

Sourcebook on Food and Nutrition

Edition

Sourcebook on Food and Nutrition

Third Edition

Contributing Editors

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Preface

Like its predecessors, the third edition of *Sourcebook on Food and Nutrition* is a compendium of dietary information on current topics. It is designed primarily as a reference tool for librarians, dietitians, researchers, biochemists, food scientists, students, physicians and, indeed, anyone interested in the field of nutrition.

In preparing this edition, more than 200 separate research grants for nutritional investigation were analyzed to define important, new dietary directions. From the several hundred thousand articles published in the past five years, a database search yielded 5,000 articles and/or monographs for possible inclusion in this edition. These articles were then evaluated for readability, scientific credibility, medical accuracy, and thematic scope.

From this grouping, the editors selected about 400 articles for thorough analysis. The final selection appears in the first three parts of this book. Each part features a short introduction, followed by a brief listing of other pertinent sections for further information on specific topics.

Part 1, "Dietary Guidelines in the 1980s," begins by discussing the efforts of major governmental groups to develop a national nutrition policy. Essentially, the federal scientists agree in their analyses of the scientific data. However, fully one half of the adult population risks one or more of the diseases that result from affluent diet. Consequently, some dietary guidelines are designed for those with diabetes, obesity, heart disease, cancer, hypertension, and other ailments of a society that is not necessarily well-fed, but one in which food is overabundant. Other guidelines are designed for healthy Americans. As technology advances, new problems surface. Although most Americans no longer need fear gross deficiency diseases such as pellagra or scurvy, scientists are discovering new links to food's direct impact on other human afflictions. Environmental contamination and food safety become important in this regard.

"Nutritive Values" covers the ninth edition of the Recommended Daily Allowances released by the National Academy of Sciences, as well as the measured values of hundreds of food items. "Energy Requirements," "Vitamins," "Minerals," and "Elements" ad-

dress some of the topical issues on nutrient needs. The emphasis on minerals and trace elements as contributing to good nutrition is also covered.

Because table salt is a frequent mineral in our diet—30 million Americans suffer from hypertension while another 30 million are borderline hypertensives—a subsection of part 1 concentrates on sodium's positive and negative impact on this problem. Technically speaking, dietary fiber has no nutritive value, but it does affect the nutritive value of many other items in our diet, and therefore, is included as a subsection of part 1. Both obese and diabetic patients appear to benefit from increased dietary fiber. And more than one proposed nutritional guideline finds value, for the general population, in increased consumption of dietary fiber. **However, the editors stress that no section of this book should be adapted to an individual's diet without first consulting a nutritional professional or family physician.**

Sugar and a number of its replacements—both good and bad—are addressed in "Sweeteners." Included are fructose, lactose, corn syrups, honey, saccharin, cyclamate, aspartame, and others. The concept of replacing the calories in sweeteners with complex carbohydrates is also addressed.

In the next two parts, the editors grouped life cycle issues. Part 2, "Nutrition from Conception Through Adolescence" begins with the link of the nutritional condition of the mother to the fetus. Caffeine, alcohol, and medical contraindications for the fetus and the breast-fed newborn are discussed in "Pregnancy and Lactation." Next, the nutrients that infants receive from both breast-feeding and supplemental feeding are discussed.

Nutrition has a profound impact on the immunological defenses of the body. Although the development of the immune system begins in childhood, many of the immunological problems of children resurface in geriatrics, when the defense mechanisms in the body begin to break down. Consequently, this section is cross-referenced to the "Geriatric Needs" portion of part 3.

Nationally sponsored nutrition programs for children are also treated in part 2. Highlighted are studies in the very im-

portant area of salted snack food consumption. Adolescents also have specific nutritional concerns including the implications of junk food consumption, teenage pregnancy, and the underweight adolescent.

Ideally, physical exercise is a part of the life cycle. However, the editors chose to begin part 3, "Adulthood into the Golden Years," with a positive need. Along with a variety of foods, maintenance of body weight is important for millions of Americans who wish to reduce the potential health problems associated with a sedentary lifestyle. Part 3 then covers dietary influences on the major diseases of adulthood.

