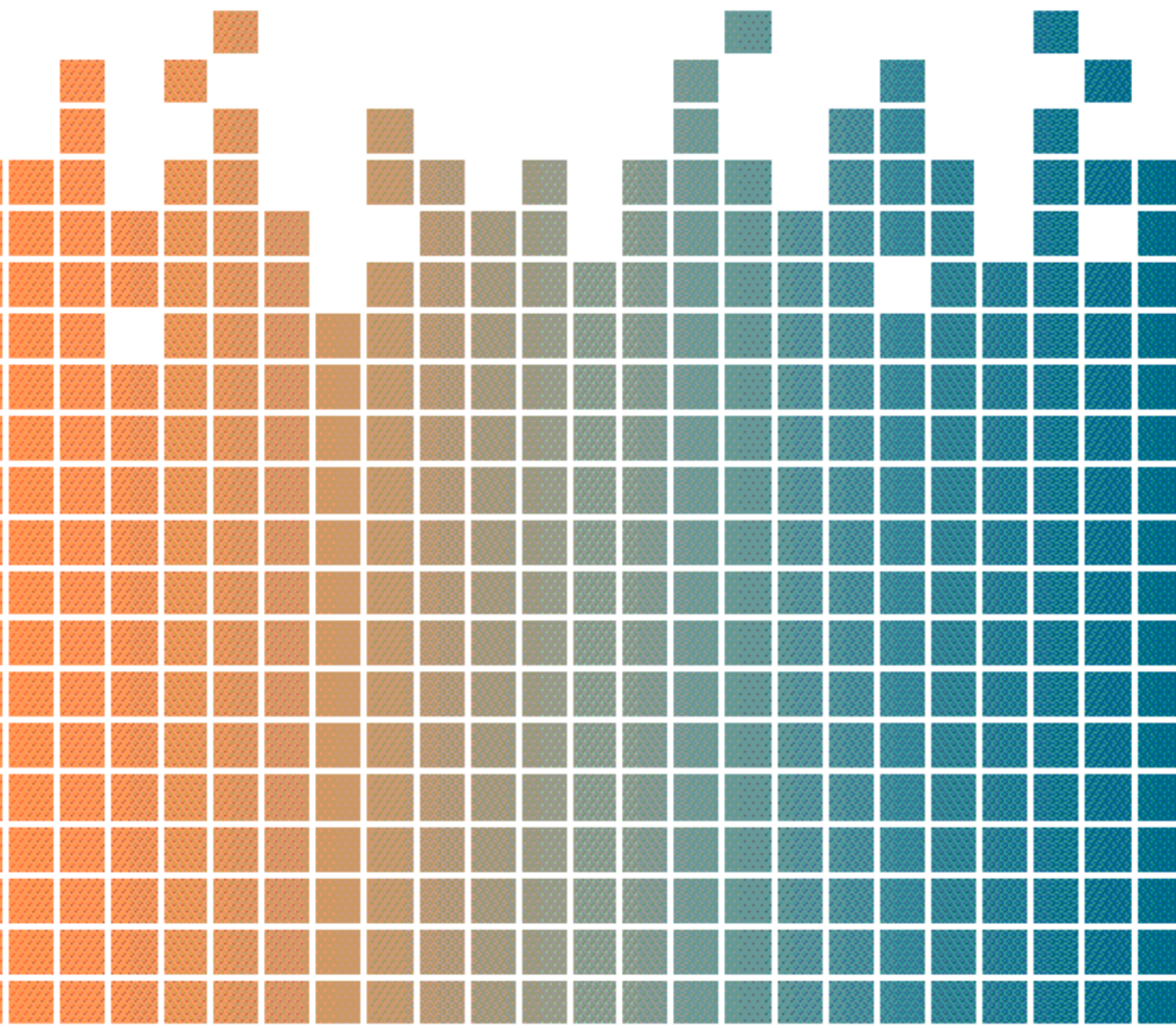


# Third Report on Nutrition Monitoring in the United States

## Executive Summary

Prepared by the Life Sciences Research Office,  
Federation of American Societies for Experimental Biology

**Interagency Board for Nutrition Monitoring and Related Research**



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Issued December 1995

## Foreword

This report is the third in a series on nutrition monitoring in the United States. The first report, *Nutrition Monitoring in the United States: A Progress Report from the Joint Nutrition Monitoring Evaluation Committee*, was published in 1986. The second, *Nutrition Monitoring in the United States: An Update Report on Nutrition Monitoring*, was published in 1989. The third report reviews the dietary and nutritional status of the U.S. population, as well as the factors that determine status, based on the data available through the National Nutrition Monitoring and Related Research Program (NNMRRP) by June 1994.

