (3) make partial substitution of polyunsaturated fat for saturated fat. Tables 6, 7 and 8 provide guidance in these areas.

With respect to overall fat consumption, using Tables 6 and 7, it may be useful to follow a strategy of selecting greater numbers of foods that derive 30 percent or less of their calories from fat.

The following excerpt from a presentation by the American Heart Association to the Federal Trade Commission compares consumption goals to commonly used food measures:

A relatively small number of foods do contribute a major proportion of the cholesterol and saturated fat in the American diet. For example, in our 1972 report, the Inter-Society Commission for Heart Disease Resources recommended the reduction of dietary cholesterol to less than 300 mg. per day. We noted that the average American daily cholesterol intake was approximately 600 mg. per day. A single egg yolk, however, contains 250 mg. cholesterol by itself, nearly the daily allowance. We further recommended an intake of less than 20 percent of total calories to be obtained from saturated fat. Assuming a caloric intake of 2,500 calories per day, the average American should take in no more than 250 calories or less than 27 grams of saturated fat per day. One cup of whole milk contains 5 grams saturated fat. One cup of ice cream contains 8 grams; six ounces of ham approximately 8 grams. These are very substantial portions of the maximum recommended allowance for a day. Therefore the contribution of individual foods to the cholesterol and saturated fat intake in the diet can be highly significant.

Fremes and Sabry point out in "NutriScore" that food labels rarely if ever indicate the type and saturation of fats used in processed foods. They report that the saturated fats, palm oil and coconut oil, are used interchangeably in powdered, frozen or liquid coffee creamers used at home and in restaurants and coffee machines. They say:

> But what of all the other products like chips, convenience spreads and cookies? What oil is in them? We don't know and won't know without some government regulations and industry cooperation. Until it becomes mandatory for manufacturers to declare the type of oil on the labels of foods with vegetable oil listed, we would recommend that you stay away from all commerical snack foods, including potato chips, baked goods, crackers and all mixes. If you must use a whipped topping occasionally, consider this: packaged synthetic toppings are just as saturated as real whipped cream, and real milk or table cream has much less fat than whipped cream or the substitutes.

GOAL 5. REDUCE SUGAR CONSUMPTION BY ABOUT 40 PERCENT TO ACCOUNT FOR ABOUT 15 PERCENT OF TOTAL ENERGY INTAKE

Figure 3, from an article by Louise Page and Berta Friend, of the Department of Agriculture, appearing in "Sugars in Nutrition," published by the Nutrition Foundation, shows that various kinds of sugar accounted for only about 32 percent of total carbohydrate consumption in the period 1909 to 1913. However, by 1976, sugar had replaced starch, or complex carbohydrates, as the predominate carbohydrate energy source.

The largest components of the sugar category are refined sugar and syrups, molasses and honey, accounting in 1976 for about 14 percent and 4 percent of total calories, respectively. The remainder occurs naturally in fruit and milk products.

The greatest impetus for increased sugar use apparently has come from the addition of refined sugar to processed foods. Figure 11, also from the Page/Friend article, shows the dramatic increase in use of sugar added outside the control of the consumer.

Page and Friend report:

Use in processed food products and beverages has increased more than threefold from nearly 20 to 70 lbs., while household purchase has dropped one-half from a little more than 50 to about 25 lb. Currently, food products and beverages account for more than two-thirds of the refined sugar consumed—70 lb. out of a little over 100 lb. Moreover, beverages now comprise the largest single industry use of refined sugar, accounting for over one-fifth of the total refined sugar in the United States diet, or nearly 23 lb. Furthermore, the amount used in beverages has increased nearly sevenfold since early in the century when 3½ lb./person/year was used in these products. Use of refined sugar in beverages is now second only to household use.

FIGURE 11

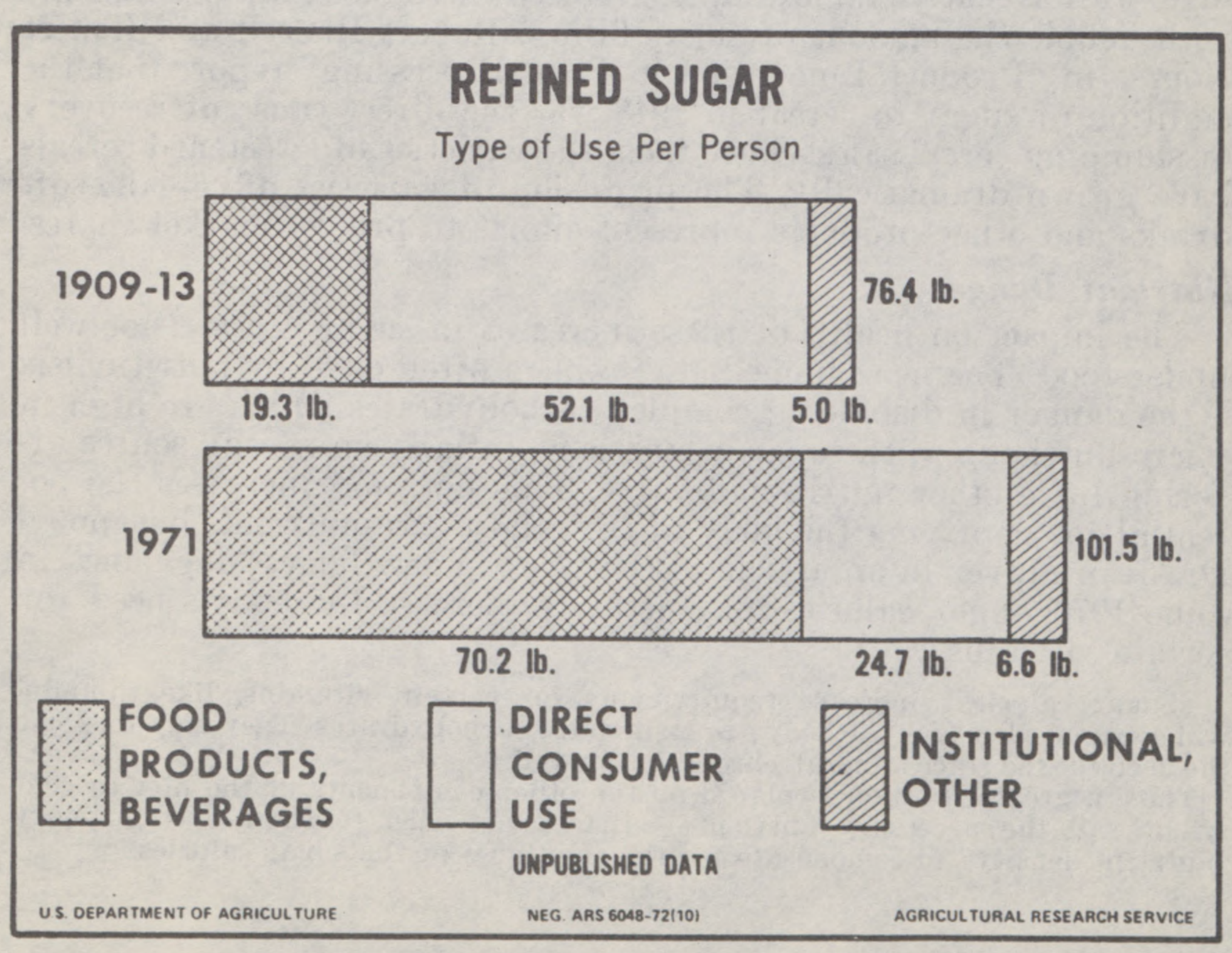


Table 9, provided by Page and Friend, show changes in sugar use in this century.

TABLE 9.—Refined sugar, estimated per capita consumption by type of use, selected periods, 1909–13 to 1971.*

Type of use	1909–13 (lb)	1925–29 (lb)	1935–39 (lb)	1947–49 (lb)	1957–59 (lb)	1965 (lb)	1971 (preliminary) (lb)
In processed foods:							
Cereal and bakery products	4.5	7.7	9.7	12.9	15.4	15.6	17.6
Confectionery products	6.5	8.0	8.2	9.8	9.6	10.4	11.0
Processed fruits and vegetables[b]	3.0	4.6	4.4	9.0	9.8	9.5	10.4
Dairy products	1.5	2.3	2.4	4.6	4.9	5.3	5.8
Other food products[c]	0.3	0.7	1.2	1.5	1.7	2.5	2.6
Total food products	15.8	23.4	25.9	37.8	41.4	43.3	47.4
Beverages (largely in soft drinks)	3.5	5.0	5.2	10.6	12.6	16.9	22.8
Total processed food and beverages	19.3	28.4	31.1	48.4	54.0	60.2	70.2
Other food uses:							
Eating and drinking places[d]	4.5	5.7	6.3	7.7	7.3	6.2	5.5
Household use[e]	52.1	65.0	58.8	37.4	33.1	28.2	24.7
Institutional and other use[f]	0.5	0.9	0.9	1.3	1.0	1.4	1.1
Total	57.1	71.6	66.0	46.4	41.4	35.8	31.3
Total food use	76.4	100.0	97.1	94.8	95.4	96.0	101.5
Nonfood use[g]	0.3	0.4	0.4	0.4	0.7	0.6	0.9
Total consumption	76.7	100.4	97.5	95.2	96.1	96.6	102.4

[a] Prepared by Food Consumption Section, Economic Research Service, U.S. Department of Agriculture.
[b] Canned, bottled, and frozen foods (processed fruit and vegetable products); jams, jellies, and preserves.
[c] Includes miscellaneous food uses such as meat curing, and syrup blending.
[d] Includes hotels, motels, restaurants, cafeterias, and other eating and drinking establishments.
[e] Household use assumed synonymous with deliveries in consumer-sized packages (less than 50 lb).
[f] Largely for military use.
[g] Includes use in pharmaceuticals, tobacco, and other nonfood use.