"Cardiovascular" covers heart-related aspects of diet, especially the debate whether saturated fats and cholesterol are risk factors or essentials to life. Lipoproteins and the Framingham Heart Study also are highlighted here, along with hypertension.

Cancer is the second leading cause of death in the United States, exceeded only by cardiovascular disease. Actually, cancer is not one disease, but a complex array of disorders. Those cancers that are linked with digestion and diet are touched on here.

Nearly all Americans have had at least one decayed tooth by the time they become adults. Findings that emphasize the relationship of diet to the microbial ecology of the oral cavity are presented.

Adult-onset diabetes is most frequently linked to obesity. A treatment that is increasingly controversial is the use of sugar replacements in the diets of diabetics. Other treatments investigate high-dietary fiber diets for diabetic patients. The editors stress that diabetics may suddenly precipitate reduced insulin requirements and bring on dangerous hypoglycemic attacks by abruptly introducing large amounts of fiber into their diets. Fiber should be modified only under the direct supervision of a doctor. Likewise, those diabetics who choose to consume alcoholic beverages, must do so understanding the interaction between insulin and alcohol. This section is very technical because the scientific data are still being tabulated. Dietary changes in diabetics should be made only under the direct supervision of a physician.

"Medical Interactions" covers the interaction of prescribed drugs and other medical treatments with food.

Mental development and learning are linked to nutrition in the section titled "Mental Health." Also of concern is the nutritional demand imposed by stress. For example, mild trauma will elevate energy requirements only slightly, but other reactions to stress, such as overeating or loss of appetite, can derange metabolism far more seriously.

The editors address nutrition in the aged. Statistics show that one out of every nine Americans is a member of that group called the elderly. Every day, about 5,000 Americans celebrate their 65th birthday. By the year 2000, the United States will have approximately 32 million people who will be at least 65 years old. The nutritional needs of this group change as the years add up.

Part 4, "Resources for Further Information," lists associations, colleges and universities with departments in food and nutrition areas, book and magazine publishers, grant support programs, publishing opportunities, and specialized libraries.

Because nutrition today encompasses myriad topics, no single book could begin to cover every topic in depth. However, the editors hope that this edition of Sourcebook on Food and Nutrition will provide the reader with a solid, helpful beginning.

About the editors

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PART 1

DIETARY DIRECTIONS IN THE 1980s

Since the 1940s—when standards for enriching grain products and margarine were established, and the school lunch program commenced—the United States has been attempting to develop a national nutritional policy. By the end of the 1960s, the first U.S. nutritional status study was showing results and the White House Conference on Food, Nutrition, and Health met.

Following the release of the somewhat controversial *Dietary Goals for the United States* by the Senate Select Committee on Nutrition and Human Needs in December 1977, numerous other scientific and federal groups have issued their own nutritional positions. These groups include the National Research Council—National Academy of Sciences (NAS), the Surgeon General, the U.S. Department of Agriculture (USDA), the Food and Drug Administration (FDA), the Department of Health and Human Services (DHHS, formerly the Department of Health, Education and Welfare), and the Federal Trade Commission (FTC).

In February 1980, the USDA and the DHHS developed their guidelines, *Nutrition and Your Health, Dietary Guidelines for Americans*. Although all officials involved in preparing the Dietary Guidelines stressed that these guidelines represented a consensus among government scientists on the current state of nutritional knowledge, other agencies—most notably, the Food and Nutrition Board of the National Research Council—voiced their concern that consensus in the interpretation of scientific facts may not be appropriate for the public policy decision-making process.

Essentially, however, all of them concur that a variety of foods should be consumed. Similarly, since obesity is linked to increased occurrence of hypertension, diabetes, coronary heart disease, and gall bladder disease, no major group argues that an ideal weight should not be maintained.

There is further agreement in the dietary guidelines developed by each group that if alcohol is consumed, it should be done in moderation. Science links overindulgence in alcohol with a higher incidence of cirrhosis of the liver, certain cancers, and, in pregnant women, defective infants.

Generally, all of the major groups concerned with developing a national nutrition policy also recommend

avoiding too much sodium in the diet. But how much is too much depends on the group. NAS suggests 3 to 8 grams of sodium per day would be better than current consumption pattern of between 10 and 12 grams. The Senate Select Committee supports limiting intake to 8 grams per day.