The NNMRRP includes surveys, surveillance systems, and other monitoring activities that provide information about the dietary, nutritional, and nutrition-related health status of Americans; the relationship between diet and health; and the factors that influence dietary and nutritional status. The program was established by the U.S. Congress in the National Nutrition Monitoring and Related Research Act of 1990 (Public Law 101-445). The act specified that the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) jointly implement and coordinate the activities of the NNMRRP. The legislation further specified that the agencies “contract with a scientific body, such as the National Academy of Sciences or the Federation of American Societies for Experimental Biology, to interpret available data analyses, and publish . . . a report on the dietary, nutritional, and health-related status of the people of the United States and the nutritional quality (including the nutritive and nonnutritive content) of food consumed in the United States . . . at least once every five years.”

The third report on nutrition monitoring was developed at the request of USDA and HHS in accordance with the provisions of a joint contract, No. USDA 53-3K06-5-020, with the Federation of American Societies for Experimental Biology (FASEB). The report was prepared by the Federation’s Life Sciences Research Office (LSRO). The report was drafted and edited by Sue Ann Anderson, Ph.D., R.D., Associate Director, and Janet H. Waters, M.S., R.D., Staff Scientist, LSRO, FASEB, with the assistance of Expert Consultants, scientists who were chosen by FASEB for their qualifications, experience, and judgment, with due consideration for balance and breadth in appropriate disciplines. The Expert Consultants examined and reviewed data, suggested interpretations, and reviewed and edited drafts of the report during its preparation. LSRO extends its appreciation to the Expert Consultants, whose expertise, insights, and encouragement were invaluable in the preparation of this report.

The LSRO staff and Co-Project Officers met with the Expert Consultants between December 1993 and March 1995 to obtain background information on the NNMRRP, to review analyses of NNMRRP data prepared for this report, and to review drafts of the report. The Expert Consultants reviewed each draft of the report and provided additional documentation of conclusions and viewpoints to incorporate into the report; however, the participation of these individuals in the project does not imply that each Expert Consultant specifically endorses all statements in the report.

The efforts of the Expert Consultants were augmented by contributions from two Special Consultants—George H. Beaton, Ph.D., University of Toronto, Toronto, Ontario, Canada and Barbara A. Underwood, Ph.D., World Health Organization, Geneva, Switzerland. LSRO also thanks these individuals for their assistance. Similarly, listing of individuals as Special Consultants does not imply that they necessarily agree with interpretations and conclusions in the report.

The contractual activities were overseen and assistance was provided to LSRO and its Expert Consultants by a Steering Committee, consisting of representatives of Federal agencies submitting data for this report. The Committee provided oversight for the report on behalf of the Interagency Board for Nutrition Monitoring and Related Research (IBNMRR). Members of the IBNMRR and the Steering Committee reviewed drafts of the report for technical accuracy. Members of the National Nutrition Monitoring Advisory Council provided input to the format and also reviewed selected drafts. The cooperation and the careful, conscientious reviews provided by these groups were essential to the successful completion of this project. LSRO accepts responsibility for the study conclusions and the accuracy of the report.

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Although this is a report of the Federation of American Societies for Experimental Biology, it does not necessarily reflect the opinion of each individual member of the FASEB constituent Societies.

July 31, 1995  
(Date)



Marvin Snyder, Ph.D.  
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# Preface

The U.S. Congress has defined nutrition monitoring and related research as "the set of activities necessary to provide timely information about the role and status of factors that bear on the contribution that nutrition makes to the health of the people of the United States." The National Nutrition Monitoring and Related Research Program (NNMRRP) was established by Congress in the National Nutrition Monitoring and Related Research Act of 1990 (Public Law 101-445). In that legislation, Congress directed the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) to share responsibility for implementing the program and to "contract with a scientific body, such as the National Academy of Sciences or the Federation of American Societies for Experimental Biology, to interpret available data analyses, and publish . . . a report on the dietary, nutritional, and health-related status of the people of the United States and the nutritional quality (including the nutritive and nonnutritive content) of food consumed in the United States . . . at least once every five years."

This *Third Report on Nutrition Monitoring in the United States* (TRONM) was prepared by the Life Sciences Research Office (LSRO) of the Federation of American Societies for Experimental Biology (FASEB) under contract with USDA and under the joint leadership of HHS and USDA. The first report, *Nutrition Monitoring in the United States: A Progress Report from the Joint Nutrition Monitoring Evaluation Committee*, written by HHS and USDA in 1986, and the second report, *Nutrition Monitoring in the United States: An Update Report on Nutrition Monitoring*, prepared by LSRO in 1989, summarized nutrition monitoring information from the National Nutrition Monitoring System, the NNMRRP's predecessor. Between publication of the second and third reports on nutrition monitoring, the Interagency Board for Nutrition Monitoring and Related Research (IBNMRR) published *Chartbook I: Selected Findings from the National Nutrition Monitoring and Related Research Program*.

LSRO prepared the TRONM with the assistance of Expert Consultants with specialties in dietary intake and food consumption patterns, food composition and analysis, public health nutrition, community nutrition, clinical nutrition, nutrition monitoring and surveillance research, behavioral aspects of the interrelationships of nutrition and health, agricultural economics, and statistics and biostatistics. The data for the TRONM came from surveys and surveillance systems in the interconnected Federal and State activities that are part of the NNMRRP. A description of each NNMRRP survey and surveillance system can be found in *Nutrition Monitoring in the United States: The Directory of Federal and State Nutrition Monitoring Activities*, a 1992 report by the IBNMRR. Major components of the NNMRRP discussed in the TRONM include

- nutritional status and nutrition-related health measurements;
- food and nutrient consumption;
- knowledge, attitudes, and behavior assessments;
- food composition and nutrient data bases; and
- food-supply determinations.