Source: "Sugars in Nutrition," Levels of Uses of Sugar in the United States, L. Page, B. Friend, 1974.

This increased use of sugar is traceable in large part to the desire of food manufacturers to create unique food products with a competitive edge. Just recently, for example, Nabisco introduced an Oreo cookie with double the amount of sugar filling. Robert Buzzell and Robert Nourse in "Product Innovation in Food Processing" report that the addition of sugar to cereal in 1948 was the direct cause of recovery of slumping cereal sales. Since then, the varieties of sweetened cereals have grown dramatically. The profusion of varieties of cereals, soft drinks and other products represent efforts to protect market shares.

Nutrient Danger

The impact on health of these increases in sugar use are not well understood. The most immediate problem often cited by nutritionists is the danger in displacing complex carbohydrates which are high in micro-nutrients, with sugar, which is essentially an energy source offering little other nutritional value. This not only increases the potential for depriving the body of essential micro-nutrients but, noted Dr. Jean Mayer in an article in the "New York Times Magazine" in June 1976, sugar calories may actually increase the body's need for certain vitamins.

(Sugar calories) increase requirements for certain vitamins, like thiamin, which are needed (for the body) to metabolize carbohydrates. They may increase the need for the trace mineral, chromium, as well.

Thus, a greater burden is placed on the other components of the diet to contribute all the necessary nutrients—other foods need to show extraordinary "nutrient density" to compensate for the emptiness of the sugar calories.

Sugar has been implicated in cardiovascular disease, notably by Dr. John Yudkin. However, the Connors, as well as other experts, report that no clear links have been established between sugar and heart disease.

Diabetes

There is some evidence, though, connecting sugar with diabetes. Dr. A. M. Cohen and associates report in "Sugars in Nutrition" that rats with a genetic predisposition to diabetes will develop the disease when exposed to high sugar diets and that they can be prevented from contracting it with a sugar-free diet. Dr. Mayer noted in an article in the Los Angeles Times in October 1975, that several epidemiological studies indicate a connection between high-sugar use and diabetes. For example, Yemenite Jewish immigrants to Israel had a low incidence of diabetes until they had consumed a Westernized diet high in sugar for several years.

Tooth Decay

Sugar has also been implicated in tooth decay, which may be the most widespread disease related to nutrition. Dr. Mayer, citing a government survey said in the Times article:

> In nations of the Far East, where sugar intake per person per year ranged (at the time) from 12 to 32 pounds, the national averages for decayed, missing or filled teeth in adults 20 to 24 years old ran from 0.9 to 5. By contrast, in South American nations, where sugar intake was high (44 to 88 pounds per person annually) the averages for decayed, missing or filled teeth in the same age group ran from 8.4 to 12.6. As for the United States today, it has been estimated that 98 percent of American children have some tooth decay; by age 55 about half of the population of this country have no teeth.

These considerations have led a number of governmental and professional health organizations in the United States, and other nations, cited earlier, to recommend a general decrease in sugar consumption (Appendix B).

In "Sugars in Nutrition," Dr. Arvid Wretlind, of the Nutrition Unit, Karolinska Institutet, Stockholm, writing about sugar usage in Europe, suggests that sugar consumption be reduced to 10 percent of calories.

> In Europe there has been, and in some countries still is, a continuous increase in sugar consumption. In some of these countries the sugar content of the diet has reached a level between 15 and 18 percent of calories. The increase in sugar consumption, followed by an increased fat intake will, generally speaking, result in a decreased content of essential nutrients and in a reduced consumption of other foods which contain not only energy but also valuable nutrients. The conclusion is that the amount of sugar in a moderate diet should be moderate. A maximum level of 10. cal/percent is proposed.

While such a level might be ultimately desirable, a reduction of sugar consumption to about 15 percent of caloric consumption appears to be a more realistic goal for the United States, one which would take sugar consumption to a point slightly lower than that of the early 1900's.

Guide To Reducing Sugar Intake

In reviewing ways of cutting sugar consumption, the most obvious item for general reduction is soft drinks. Total elimination of soft drinks from the diet, for many people, would bring at least half the recommended reduction in sugar consumption.

Soft drink consumption in the United States doubled between 1960 and 1975, rising from 13.6 gallons a year to 27.6, as shown in Table 10 from the Department of Agriculture's "Sugar and Sweetener Report," September 1976. This translates into 221 sixteen-ounce cans and 21.5 pounds of sugar a year.

TABLE 10.—SOFT DRINK SALES, PER CAPITA CONSUMPTION AND AMOUNTS AND VALUE OF SUGAR USED IN MANUFACTURE, 1960–75

	Sales (millions)	Per capita soft drink consumption		Per capita sugar consumption (pounds)	Value of sugar (millions)
		16-ounce	Gallons		
Year:					
1960	$1,857	109	13.6	11.3	$188
1965	3,195	154	19.2	15.2	274
1970	5,016	193	24.1	19.2	420
1975	9,426	221	27.6	21.5	1,218

Source: Sugar and Sweetener Report, Vol. 1, No. 8, September 1976 Economic Research Service, U.S. Department of Agriculture.

This increase has evidently been made at the expense of more nutritious beverages. As Table 11 shows, between 1962 and 1975, soft drinks became the second most highly consumed beverage, displacing milk. Currently, soft drinks compete with coffee for first place.

TABLE 11.—TRENDS IN BEVERAGE CONSUMPTION

[Gallons, per capita, per year]

Beverage	1962 [1]	1975
Coffee	40.4	31.6
Milk	25.6	24.4
Soft drinks	16.8	31.4
Juices	4.3	6.2

[1] Earliest data available.

Source: Copyright, John C. Maxwell Jr., Maxwell Associates. Richmond, Va.

Another source of concern is the caffeine in cola soft drinks, which account for about 65 percent of total soft drink consumption (at least one non-cola also contains caffeine). Medical World News, of January 1976, reports that suspected connections between caffeine and ulcers, heart disease and bladder cancer have been investigated but that evidence is not strong enough to cause caffeine to be adjudged a risk factor in these diseases. There have been findings of withdrawal symptoms of headache, nervousness and irritability among subjects deprived of normal coffee doses as well as similar symptoms among those who may have ingested too much caffeine. The report said colas are of special concern since they are the major caffeine source for most children.

(Doctors, particularly pediatricians) have reported signs—including irritability, headaches, and nervousness—of what has come to be known as "caffeinism" among cola-guzzling youngsters whose total caffeine intake (30 mg per 8-oz. can) may be boosted by cocoa or hot chocolate (up to 50 mg per 5-oz. cup) and chocolate bars (25 mg).

Reduction in soft drink consumption also offers the advantage of reducing consumption of non-nutritive additives, colors, flavors, and preservatives.

The second major area for consideration in cutting sugar consumption is baked goods, reported by Page and Friend to be the second highest source of sugar use. In this area, as in others, home preparation provides greater control over sugar as well as fat use.

Finally, it is important to remember that sugar has been added to a wide range of products, but labeling regulations do not currently require sugar content to be described. As noted earlier, use of fresh food enables greater protection against hidden sugar.

GOAL 6. REDUCE SALT CONSUMPTION BY ABOUT 50 TO 85 PERCENT TO ABOUT 3 GRAM/DAY

Salt (sodium chloride) consumption in the United States is estimated to range from about 6 to 18 grams a day, according to "Recommended Dietary Allowances," published in 1974 by the National Academy of Sciences. Drs. George Meneely and Harold Battarbee, in "Present Knowledge in Nutrition," suggest, however, that the average human requirement for salt is probably only about half a gram. The three gram a day allowance which is derived from the Academy report, the authors say, "is more than enough."

The average requirement could normally be achieved without adding salt to any food. Drs. Meneely and Battarbee cite studies indicating that desire for salt is not a physiological necessity but an acquired taste.

The authors point also to evidence that there is an important balance between sodium and potassium, required for the proper flow of fluids among and through cells. (The Academy describes a requirement for potassium of 2.5 grams a day.) They provide the following Tables 12 and 13 showing the impact of various processing methods on sodium and potassium content, and say:

> Aside from the rather uncertain matter of treks to salt licks, there are no terrestrial mammals except man which add salt to their food. Table 12 which traces the changes in sodium and potassium in 100 g of peas exemplifies the extent to which potassium is depleted and sodium increased during canning and freezing. Peas, drained and before butter and salt are added for serving at table, thus contain 255 times as much sodium as the fresh product and more than half of the potassium is gone. Sodium intake is thereby greatly increased, potassium reduced. The sodium and potassium content of several other foods are shown in Table 13.
>
> Consumer purchase of salt has declined somewhat as his use of processed and prepared foods has increased. Sodium intake is more and more determined by the food processors rather than by the individual.