Controversies still entangle three other categories in the dietary guidelines proposed by the various groups. Should a diet high in fat, especially saturated fats and cholesterol, be avoided? Should Americans increase intake of foods with complex carbohydrates and fiber? Should sugar consumption be reduced?

Although these questions remain hotly contested, the disagreements voiced in each of the dietary guidelines rarely rely on interpretations of the scientific facts. Science appears to agree that 50 percent of the adult population risks heart disease, diabetes, hypertension, and cancer—the diseases of an affluent diet. It also agrees that 50 percent of the population is not at risk. As a result, USDA-DHHS formulated its guidelines for the "at-risk" half of this country; NAS addressed its report to the half that is "not at-risk."

Obesity is estimated to plague 10 to 50 million Americans. Excess body fat is associated with the development of such chronic health disorders as cardiovascular disease, hypertension, gall bladder disease, maturity-onset diabetes, and various psychological disturbances, as well as decreased life span. Genetic, psychological, and environmental factors influence both energy intake and energy expenditure. But to control obesity, most experts recommend a conservative weight-reducing approach that combines moderate caloric control with increased physical exercise and behavioral modification.

Truly serious vitamin deficiency diseases are seldom seen in today's U.S. population. Few doctors see cases of scurvy, beriberi, pellagra, or rickets. Those diseases that do occur can frequently be traced to poverty, child abuse or neglect, ignorance and/or indifference in food selection, or bizarre eating patterns. Nonetheless, relative vitamin deficiencies may have an impact on health and well-being, particularly in special health circumstances.

Although vitamins often take center stage in discus-

sions of dietary needs, minerals and trace elements have received accelerated research during the 1970s. The concept of trace elements as biologically active substances was established. Mineral and trace element interactions are recognized as important determinants of metabolism and nutritional status. Also, better determinations of human needs for minerals and trace elements are being developed.

Americans consume the equivalent of between 2 and 2½ teaspoons of sodium daily. Approximately 30 million people in this country suffer from high blood pressure; another 30 million are considered borderline hypertensives. For these people, reducing sodium consumption—when this is combined with a total therapeutic regimen developed with their physician—appears to be extremely beneficial. More complex is the concern that a high sodium intake, particularly in childhood and adolescence, may play a role in the current epidemic of hypertension in America today.

The interpretation of fiber research has been complicated by the lack of a widely accepted definition of the word. Crude fiber is the residue remaining after a food sample has been treated with a solvent, hot acid, and hot alkali. Dietary fiber, however, includes all food components that are not broken down by enzymes in the digestive tract. Although fiber itself has no nutritive value, it interacts with other nutrients, particularly sugars, fats, and vitamins, in some rather and diverse profound ways.

A study released in 1978 by the National Center for Health Statistics indicated that as much as one-third of the U.S. population was overweight. Americans receive as much as 24 percent of their calories from sugar. Three percent of this sugar comes naturally in fruits and vegetables, while another three percent is from dairy products. The rest comes from sugar added to foods. Though some may wish to lower their sugar intake, few Americans, it seems, are willing to sacrifice their taste for sweetness. Alternatives are being touted. Some of them are covered here.

For further information on:

- **Obesity** See part 3, especially "Cardiovascular" and "Diabetes"
- **Energy requirements** See part 3, "Cardiovascular"
- **Salts** See part 2, "Children" and part 3, "Cardiovascular"
- **Fibers** See part 3, "Diabetes"
- **Sweeteners** See part 3, "Diabetes"

NATIONAL NUTRITION POLICY

Toward a National Nutrition Policy

by Nutrition Policy Issues

Preface

The United States Department of Agriculture (USDA) and the Department of Health and Human Services (DHHS, previously known as the Department of Health, Education and Welfare) recently published *Nutrition and Your Health, Dietary Guidelines for Americans*.¹ Although these guidelines are generally consistent with recommendations from other scientific and government bodies, the media has drawn attention to the differences in interpretation. This has resulted in consumer confusion about the function of diet in health and raised Congressional concerns about the direction of a national nutrition policy.