TABLE 12.—CHANGES IN SODIUM AND POTASSIUM CONTENT OF PEAS

Food (100 g edible portion)	Na (mg)	K (mg)
Fresh peas	0.9	380
Frozen peas	100	160
Canned peas, liquid poured off	230	180
Add salt, serve with salted butter	(?)	(?)

TABLE 13.—SODIUM AND POTASSIUM CONTENT OF SEVERAL FOODS

Food (100 g edible portion)	Na (mg)	K (mg)
Olives	2,400	55
White bread	507	105
Cornflakes	660	165
Cheddar cheese	700	82
Dried nonfat milk	525	1,335
Bacon	1,770	225
Chipped beef	4,300	200
Smoked ham, raw	2,530	248
Frankfurter	1,100	230
Salami	1,260	302
Canned crabmeat	1,000	110
Canned salmon	540	330

Source: Present Knowledge in Nutrition: sodium and potassium, G. Meneely, H. Battarbee, 1976.

Salt is added to processed food principally as a flavoring agent rather than as a preservative. In some instances it is the primary flavoring agent and may be used to mask other, less appealing, flavors.

Hypertension

Salt has been found to cause an increase in blood pressure, hypertension, among some individuals, but others do not seem genetically susceptible. There is some evidence that imbalance with potassium intake may be a factor in hypertension. Drs. Meneely and Battarbee estimate that 20 percent of the United States population is susceptible to hypertension and up to 40 percent of older people. They recommend reduction of salt intake as an important countermeasure.

Millions of children and youths are moving toward hypertension. Excess dietary sodium is clearly an adverse factor in some, if not in most, people prone to hypertension. The evidence indicates that a systematic effort to reduce dietary sodium chloride intake and increase dietary potassium intake would result in the amelioration of much suffering among those who are prone and would increase both duration and quality of life for many millions of people.

Other Findings

Drs. Meneely and Battarbee, who also describe excessive salt as "noxious per se," report observations of possible connections between high sodium intake and heart disease. Researchers have found that increases in sodium from 4 grams to 24 grams a day in humans altered the ability to clear intravenously administered fat from the blood stream. Other researchers have found improvement in vascular disease resulting from a decline in salt consumption even when blood pressure failed to decline.

They also report findings of possible connections between high salt intake and changes in levels of gastric acid secretion, stomach cancer and cerebrovascular disease.

Dr. John Brainard, reporting in Minnesota Medicine, April 1976, draws a connection between migraine headaches and salt. Twelve migraine suffers were advised to avoid all known factors in migraine, such as sodium nitrite and monosodium glutamate, and also sodium chloride by following a salt restriction which entailed "avoiding all salted snack foods, such as pretzels, nuts and potato chips before

dinner." Ten out of 12 responded favorably, the report said, with a few saying migraine no longer was a problem. And the report noted:

> It has not been appreciated that the sudden salt load of a handful of salted nuts or potato chips, particularly if taken on an empty stomach, can cause a severe migraine six or twelve hours later. The reason for the lag period is not known.

Finally, in "Human Nutrition," Dr. Jean Mayer warns of hypertension that may develop as a result of high salt intake by children. He reports:

> Clinically, it is well known that the tendency for edema to develop in prematurely-born infants is a function of the sodium content of the diet. It has also been demonstrated that a high salt content of the diet increases the likelihood of renal cast formation (an indication of possible kidney damage) in these infants.

Although there is some evidence that increased potassium intake might help offset possible adverse effects of high sodium consumption, the most prudent course appears to be to reduce salt intake to at least the level of 3 gm a day.

Guide To Reducing Salt Consumption

The goal of 3 gm of salt a day amounts to about three-fifths of a teaspoon and 1,200 mg of sodium alone. (Salt is about 40 percent sodium.) However, as mentioned earlier, the daily goal will be met for most in the United States without the addition of salt to food or consumption of foods on which the salt is visible, such as pretzels and potato chips.

Furthermore, commonly-used seasoning may also be relatively high in sodium. For example, based on Agriculture Handbook 456, a tablespoon of catsup plus the salt on 10 french fries would result in sodium ingestion of about 370 mg. or about 25 percent of the allowance suggested by the foregoing goal. The same french fries would bring only 2 mg of sodium if served unsalted.

In pursuing a diet with reduced sodium, it may be helpful to follow guidelines for achieving mild salt reduction contained in Dr. Mayer's "Human Nutrition."

Foods That May Be Eaten (Fresh, Frozen, Canned)

Low in Sodium

Fruits: all fruits and fruit juices.

Fats: Avocado, Butter, margaine, Cooking oils or fats(except bacon fats), Cream, sweet or sour, Mayonnaise, and Unsalted nuts.

Moderately High in Sodium

Vegetables: all kinds except those listed under "Foods to avoid."

Breads and cereals: Barley, Bread, (white and whole wheat), Biscuits, Muffins, Matzo, Grits, Cornbread, Cornmeal, Cornstarch, Wheat meal, Rolled wheat, Oatmeal, Rice, Tapioca, Farina, Dry cereal, Crackers, Griddle cakes and waffles, Macaroni, Noodles, and Spaghetti.

High in Sodium

Milks: Whole, Skim, Buttermilk, Powdered, and Evaporated.

Meats: Beef, Pork, Lamb, Veal, Rabbit, Brain, Kidney, Liver, Tongue, Chicken, Duck, Quail, and Turkey.

Fish: All kinds, except those listed under "Foods to avoid."

Cheese: (lightly salted) Swiss, American, Cottage.

Breads and cereals: Barley, Bread, (white and whole wheat), Biscuit, Muffins, Matzo, Oatmeal, Rice, Tapioca, Farina, Dry cereals, Crackers, Grits, Cornbread, Cornmeal, Cornstarch, Wheat meal, Rolled wheat, Griddle cakes and waffles, Macaroni, Noodles, and Spaghetti.

Eggs: in moderation.

Other foods: Alcoholic beverages, Fountain beverages, Baking chocolate, Cocoa, Candy, Coffee or coffee substitute, Gelatin, Pudding mixes, Syrups, Honey, Molasses, Leavening agents such as Baking powder, Baking soda, for baking only, Potassium bicarbonate, and Yeast.

Foods to Avoid (Very High in Sodium)

Meats: (Salted or smoked, Bacon, Bologna, Corned beef, Ham, Luncheon meats, Sausage, and Salt pork.

Fish: (Salted or smoked), Anchovies, Sardines, Caviar, Dried cod, and Herring.

Peanut butter, unless low-sodium dietetic.

Flavorings: Commercial boullion, Catsup, Celery, onion or garlic salts, Chili sauce, Meat extracts, sauces or tenderizers, unless low-sodium dietetic, Prepared mustard, Relishes, Salt substitutes, Cooking wine.

Cheeses: Processed cheese, Cheese spreads, Roquefort, Camembert, and Other strong cheeses.

Vegetables: Salted or packed in brine, Pickles, sauerkraut, etc.

Miscellaneous: Breads with salt topping, Potato chips, Popcorn, Other salted snacks, Bacon and bacon fat, Pretzels, Salted nuts, and Olives.

GENERAL REMINDERS

Milks, meats, fish, cheese and eggs are quite high in sodium.

Vegetables, breads and cereals have moderate amounts of sodium, which vary greatly among the different vegetables.

Fruits and fats are low in sodium or have only trace amounts.

Highly salted snack foods should be avoided.

Halve the amount of salt, soy sauce, and monosodium glutamate used in cooking and at the table.

Do not add salt to foods already salted in freezing and canning.

Try different flavorings except those listed under "Foods to avoid."

Do not use a salt substitute unless the physician has recommended it.

When eating out or buying prepared canned or frozen foods, try to avoid those with an unlisted salt content.

EFFECTS OF GOALS BEYOND NUTRITIONAL CONCERNS

1. SOCIO-CULTURAL IMPLICATIONS

The social, cultural and psychological significance of food in our lives can scarcely be overestimated. Sharing of food is one of the prime social contacts; provision of food is one of the prime signs of caring. Just as the general meaning of food in our lives should not be underestimated, changes in our eating behavior must not be underestimated in terms of their potential impact on our whole way of life. A substantive discussion of the socio-cultural impact of profound changes in eating habits (both those which have in fact occurred in 20th century America and those recommended here) is beyond the scope of this report. Nevertheless, it is possible to illustrate the growing concern that a diet increasingly dependent on highly processed, highly packaged food, i.e., an increasingly mechanized approach to the provision of food, may have not only potential for negative nutritional effect but also a negative psychological effect.

All of the following examples refer directly only to institutional environments. In such situations it is clear that the tendency toward mechanization of the feeding process is particularly strong—stronger, by far, because of the necessities of institutional management, than the same tendency in the home. Nevertheless, observations on the psychological impact of different kinds of eating environments, made in institutional settings, may be appropriately applied to the home-eating situation when the difference in degree is acknowledged.

In May of 1976, the Washington Post reported on the overhaul of food service practices at the Montgomery County Detention Center in Maryland. Inmates had been fed for five or six years on frozen TV-type meals served in aluminum foil pans. While fed this way, groups of inmates, on a regular weekly basis, threw their trays against the wall in anger. When a switch was made to fresh foods, prepared on the premises by an inmate chef, complaints about the food dropped to "almost nothing."

It is plausible to speculate that feelings about taste and nutrition were not the sole motivators of the inmates' disgust over the way they were being fed. The feeding status quo had been de-humanized and was therefore, de-humanizing. The switch not only improved nutrition (more fresh fruits, vegetables and salads; the option of whole wheat bread; and steps toward reducing sugar intake) and saved money (20 to 30 cents per day per capita), but perhaps even more important, as soon as the frozen dinners were replaced, "morale picked up immediately."

Schools, as another example of an institutional mass-feeding situation in which there is a strong temptation to turn to mass-produced food, are relying increasingly on pre-plated convenience meals and formulated foods. While the children may not have rebelled, many

parents and concerned outsiders have objected, and not simply on nutritional grounds. Marian Burros, in a Washington Post article in August of 1976, cited the following general objection to the trend toward using formulated foods to save time and/or money: ". . . such a position ignores the concept that the feeding of children in any school program should be an integral part of their education process and not just something to get out of the way as quickly as possible."

Others have more explicitly described the reasons behind that concept which they feel is being ignored. A Washington Star editorial in June of 1976, praising the work of Mary Goodwin, Montgomery County public health nutritionist, in combating the convenience trend, made the following comments:

> The pleasures of seeing, smelling and tasting food that looks, smells and tastes good, nourish the personality with sensuous experience even as the vitamins and minerals are making their contribution to the growth of bone and muscle. An awareness of real people preparing and serving the foods helps too.
>
> Which is to say that if you eat enough precooked, frozen, reheated foil-and-plastic packed lunches out of machines, part of you will starve to death. On-site food preparation—most important of all—is, in her (Mary Goodwin's) words, "a way of keeping children in contact with the real world rather than a highly mechanized, impersonal one."

Dr. Bruno Bettelheim, a noted child psychiatrist, believes that eating plays a central psychological role in human life, and that in this regard not only what the food is, but also where and how it is served makes a difference. Several quotes from Bettleheim's article, "Food to Nurture the Mind," in the May 1975, School Review, summarize his case. Concerning the general psychological significance of food, he says:

> Eating and being fed are intimately connected with our deepest feelings. They are the basic interactions between human beings on which rest all later evaluations of oneself, of the world, and of our relationship to it. Eating experiences condition our entire attitude to the world, not so much because of how nutritious is the food we are given, but because of the feelings and attitudes with which it is given.

Concerning the specific importance of the sharing of food and the effect it has on inter-personal relations, he says:

> The social climate of a mental institution changes immediately if the entire staff, up to the top of the hierarchy, takes its meals with the patients. The fact that patients, staff, and doctors eat together, and eat the same fare, immediately reduced the levels of tension, the potentiality of violent outbreaks. And this not just at mealtime but all during the day and throughout the institution. Nothing is more divisive than when people eat a different fare, in different rooms.

At a time when more and more meals are being taken away from the home, removed from the company of family members, perhaps more consideration should be given to the possibility that this trend is a factor that substantially contributes to the stresses found in modern family life.

Perhaps the most significant statement in Dr. Bettelheim's article is the following:

> The distinction between physical and emotional need, between body and intellect, is, in reality, a false one.

The impact of changed eating patterns in the home as well as in institutions, on our whole way of life is, no doubt, unquantifiable. It

may even be indescribable. It is important in examining historical trends in eating habits, and in assessing the need for future changes in eating habits, to remember that we are dealing with an aspect of our lives which is by no means limited to the physical.

2. FOOD BUDGET

A shift to the dietary goals outlined offers potential for significant reduction in food costs. Savings can be achieved through home preparation and through reduction of and substitution for fats, sugar and expensive, fatty protein sources.

Table 5, from "Diet for a Small Planet," comparing costs of protein sources, shows that every legume listed and every grain product except one provides the daily protein allowance for less than one dollar, whereas the majority of meat protein sources cost over one dollar a day.

Within the category of grain products, choosing the less processed, more nutritious products may often mean a savings. For instance, in one sampling, brand-name converted rice cost more than 25 percent less than the low-priced store brand of instant rice. Slightly processed hot cereals like oatmeal are generally less expensive than ready-to-eat cereals.

The most dramatic savings made by a reduction in sugar consumption result from cutting back on or eliminating purchases of candy, sweet baked goods, and soft drinks. Costs are also cut when the consumer chooses the unsweetened as opposed to the presweetened version of a particular food item; the prime example is breakfast cereals.

Reducing fat consumption, and particularly consumption of saturated fats, may also yield cost savings in several areas. Liver and chicken, lower in the saturated fat categories among the meat and poultry products, may average less than half the price of the beef, pork and lamb cuts. Butter, on a per teaspoon basis, is generally more expensive than even the most costly of the unsaturated vegetable oils. Reduced use of prepared salad dressing, catsup, and sauces can not only cut expenses but reduce fat and/or salt and sugar consumption.

Greater home preparation can also yield savings in some areas as well as greater control over diet composition. A recent study by the Department of Agriculture comparing the costs of various convenience foods with their home-prepared counterparts found that out of 25 meat dishes tested, 21 were more expensive per serving when purchased ready-made. Many of the cost differentials were dramatic. The report said:

> The cost of home-prepared batter-dipped chicken was less than one-third that of the convenience products. Both chicken a-la-king frozen in a pouch and canned chicken salad spread, were about 60 percent more expensive per serving. . . . Consumers paid approximately 40 cents more per serving for frozen turkey dinner or tetrazzine than for the separate ingredients.

Many will find it impossible to change food preparation patterns drastically. However, it is evident that home-preparation can offer savings as well as nutrition advantages.

Consumption of Food Additives

There are more than 1,300 food additives currently approved for use as colors, flavors, preservatives, thickeners and other agents for controlling physical properties of food.

The exact amounts of additives now in use are not known, but more accurate measures may be available after a survey being planned by the Food and Drug Administration for 1977. A study prepared by the FDA in 1976 estimates that the average daily consumption of artificial colors alone among children aged 1 to 5 may be about 60 milligrams and average consumption for children aged 6 to 12 may be about 75 milligrams. The study finds, as shown in Table 14, that the largest single category contributing to artificial coloring consumption among children is beverages.

TABLE 14.—AVERAGE MILLIGRAMS OF ALL FD AND C COLORS IN FOOD INTAKE BY FOOD CATEGORY AMONG TWO GROUPS OF CHILDREN

Food category	Color intake			
	Average diet eaters only (mg), age—		Diets of total age group (mg), age—	
	1–5	6–12	1–5	6–12
Candy and confections	5.2	6.0	0.9	1.2
Beverages	21.1	29.3	8.5	13.6
Dessert powders	18.0	20.7	1.8	1.9
Cereals	8.4	10.6	3.8	4.6
Maraschino cherries	----------	8.4	----------	(1)
Bakery goods	3.5	5.1	2.5	3.8
Ice cream	2.6	3.6	.8	1.3
Sausage	7.5	9.2	1.6	2.3
Snack food	3.0	3.4	.5	.8
Miscellaneous	48.6	55.4	38.8	46.4
Food with color, less miscellaneous	21.3	30.3	20.5	29.3
Food with color, including miscellaneous	60.0	76.2	59.2	75.5

1 Less than 0.05 milligrams.

Source: Arletta Beloian, Food and Drug Administration memorandum: Estimates of average, 90th percentile and maximum daily intakes of FD & C artificial food colors in one day's diets among two age groups of children. July 30, 1976.

The food additives now in use are considered safe by the FDA based on varying degrees of testing, review of scientific literature, expert opinion and long-time usage. The most testing, according to an FDA official, has been given to artificial colors, most of which have had animal toxicity testing by the food industry. The FDA will begin in 1977 a re-evaluation of the safety of colors, flavors, and "direct" additives. Artificial flavors have had the least animal testing of the three additive categories.

Although food additives as a category may not justifiably be considered harmful, the varying degrees of testing and quality of testing and the continuing discoveries of apparent connections between certain additives and cancer, and possibly hyperactivity, give justifiable cause to seek to reduce additive consumption to the greatest degree possible.

In NutriScore, Fremes and Sabry suggest that "necessity should be the touchstone for the use of additives." They argue, as do others, that only those additives that serve a necessary function should be permitted in food. They do not define necessary, but it is apparent that necessity most strictly defined has to do with protecting food safety.

There are several additives commonly considered under the heading of preservatives and flavor enhancers that Fremes, Sabry and others classify as unnecessary and possibly a hazard to health.