This paper reviews and summarizes the nutritional positions of the National Research Council - National Academy of Sciences (NAS), the Surgeon General, USDA, the Food and Drug Administration (FDA), the Federal Trade Commission (FTC) and the Senate Select Committee on Nutrition and Human Needs.

Background

The United States has been moving toward a national nutrition policy since the 1940s when standards for the enrichment of grains and margarine were established and when the school lunch program began. Since then, many additional steps have been taken. In the 1960s, the first U.S. nutritional status study was conducted and the White House Conference on Food, Nutrition and Health was held. Additional government programs were begun in the 1970s, such as USDA's nutrition education and supplementary feeding program for Women, Infants and Children (WIC) and the congregate dining program for the elderly (TITLE VII); national labeling hearings were held by FDA, USDA and FTC;² the Senate Committee on Nutrition and Human Needs published *Dietary Goals for the United States*;³ and the Surgeon General released his report entitled *Healthy People*.⁴

The 1980s already have yielded Dietary Guidelines which were developed by USDA and DHHS¹ as well as the report *Toward Healthful Diets* from NAS.⁵ In response to these more recent publications, several national organizations have released statements dealing with the recommendations.

There is general agreement on most of the recommendations. However, the disagreement among the groups on the interpretation and application of some of the recommendations may cause a delay in the scientific and public policy decision-making process leading toward a national nutrition policy.

Comparison of Opinions

When the USDA-DHHS announced their guidelines in February 1980, Agriculture Secretary Bob Bergland said, "There are no absolutes in our guidelines. It is not a prescription. We are simply trying to advise people how to stay healthy through a proper diet, to dispel some of the misinformation, to give Americans the information they need to make informed decisions about the food they eat."⁶ It has been stressed by all the officials involved in preparing the guidelines that these guidelines are a consensus among government scientists on the current state of nutritional knowledge.⁶

The most controversial response to the guidelines is the report *Toward Healthful Diets*, published by the Food and Nutrition Board of the National Research Council in June 1980. The attitude of the Board toward dietary recommendations is summarized as follows in the introduction of their report:

"The Food and Nutrition Board is concerned about the flood of dietary recommendations currently being made to the American public in the hope that a variety of chronic, degenerative diseases may be prevented in some persons.

These recommendations, which have come from various agencies in government, voluntary health groups, consumer advocates and health food interests, often lack a sound, scientific foundation, and some are contradictory to one another.

In an effort to reduce the confusion in the mind of the public that has resulted from these many conflicting recommendations, the Board has prepared [their report]."⁵

Specific Recommendations

The USDA-DHHS Dietary Guidelines are used throughout this paper as the basis for comparison. Comments on them from the various groups are summarized in the chart.

1. Eat a Variety of Foods.
There is general agreement on this guideline from all major government and scientific groups.
2. Maintain Ideal Weight.
Since obesity is linked to increased occurrence of hypertension, diabetes, coronary heart disease and gall bladder disease, this recommendation has received unanimous support.
3. Avoid Too Much Fat, Saturated Fat and Cholesterol.
On this recommendation, there is much disagreement. While there is agreement that high blood levels of cholesterol and certain fats are related to heart disease, the

4. DIETARY DIRECTIONS IN THE 1980s

difference arises on the use of dietary control as a treatment for this condition. Government scientists have taken a public health stance, believing an excess of these substance in the diet may be hazardous since heart disease is a major cause of death; thus they have recommended that all persons reduce their intakes. The Surgeon General, DHHS and USDA believe there is no harm in having the total population reduce its intake of cholesterol and saturated fat.

The NAS has taken a clinical approach, recommending that people with major risk factors (such as diabetes, overweight, cigarette smoking, elevated blood pressure) should have their blood lipid levels determined and then follow the advice of their physicians. Both the NAS and the American Medical Association⁷ state that the available evidence is not strong enough to recommend that all healthy adults reduce their intakes of cholesterol, total fat and saturated fat.