Nitrates and Nitrites

"NutriScore" comments:

> While these additives are not in themselves harmful, they may combine with other chemicals in food or in the intestine to form nitrosamines, which are known to cause cancer. The advantages of using nitrites in processed foods is that they maintain a pinkish-red color, which makes the meat look fresh and attractive, and they check the growth of bacteria. Some of these bacteria, like botulinum, produce deadly poisons. Government should therefore limit the addition of nitrites to the amount needed to check the growth of botulinum bacteria and no more.
>
> This has been done in Canada, where the Canadian Health Protection Branch has recently reduced the amounts of nitrates and nitrites allowed in cured and processed meats. Industry, for its part, should find a preservative other than nitrite that will be effective against bacteria, yet will not present a cancer hazard.

BHT and BHA

These chemical preservatives are judged safe by the Food and Drug Administration, but neither is essential. "Nutrition Scoreboard" points out that foods not using the chemicals can be found readily.

Monosodium Glutamate

"NutriScore" recommends against use of foods containing monosodium glutamate, saying it may be associated with headaches, flushes in the head and body and tingling in the spine. The chemical is a flavor enhancer but not a necessary food ingredient. Researchers at Yale University School of Medicine said in a letter to the editor of the November 4, 1974 Journal of the American Medical Association that their studies indicated:

> That MSG offers a hazard to those endangered by excessive sodium intake: its moderate saltiness fails to warn the user about its high sodium content and can therefore lead to increased sodium ingestion.

PART II

RECOMMENDATIONS FOR GOVERNMENTAL ACTION

INTRODUCTION

The dietary trends in the United States described in Part I have occurred in other nations as well, in several cases prompting governmental action. In 1968, the medical boards of Finland, Norway and Sweden published "Medical Viewpoints on the National Diet in Scandinavian Countries" which recommended:

1. The dietary energy supply should, in many cases, be reduced to prevent overweight.
2. The total fat consumption, at present about 40 percent, should be decreased to between 25 and 30 percent of total calories.
3. The use of saturated fat should be lowered, and the consumption of poly-unsaturated fat should be simultaneously increased.
4. The consumption of sugar and products containing sugar should be less.
5. The consumption of vegetables, fruits, potatoes, skimmed milk, fish, lean meat and cereal products should be increased.

In 1969, the Swedish National Board of Health and Welfare motivated by "the decidedly negative results of the changed food habits in our country during the last 30–40 years (and) the enormous costs of medical care of disease related to these changes," began a 10-year campaign to encourage the public to exercise more and alter their diets. Table 15 shows recommended dietary changes.

TABLE 15.—Example of changes desirable in the average consumption of foods in Sweden. The proposed changes are expressed percent of the mean consumption in 1960.

Food group	
1. Green vegetables, dried peas and beans	+100
2. Fruit	+50
3(a). Potatoes	+25
(b). Other root vegetables	+100
4. Standard milk	+25
5. Meat, fish and eggs	±0
6. Flour, meal macaroni for direct consumption	+25
Crispbread and soft bread	+25
7. Fats and oils	−25
Other products: sugar, syrup, sweets, etc.	−25

Source: "Activities in Sweden to Improve Dietary Habits," *Nutr. Diet.*, No. 19, pp. 154–165 (Karger, Basel. 1973).

The impact of Sweden's program has not been completely measured. An interview survey conducted in 1974 found that sugar consumption had declined from 61.5 to 47.8 pounds a year and fresh vegetable consumption had risen from 31.5 to 44.8 pounds a year. Poultry con-

sumption rose from 3.3 to 8.8 pounds, but potato consumption dropped from 191.4 to 144.9 pounds. Consumption of certain fruits also declined.

In addition, the percentage of energy in the diet derived from fats declined from about 41 percent in 1965 to 38.5 percent in 1974.

In 1975, Norway's ministry of agriculture presented to the nation's legislative body a report on nutrition and food policy which described trends in food consumption such as those in the United States and said:

> **The aforementioned unfavorable health tendencies, particularly with respect to cardiovascular disease, as well as the gradual understanding that is being gained of the connection between nutrition and health, make it necessary for the Government to base itself on the experts' recommendations, issued by the National Nutrition Council, when planning the Norwegian nutrition and food policy.**

The report noted that the government would therefore take steps to try to reduce total fat intake to 35 percent of energy intake and compensate by increasing consumption of starchy foods, principally cereals and potatoes. A reduction in sugar consumption is sought as well as an increase in use of poly-unsaturated fats.

United States Experience

The United States' most recent experience with governmental diet counselling occurred during World War II when the government intervened to control food prices, and required production of the most nutritious foods, as well as attempting to educate the public in principles of nutrition.

The education program, aimed primarily at fighting nutrient deficiencies, enlisted the aid of the food industry, advertisers and educators and revolved around the Seven Basic Food Groups. After the war, the Basic Seven concept was simplified to the Basic Four.

The basic food group concept has been criticized for a variety of reasons. First, it recommends eating foods in all groupings, but does not caution about risk factors that may be associated with over-consumption of the dietary elements outlined in Part I. In addition, critics have said that the wide variety of choices by grouping does not ensure adequate nutrition. It has also been said that: the groupings are not designed to meet current nutrition problems; that they give too much emphasis to animal source products; and that they do not take ethnic food preferences into adequate consideration.

There was optimism at the close of the war that advances in nutrition would continue at the wartime pace. However, in a speech in 1948, Hazel K. Stiebeling, chief of the Bureau of Human Nutrition and Home Economics in the Department of Agriculture, anticipated hazards to sound nutritional health for the United States.

> **We do not yet understand the dynamics of modifying food habits well enough to apply . . . laws (of nutrition) in a fully effective way. But we are all aware of the bewilderment that household food buyers feel over much of the current advertising—advertising that attempts to push to the maximum of human capacity the consumption of every separate commodity—indiscriminately. Surely in the education of the public and in the orientation of food production and trade for bettering consumption patterns, we should look at the physiological research, and at the relative economy and usefulness of various foods to serve these needs. And science should speak with one voice in broad over-all terms about food choice and food use. This will have to be done if we are to progress at a pace in keeping with scientific knowledge and potentialities.**

The Impact of Television Food Advertising

Since World War II, the largest expenditure for public information on diet in the United States has been made by the food industry. In 1975, according to Leading National Advertisers, Inc., about $1.15 billion was spent on food advertising, which represents about 28 percent of total television advertising spending.

The most recent study to suggest the possible impact of current food advertising on the nation's nutritional health has been prepared by Lynne Masover and Dr. Jeremiah Stamler, of Northwestern University Medical School, and presented to the 1976 convention of the American Public Health Association. The study, which analysed the food advertising on four Chicago television stations during the period August 4–10, 1975, reported:

> **A detailed look at this weekly food advertising time—restaurants excluded—found that the group of non-nutritive beverages was, by far, the single most-advertised food group, capturing approximately two-fifths of time, of which nearly one-third was for wine and beer. Sweets took up about 11 percent of the time; non-nutritive beverages plus sweets—all items low in nutrients and most of them high in calories—commanded an absolute majority of time. Add to these the oils, fats, and margarines, baked goods, snack foods, and relishes, and the proportion of advertising going to low-nutrient, generally high-calorie foods was nearly 70 percent! . . .**
>
> **Of the restaurants advertised, nearly all were of the limited-menu, fast-food type specializing in foods high in saturated fats and cholesterol.**

The study found that only about 25 percent of the time was devoted to "nutritious groups," such as bread, cereal, pasta, meat, fish and seafood, dairy products, fruits and vegetables, soups and nut products.

More specifically, Table 16 shows that on weekdays during the period of analysis, almost 70 percent of the time devoted to food advertising promoted foods generally high in fat, saturated fat, cholesterol, sugar and/or salt. However, only 3 percent of the time was devoted to fruit and vegetables. Of that total, no time was spent for the promotion of fresh vegetables and 0.7 percent was devoted to fresh fruit and juices. Fish, seafood and poultry received about the same advertising exposure as beef, 3.2 percent of the time compared to 3.5 percent for beef.

Table 17 indicates an even less healthful balance of weekend food advertising in which about 85 percent of time is devoted to foods high in fat, saturated fat, cholesterol, sugar and/or salt. During the sample weekend period, no advertising time was given to fresh fruit or vegetables.

TABLE 16.—*Total weekday food advertising by food groups on four Chicago Television stations, August 4–10, 1975 (including local and network advertising)* *

Food group	*Percent time of all stations combined*
Nonnutritive beverages	37.5
Carbonated (with sugar)	13.2
Carbonated (sugar-free)	2.9
Beer and wine	9.2
Drink mixes	7.2
Coffee and tea	5.0
Grain	17.5

See footnotes at end of table.

TABLE 16.—*Total weekday food advertising by food groups on four Chicago Television stations, August 4–10, 1975 (including local and network advertising)**—Continued

Food group	*Percent time of all stations combined*
Bread, cereal, and pasta	13.4
Baked goods	4.1
Sugars and sweets	10.3
Candy, frosting, syrups	5.2
Chewing gum (sugar)	2.6
Chewing gum (sugar-free)	1.5
Gelatin, pudding	1.0
Oil, fat, margarine	8.5
Oil, fat, margarine	4.2
Salad dressing	4.3
Food stores	7.0
Food store-item unspecified	4.0
Food store-low fat dairy	1.5
Food store-fresh beef	1.0
Food store-all other	.5
Processed meat, fish, poultry	5.7
Fish, seafood, poultry	3.2
Beef, pork, lamb	2.5
Snack foods	2.9
Potato chips	1.3
Corn chips	.7
All other snack foods	.9
Dairy	3.1
High fat dairy	2.4
Low fat dairy	.7
Relishes, condiments, sauces	2.6
Vegetables	1.3
Processed vegetables, juices	0.9
Fresh vegetables, juices	.0
Processed potato products	.4
Fruit	1.7
Processed fruit juices	1.0
Fresh fruit, juices	.7
Soup	1.1
Sugar substitutes	.5
Nuts, nut products	.3
Egg substitutes	.0
Total	100.0
Total food advertising time (minutes)	751.5

*Restaurants and food preparation equipment excluded.

SOURCE: Unpublished thesis material, Lynne Masover, Department of Community Health and Preventive Medicine, Northwestern University Medical School, Chicago, Ill.

TABLE 17.—*Total weekend food advertising by food groups on four Chicago Television stations, August 4–10, 1975 (including local and network advertising)**

Food group	*All stations combined*
Nonnutritive beverage	51.7
Beer and wine	24.3
Carbonated (with sugar)	17.9
Carbonated (sugar-free)	2.0
Drink mixes	4.0
Coffee and tea	3.5
Grain	19.8
Bread, cereal, and pasta	10.7
Baked goods	9.1
Sugar and sweets	12.9
Candy, frosting, syrups	7.0
Chewing gum (sugar)	4.2
Chewing gum (sugar-free)	1.2
Gelatin, pudding	.5
Oil, fat, and margarine	5.7
Oil, fat and margarine	3.2
Salad dressing	2.5
Snack foods	3.7
Corn chips	1.7
Potato chips	1.0
All other snack foods	1.0
Dairy	2.0
High fat dairy	1.5
Low fat dairy	.5
Vegetables	1.7
Processed vegetables, juice	1.2
Fresh vegetables	0
Processed potato products	.5
Relishes, condiments, sauces	1.2
Processed meat, fish, poultry	.6
Fish, seafood, poultry	.3
Beef, pork, lamb	.3
Sugar substitutes	.2
Eggs and egg substitutes	0
Food store specials	0
Fruit	0
Infant foods	0
Nut products	0
Soup	0
	99.5
Total food advertising time (minutes)	100.12

*Restaurants and food preparation equipment excluded.

SOURCE: Unpublished thesis material, Lynne Masover, Department of Community Health and Preventive Medicine, Northwestern University Medical School, Chicago, Ill.

With respect to restaurant and fast food advertising, not included in the above totals, the percent of total general advertising time devoted to them rose from 2.8 percent on weekdays to 3.2 percent on weekends.

In the report's conclusion, Masover and Stamler said:

> When this outlay of food advertising is juxtaposed with what is known about the prevalence in the United States of malnutrition of both the under-nutrition and over-nutrition types, coronary heart disease, hypertension, diabetes, and alcoholic liver cirrhosis, it is reasonable to conclude that on weekdays over 70 percent and on weekends over 85 percent is negatively related to the nation's health needs . . . Television is the primary source of information for the American public today. On the other hand, positive nutrition education from other sources is comparatively miniscule in the country. Thus it is reasonable to infer further that these combined circumstances are significant contributors to the current array of nutrition-related health problems. Therefore it is further reasonable to inquire why food advertising time on television should not be used exclusively to present the viewing audience with good rather than bad food choices?

A report prepared by Richard Manoff for the Ninth International Congress of Nutrition in 1972 suggests that more than 50 percent of the money spent on television food advertising may be negatively related to health. Calculations based on Table 18, provided in his report, indicate that a minimum of 48 percent of the money spent on television food advertising in 1971 went for items that may be generally characterized as high in fat, saturated fat, cholesterol, sugar, salt or alcohol. This is a conservative estimate, not including sugared cereals and certain cake mixes, meat products, eggs, butter and cheeses that may be high in one or more of the dietary risk factors. In addition, coffee, tea and cocoa are not included in this calculation.

TABLE 18.—U.S. FOOD AND BEVERAGE ADVERTISING EXPENDITURES

[In thousands of dollars]

	1971	
	6-media total [1]	TV
Sugars, sirups, and jellies	10,125.2	[2] 5,993.2
Shortening and oils	39,547.7	[2] 34,498.6
Flour and prepared baking mixes	18,580.6	12,603.6
Seasons, spices, and extracts	6,576.1	[2] 4,363.9
Desserts and dessert ingredients	32,361.4	[2] 22,824.3
Condiments, pickles, and relishes	10,785.2	[2] 8,056.3
Sauces, gravies, dips	13,214.8	[2] 10,986.2
Salad dressings and mayonnaise	20,506.1	[2] 15,814.6
Miscellaneous ingredients	14,753.0	12,639.3
Soups	25,608.5	17,028.7
Cereals	89,144.0	81,645.5
Health and dietary foods	9,893.2	4,047.1
Infant foods	3,074.0	2,161.3
Pastas	25,426.4	21,010.0
Prepared dinners	27,850.9	22,305.3
Milk, butter, and eggs	30,358.8	25,622.8
Cheese	11,170.4	8,651.2
Ice cream and sherbets	4,575.3	[2] 4,195.5
Fruits and vegetables	36,239.5	24,198.5
Meats, poultry, fish	50,131.5	42,631.1
Bread and rolls	50,183.2	34,454.8
Cakes, pies, cookies	24,244.7	[2] 21,189.0
Coffee, tea, cocoa	82,084.7	75,691.4
Fruit and vegetable juice	23,105.0	19,991.8
Candy, gum, snacks	104,190.2	[2] 98,298.3
Soft drinks	108,050.4	[2] 96,055.8
Beer, wine, liquor	231,785.6	[2] 104,712.7
Total food and beverage [3]	1,159,522.6	890,882.4

[1] Total of measured media excluding spot radio.
[2] Used to determine percent advertising that may be negatively related to health.
[3] Including combination copy advertising which is not detailed.

Source: LNA Competitive Brand Cumulative for 1970 and 1971 (4), presented in "Potential Uses of Mass Media in Nutrition Programs," R. K. Manoff, and appearing in the proceedings of the 9th International Congress on Nutrition, Mexico, 1972, vol. 4, pp. 256–277 (Karger, Basel 1975).

It is important to point out that the amounts of advertising for various kinds of foods are not dictated by any overall plan for the achievement of a healthful diet but by needs of various firms at any given moment. Furthermore, those foods most heavily advertised are predominantly processed foods since it is difficult to develop brand loyalties for relatively undifferentiated raw staples.

Advertising and Low-Income Consumers

It is likely that those most influenced by food advertising are low-income and elderly consumers who are least capable of comprehending written guidance on food selection and least able to make comparisons between foods based on the nutrition labelling and price.

A report quoted by James T. Parker of the Division of Adult Education of the U.S. Office of Education at the Department of Agriculture's 1976 Outlook Conference, found that, with respect to consumer economics, almost 30 percent of the population falls into the lowest category of functional literacy:

> In terms of the general knowledge areas, the greatest area of difficulty appears to be consumer economics. Almost 30 percent of the population falls into the lowest level (those adults who function only with difficulty because of their unsatisfactory mastery of the requirements for functional literacy), while one-third of the population is categorized as (those adults who are functional, but not proficient).

This means, the report said, that about 34.7 million adults "function with difficulty" within consumer economics and an additional 39 million "are functional (but not proficient)." As an example, the report noted:

> When given pictures of three competing packaged cereals marked by net weight and price, only three out of four respondents identified the cereal which, in the sense of lowest cost per ounce, was the "best buy."

The report finds that the level of general competency decreases as levels of education and income decline. And the report finds ". . . the general trend is that the older the individual, the more likely that he/she is incompetent."

In a test gauging nutrition knowledge, 71 percent correctly selected tuna when asked to choose an item for a high-protein dinner from the list: tuna, macaroni, peaches and spinach. The report shows the lowest percent choosing the correct answer, 60 percent, was in the lowest income grouping, under $5,000 family income. In this group, 26 percent selected spinach, the most often chosen incorrect answer among all groups.

Scores by age grouping were: 18–29 years, 62 percent correct; 30–39 years, 79 percent correct; 40–49 years, 80 percent correct; 50–59 years, 72 percent correct, 60–65 years, 66 percent correct.

In another test related to nutrition, only 56 percent correctly calculated the number of calories in question. Again, the lowest scores fell in the lowest income and highest age groups. In the under-$5000 family income group, only 38 percent achieved the correct answer.

Lack of Nutrition Information

While constantly presented with persuasive messages on the kinds of food to buy, the consumer has had remarkably little information on the nutritional characteristics of the food itself.

Currently, nutrition labelling is voluntary and therefore not available on many food packages. Moreover, labels rarely provide information on the types of fats in food, or amounts of sugar, cholesterol or calories. Food additives are listed for some foods but not others.