4. Eat Foods with Adequate Starch and Fiber.

Although the recommendation to eat adequate starch and fiber was included in the USDA-DHHS *Dietary Guidelines*, no other group supported this recommendation directly. There seems to be some support, however, for the increased intake of complex carbohydrates. The NAS recommends an increase in complex carbohydrates and soluble plant fibers at the expense of simple sugars. In their tentative positions on food labeling announced in December 1979, following closely the USDA - DHHS Guidelines, the USDA-DHHS and FTC did not support fiber labeling since there is a lack of a definition of dietary fiber, methods of analysis and scientific documentation of the significance of fiber in the diet.²

5. Avoid Too Much Sugar.

While the NAS does not believe sugar intake for most individuals needs to be reduced, again due to lack of scientific evidence of any harmful effect other than dental caries, most who commented support this recommendation. The recent Federation of American Societies for Experimental Biology (FASEB) review of sucrose essentially states that sugar is safe except for potential dental caries.⁸ Dental experts generally believe that the frequency of sugar intake is more important in preventing human tooth decay than the amount eaten.^{9,10}

6. Avoid Too Much Sodium.

Both the NAS and the Surgeon General state that there would be no harm in reducing sodium intake of all individuals and that a reduction may be especially helpful in the prevention of hypertension in susceptible individuals. There is general agreement to a reduction; however, specific suggested levels of sodium intake are given by only two groups. The NAS suggests intake should be limited to 3-8 g salt/day instead of the current intake of 10-12 g. The Senate Select Committee recommends limiting intake to 8 g per day.

7. If You Drink Alcohol, Do So in Moderation.

Again, there is general agreement with this recommendation due to the link of alcohol to cirrhosis of the liver and certain cancers. Also, alcohol is a source of excess calories and therefore a decrease in consumption supports the ideal weight recommendation.

Implications

While the NAS report is not likely to change the USDA - DHHS's position on fat and cholesterol, the lack of consensus among the influential agencies will probably affect the speed with which the agencies make nutrition public policy decisions. Considerable controversy is likely to ensue concerning how the guidelines are to be interpreted and applied. For example, there is already evidence that USDA is interpreting the guideline "Avoid too much sugar" as meaning "eat less sugar." Such interpretations would significantly affect labeling and government feeding programs in the 1980s as well as government nutrition education efforts. The guidelines would thus also have a direct impact on the food industry.

Many other groups commenting on nutritional guidelines frequently mention the need for nutrition education along with a national nutrition policy. In a paper discussing the need for specific dietary guidelines, the National Institute of Health stresses the need to integrate nutrition into a total health curriculum for primary and secondary education.¹¹ The Board of the National Nutrition Consortium, in their Guidelines for a National Nutrition Policy, strongly supports nutrition education programs.¹² The Surgeon General's Report extensively discusses nutrition education for consumers, school children, health professionals and patients in medical care settings.

Recommendations for All Healthy Americans

USDA-DHHS Dietary Guidelines February, 1980	National Research Council — National Academy of Science June, 1980	Surgeon General's Report July, 1979	Tripartite Agencies' Labeling Positions December, 1979	Dietary Goals of Senate Select Committee December, 1977
1. Eat a Variety of Foods.	Agree.	Agree.	N/A.	Not discussed.
2. Maintain Ideal Weight.	Agree.	Agree.	Support calorie labeling.	Agree.
3. Avoid Too Much Fat, Saturated Fat and Cholesterol.	Disagree.	Agree.	Support total fat labeling, fatty acid labeling and cholesterol labeling.	Agree. Reduce overall fat from 40% to 30%; reduce saturated fat to 10% of total energy intake, balance with polyunsaturated fats; reduce cholesterol to 300 mg/day.
4. Eat Foods with Adequate Starch and Fiber.	Not discussed for general population.	Support increase of complex carbohydrates.	Do not support fiber labeling.	Support increase of complex carbohydrates.
5. Avoid Too Much Sugar.	Disagree.	Agree.	Support sugar labeling.	Agree. Support reducing refined and processed sugars by 45% to 10% of total energy intake.
6. Avoid Too Much Sodium.	Agree. Limit intake to 3-8 g salt/day.	Agree.	Support sodium labeling.	Agree. Support limiting intake to 8 g salt/day.
7. If You Drink Alcohol, Do So in Moderation.	Agree. Limit to no more than the equivalent of three mixed drinks/day.	Agree.	N/A.	Not discussed.