In short, the situation is one in which the consumer is under intense pressure to buy certain foods but at the same time is ignorant of some of their most important nutritional characteristics.

The following recommendations are based on the premise that the first step toward improving the nation's health through diet is provision of information that will enable food growers, processors, wholesalers, retailers and consumers to make more healthful food choices.

RECOMMENDATIONS

To encourage the achievement of the foregoing dietary goals, it is recommended:

1. That Congress provide money for a public education program in nutrition based on the foregoing or similar goals. The initial minimum period for the promotion of these dietary goals should be five years.

Such a campaign should involve the following five functional areas:

(1) health and nutrition education in the classroom and cafeterias of our schools;

(2) nutrition and health education for school food service workers;

(3) nutrition education in the federally-funded food assistance programs;

(4) nutrition education conducted by the Extension Service of the Department of Agriculture; and

(5) extensive use of television to educate the public in the potential benefits of following certain dietary goals.

2. That Congress require food labelling for all foods, containing the following information to enable the consumer to make informed comparisons between foods:

(1) percent and type of fats;
(2) percent sugar;
(3) milligrams of cholesterol;
(4) milligrams of salt;
(5) caloric content;
(6) a complete listing of food additives for all foods, including those now covered by standards of identity; and
(7) nutrition labelling which is currently voluntary.

3. That Congress provide money to the Departments of Agriculture and Health, Education, and Welfare to jointly conduct studies and pilot projects that would develop new techniques in food processing and institutional and home meal preparation aimed at reducing risk factors in the diet.

4. That Congress increase funding for human nutrition research in the Department of Agriculture in accordance with the plan of the Agricultural Research Service, contained in Appendix D, and that Congress establish a committee for the coordination of human nutrition research undertaken by the Departments of Agriculture and Health, Education, and Welfare.

5. That the Department of Agriculture and Department of Health, Education, and Welfare form a joint committee to periodically consider the implications of nutritional health concerns on agricultural policy.

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APPENDIX A

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

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.

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 to 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 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 submarginal 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 1955–66	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 to White.
	Negro males 61.1	
	White females 75.1	
	Negro females 68.2	
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; ½ 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.

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

Health problem	Magnitude of loss	Potential savings from improved diet
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.

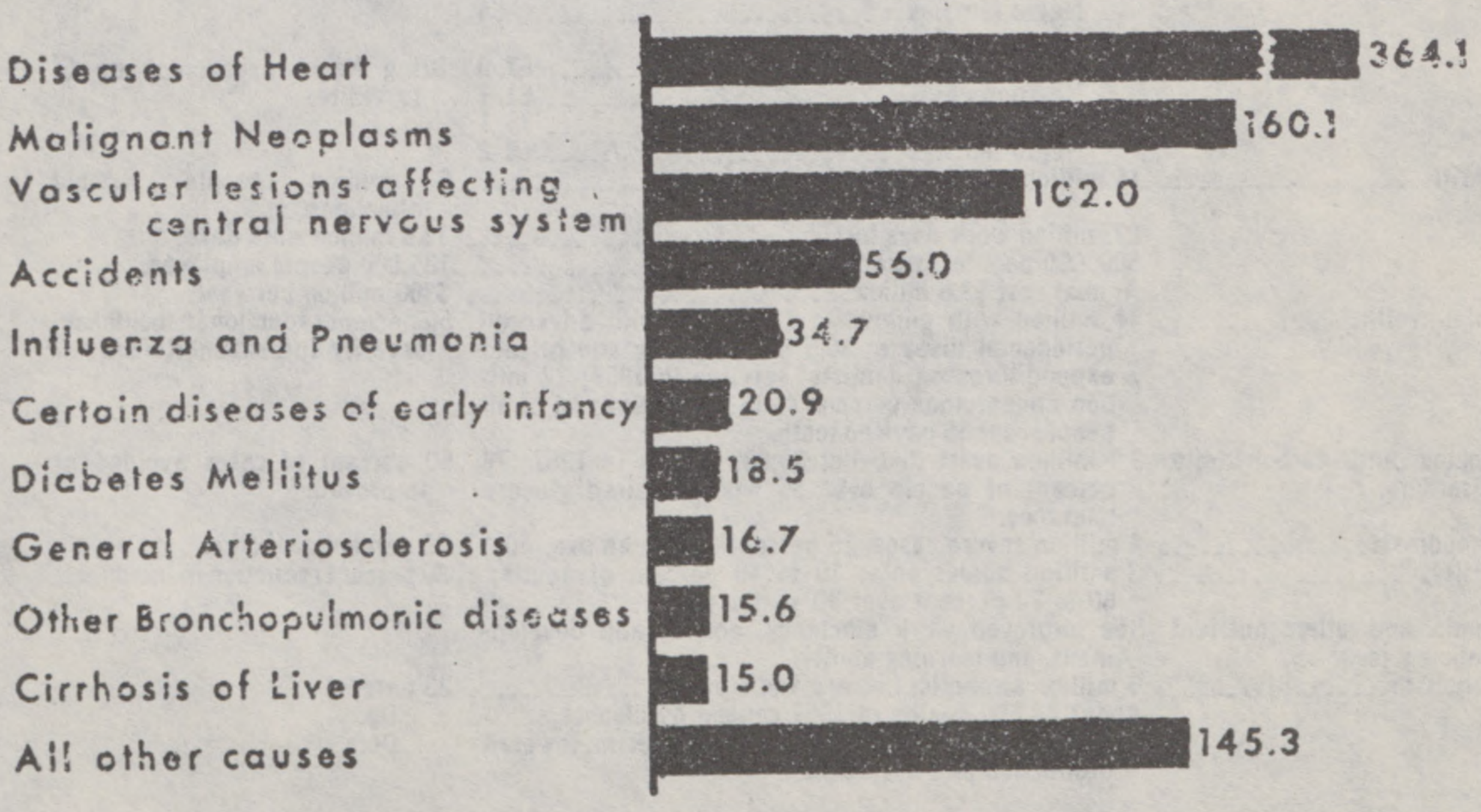


FIGURE 1

APPENDIX B

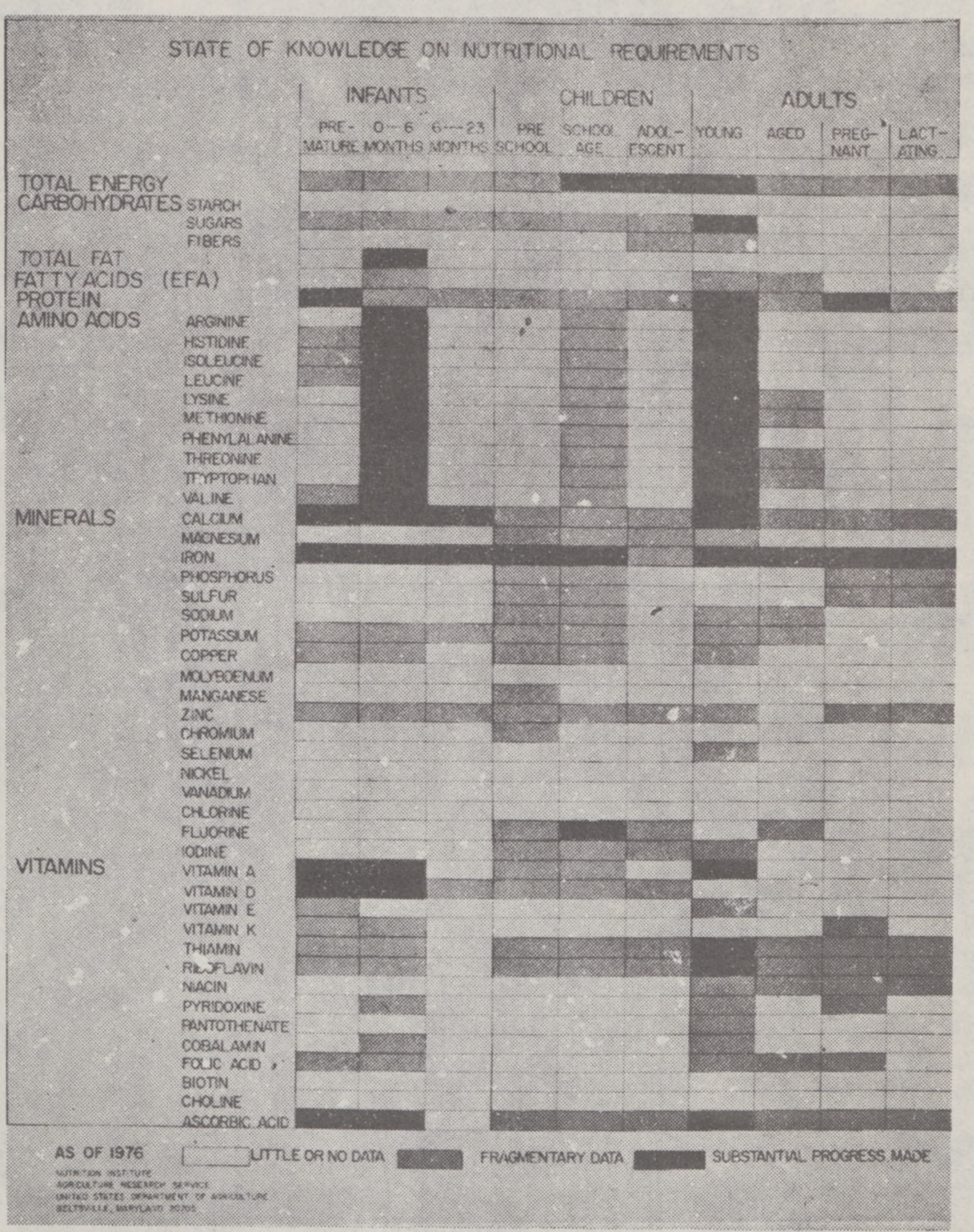
RECOMMENDATIONS OF 15 EXPERT COMMITTEES ON DIETARY FAT AND CORONARY HEART DISEASE

Country	General population (GP), high risk group (HR)	Fat content of total calories (percent)	Increased PUFA (polyunsaturated fatty acids)	PUFA–SAFA ratio (polyunsaturated to fatty acids to saturated fatty acid)	Daily dietary cholesterol (mg)	Reduction of sugar	Advised labeling of fat content of foods
United States:							
Inter-Soc. Commission for Heart Disease Resources 1970	GP	<35	Yes	1.9	<300		Yes.
	HR						
American Health Foundation (1972)	GP	35	Yes	1.0	300	Yes	Yes.
American Medical Association (1972)	HR	(1)	Yes		(2)		Yes.
American Heart Association (1973)	GP	35	Yes	1.0	300	Yes	Yes.
White House Conference (1973)	GP	35	Yes		300		Yes.
Norway, Sweden and Finland, 1968	GP	25–35	Yes			Yes	Yes.
United Kingdom:							
DHSS COMA Report (1974)	GP	(3)	No			Yes	
Royal College Physicians and British Cardiac Society (1975)	GP	(4)	Yes		(2)	Yes	Yes.
New Zealand: Heart Foundation (1971)	GP	35			300–600		
	HR	35	Yes	1.0	300–600		Yes.
Royal Society (1971)	GP		No		(2)		
	HR	(5)	Yes		(2)		
Australia:							
National Heart Foundation (1974)	HR	30–35	Yes	1.5	<300	Yes	
Academy of Science (1975)	GP	35	Yes	1.0	<350	Yes	Yes.
Germany: (Federal Republic) (1975)	GP	(6)	Yes		300		
The Netherlands (1973)	GP	35	Yes	1.0	250–300	Yes	Yes.
International Society of Cardiology (1973)	HR	<30	Yes	>1.0	<300		Yes.

1 Substantial decrease in saturated fat.
2 Reduce.
3 Reduce total fat, especially saturated.
4 Toward 35.
5 Avoid excess saturated fat.
6 Reduce saturated fat.

Source: Physiological Effects of Dietary Linoleic Acid, A. J. Vergroesen. Statement prepared for Federal Trade Commission hearing on nutrition information in food advertising, 1976.

APPENDIX C


STATE OF KNOWLEDGE ON NUTRITIONAL REQUIREMENTS
INFANTS
CHILDREN
ADULTS
PRE-MATURE
0--6 MONTHS
6---23 MONTHS
PRE SCHOOL
SCHOOL AGE
ADOL-ESCENT
YOUNG
AGED
PREG-NANT
LACT-ATING
TOTAL ENERGY
CARBOHYDRATES
STARCH
SUGARS
FIBERS
TOTAL FAT
FATTY ACIDS (EFA)
PROTEIN
AMINO ACIDS
ARGININE
HISTIDINE
ISOLEUCINE
LEUCINE
LYSINE
METHIONINE
PHENYLALANINE
THREONINE
TRYPTOPHAN
VALINE
MINERALS
CALCIUM
MAGNESIUM
IRON
PHOSPHORUS
SULFUR
SODIUM
POTASSIUM
COPPER
MOLYBDENUM
MANGANESE
ZINC
CHROMIUM
SELENIUM
NICKEL
VANADIUM
CHLORINE
FLUORINE
IODINE
VITAMINS
VITAMIN A
VITAMIN D
VITAMIN E
VITAMIN K
THIAMIN
RIBOFLAVIN
NIACIN
PYRIDOXINE
PANTOTHENATE
COBALAMIN
FOLIC ACID
BIOTIN
CHOLINE
ASCORBIC ACID
AS OF 1976
LITTLE OR NO DATA
FRAGMENTARY DATA
SUBSTANTIAL PROGRESS MADE
NUTRITION INSTITUTE
AGRICULTURE RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE
BELTSVILLE, MARYLAND 20705

APPENDIX D

U.S. DEPARTMENT OF AGRICULTURE,
AGRICULTURAL RESEARCH SERVICE,
Washington, D.C., November 12, 1976.

Hon. GEORGE MCGOVERN,
Chairman, Select Committee on Nutrition and Human Needs, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: We welcome the opportunity to respond to your recent request concerning the implementation of a national, comprehensive human nutrition research program under the leadership of the Agricultural Research Service.

The Department of Agriculture and the Agricultural Research Service have a comprehensive mandate to perform human nutrition research, including human requirements for nutrients, studies of food consumption patterns, study of nutrient content of foods and means of preserving and enhancing its nutrient quality. The Agricultural Research Service ongoing program is funded at a $13 million level.

A significant amount of research has been accomplished in this area but many important questions remain to be answered. For example, only limited knowledge exists concerning proper diets for humans. This was confirmed during recent Congressional Hearings on the relationship between diet and disease when the Assistant Secretary for Health, the nation's top health officer, stated: "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."

The agricultural research community believes that major breakthroughs of knowledge can result from an expanded nationally coordinated human nutrition program. Potential savings in terms of human lives and resources devoted to health care can be immense. Increased knowledge of human requirements for nutrients and how this can be accomplished by changes in crop and animal production practices and food processing techniques can result in increased efficiency in food consumption patterns. Overall, an expanded nutrition research program can contribute to strengthening the nation's economy and to the well being of its citizens.

National program managers feel that major breakthroughs can occur and long term needs met by building on research knowledge already known and by concentrating efforts in five major areas of work. Rationale for recommended long-range studies and recurring additional funding requirements are summarized below:

1. Human requirements for nutrients necessary for optium growth well-being—$66.6 million.

Our dietary guidance for families is hindered by inadequate knowledge about the nutritional needs at different stages of life, and the consequences of inadequate nutrition. This knowledge is needed to guide major USDA feeding programs for groups believed to be at nutritional risk. This research would establish the extent of biological variability for nutrients in individuals differing in age, sex, and genetic background. Many of these population groups have never been studied to quantitate their requirements for a particular nutrient.

2. The nutrient composition of foods and the effects of agricultural practices, handling, food processing and cooking on the nutrients they contain—$11 million.

Nutritional needs must be translated into the foods or food patterns that can best meet these needs. Up-to-date information on the composition of all important foods for the many nutrients required by man is a research goal that requires additional support.

3. Surveillance of nutritional benefits in the evaluation of the USDA food programs—$9.5 million.

The major USDA programs in child nutrition, food stamps for low-income families, and the nutrition education efforts among the hard-to-reach poor need continual surveillance and evaluation in terms of measures of nutritional health of the recipients. Research is needed on the relationship between specific foods in the diet and health.

4. Factors affecting food preferences and food habits—$4.8 million.

The nutrition educator is faced with a problem of helping people to change and improve their nutrition through diet. There is insufficient knowledge about food habits, choice, and motivations. Factors affecting food preference, such as odor, taste, and texture, need increased attention.

5. Techniques and equipment to guide consumers in the selection of food for nutritionally adequate diets in the home or in institutions—$4.7 million.

Guidance of consumers toward nutritionally adequate diets must include research-based knowledge on food management procedures and preparation of foods for the table, to assure retention of both nutritional and eating qualities and to avoid food-borne illness.

National program managers recommend that $60 to $65 million of the proposed $95 million (about 70%) be used to finance research performed by Land-Grant Colleges and other qualified public and private institutions. It is envisioned that the bulk of this research would be performed through the Land-Grant College System.

Estimated funding and distribution of effort in the five categories listed above for the expanded human nutrition program is as follows:

	Intramural Agricultural Research Service		Extramural land-grant and other institutions	
	Amount	Percent	Amount	Percent
	[Dollar amounts in millions]			
Category:				
1	$21.8	70.0	$44.8	70
2	3.1	10.0	6.4	10
3	3.1	10.0	6.4	10
4	1.6	5.1	3.2	5
5	1.5	4.9	3.2	5
Total	31.1	100.0	64.0	100

We appreciate your interest in human nutrition research and hope that the information provided meets your needs. All estimated funding levels are provided for information. They have not had the approval of Department officials or the Office of Management and Budget and should not be considered a request for funds. If I can be of further assistance, please do not hesitate to contact us.

Sincerely,

T. W. EDMINSTER, *Administrator.*

U.S. GOVERNMENT PRINTING OFFICE : 1977 O—237-395