Summary

It seems that the lack of consensus about some of the Dietary Guidelines is based not so much on a controversy about the scientific facts, but rather on what action is to be taken regarding the facts. It is believed by many, including the NAS, that scientific decisions cannot be made by consensus, but rather that the first steps in establishing public policy must be a rigorous and critical examination of the scientific facts. While consensus is the democratically acceptable procedure in decision making, it may not be applicable in the interpretation of scientific facts for public policy. Public policy decisions often bring in other factors, such as political considerations, emotions, moral, ethical

and religious beliefs and influence from those who would benefit from that public policy. When USDA - DHHS was formulating their guidelines, they realized that 50 percent of the adult population is at risk from heart disease, diabetes, hypertension and cancer, and thus attempted to deal with these risks. The NAS geared their report to the other 50 percent of the population, those not at risk.

Overall, however, there is general agreement concerning a number of dietary recommendations among the federal government agencies and the cited scientific bodies, which may signal first steps toward the establishment of a national nutrition policy. It is also recognized that any nutrition guidelines need the broad-based support of comprehensive consumer education for implementation.

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NATIONAL NUTRITION POLICY

New Diet-Health Report Causes Confusion

by American Medical News

The Food and Nutrition Board of the National Research Council has announced its official assessment of the nutritional status of the American diet, throwing nutrition policymakers into a state of confusion.

Among its conclusions, the board said that the current state of scientific knowledge regarding nutrition is so weak that no general recommendations for the modification of dietary patterns could be made to the public as a whole.

Instead, the board, a part of the National Academy of Sciences, recommended that the one positive way individuals can help themselves to prevent a wide range of diseases (heart disease, hypertension, diabetes and cancer) is to reduce body weight through a well-balanced moderate diet.

In sharp contrast to a spate of recent dietary recommendations coming from various Washington policy groups, the Food and Nutrition Board virtually dismissed the widely accepted belief that low-cholesterol diets will help prevent heart disease. "We think it is important to eliminate cholesterol as a source of worry about disease," said board member Robert E. Olson, MD, of the St. Louis U. School of Medicine.

Echoing this sentiment was board chairman Alfred E. Harjo, MD, of the U. of Wisconsin. "Our recommendations are conservative," he said. "They stress moderation and they don't invite undue risk. What we are trying to do is allay some of the apprehension and fear of food that we see is prevalent among the American public at this time."

A report issued by the group, entitled "Toward Healthful Diets," was based on the premise that epidemiological evidence is not sufficient to make recommendations for changes in dietary patterns. Rather, the report relied strictly on data from clinical trials, animal studies, and dose response studies.

The report primarily stressed weight reduction as a preventive influence against disease. In discussing heart disease and cancer, the report said that while

there might be some connection with dietary factors, no specific modifications apart from the caloric issue could be reliably made. Regarding diabetes, the report took the traditional path in endorsing the standard exercise, nutrition, and drug management program.

In one area, the question of salt and hypertension, the board did take a strong stand. The report called for a drastic reduction in salt intake to the level of 3-8 mg. a day, a level so low that it would almost prohibit any use of table salt and restrict many pre-salted processed foods.

The report cautioned against "controversial recommendations about nutrition that promise tangible benefits and alter people's lives and habits." This was inferred to include the dietary goals advocated in 1977 by Sen. George McGovern's Senate Select Committee on Nutrition and Human Needs. These urged Americans to reduce consumption of fats, cholesterol, sodium, and sugar and to eat more starches and fiber to protect their health.

Since that time, a fierce debate over nutrition policy and just what should be advocated for the public as a whole has been raging in Washington. The controversy has been punctuated by the introduction of sets of dietary recommendations from various groups, including the Dept. of Agriculture, the Dept. of Health and Human Services, the American Health Foundation, the American Society for Clinical Nutrition, the Institute of Medicine, and the American Medical Association.

According to Philip L. White, ScD, director of AMA's department of foods and nutrition, the AMA has not taken an official position on the Food and Nutrition board report. However, Dr. White said that "the report, if read in proper context, is a good report and not much different from the AMA approach to the subject."

He added, "It is an approach of variety, moderation, constraint, and exercise. The Food and Nutrition Board emphasized the importance of obesity control and indicated that healthy Americans, if eating appropriate