Food components are evaluated and classified as current public health issues, potential public health issues for which further study is required, or not current public health issues. Finally, the report summarizes the recommendations made by the Expert Consultants and LSRO for strengthening the NNMRRP, based on their experiences with analyzing and interpreting the data as they prepared the TRONM.

# Third Report on Nutrition Monitoring in the United States (1995)

## Overview of Findings

### *What is the nutrition-related health status of the U.S. population?*

Nutritional status is associated with conditions such as overweight, high serum cholesterol levels, hypertension, and osteoporosis (decreased bone mass). These diet-related conditions increase the risk of certain chronic disease outcomes, including coronary heart disease, stroke, and bone fracture.

- Markedly higher percentages of Americans are overweight now than in the late 1970s. Many adults also report sedentary life-styles. Because overweight is associated with many chronic diseases and adverse health outcomes, the increased prevalence of overweight is a cause for public health concern.
- Although the proportion of adults who have desirable serum total cholesterol levels is increasing steadily, many people still have high levels. High serum cholesterol is a major risk factor for coronary heart disease.
- Hypertension remains a major public health problem in middle-aged and elderly people. Non-Hispanic blacks have a higher age-adjusted prevalence of hypertension than non-Hispanic whites and Mexican Americans. Hypertension is the most important risk factor for stroke and a major risk factor for coronary heart disease.
- Femoral osteoporosis in females 50 years of age and older in the United States occurs in 21% of non-Hispanic whites, 10% of non-Hispanic blacks, and 16% of Mexican Americans. Low calcium intake and lack of weight-bearing exercise, among other factors, contribute to bone loss.

### *What is the nutritional quality of the U.S. diet?*

Americans are slowly changing their eating patterns toward more healthful diets. A considerable gap remains, however, between public health recommendations and consumers' practices. In particular, intakes of foods that should be changing—according to the recommendations in the Healthy People 2000 objectives, the Food Guide Pyramid, and the 1990 *Dietary Guidelines for Americans*—have not yet reached the targeted goals.

- The increase in the prevalence of overweight in the U.S. population since the 1970s indicates that energy balance remains a problem for many Americans. About one-third of adults and one-fifth of adolescents in the United States are overweight, suggesting that they have higher energy intakes than expenditures.
- Although the intakes of total fat, saturated fatty acids, and cholesterol have decreased, they remain above recommended levels for a large proportion of the population.
- Median sodium intakes from food are higher than recommended values for most Americans 6 years of age and older. (These intakes excluded salt added at the table.)
- Median calcium intakes from food are below recommended values, particularly for adolescents, adult females, elderly people, and non-Hispanic black males. Many Americans are not getting the calcium they need to maintain optimal bone health and prevent age-related bone loss.
- Median iron intakes from food are below recommended values for children 1-2 years of age, female adolescents 12-19 years of age, and females 20-59 years of age. The prevalence of anemia is generally higher in these groups than in other age-sex groups.
- Average daily intake of fruits and vegetables for the general population is about 4 servings. Fewer than one-third of American adults meet the recommendation to consume 5 or more servings of fruits and vegetables per day.
- Some Americans are not always getting enough to eat, although the availability of food and nutrients in the U.S. food supply, on a per capita basis, is generally adequate to prevent undernutrition and deficiency-related diseases. About 9-13% of people living in low-income households or families experience some degree of food insufficiency.

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<sup>1</sup>Data for this report were provided by the National Nutrition Monitoring and Related Research Program.

# Executive Summary

## Introduction

The United States has the most sophisticated national nutrition monitoring system in the world. The system can be used to examine food and nutrition issues that are important to the health of Americans (fig. ES-1). This executive summary highlights the major themes and findings of the latest comprehensive report of information from the monitoring system—the *Third Report on Nutrition Monitoring in the United States* (TRONM) (see preface). The report is based on data gathered by the National Nutrition Monitoring and Related Research Program (NNMRRP) since the second nutrition monitoring report was completed, giving special emphasis to low-income and high-risk population subgroups. Focusing on nutrients of public health concern, the report provides an update on the dietary, nutritional, and nutrition-related health status of Americans; the relationships between diet and health; and the factors that influence dietary and nutritional status. Readers are referred to the main report for a detailed presentation of NNMRRP data.

## Major themes and findings

The TRONM's major themes and findings are grouped below into three categories: nutrition-related health status, dietary status, and concerns for low-income, high-risk populations.

### Nutrition-related health status

Data collected in the NNMRRP surveys and surveillance systems provide information about the nutrition-related health status of the U.S. population. Nutritional status is associated with conditions such as overweight, high blood pressure, elevated serum cholesterol levels, and osteoporosis (decreased bone

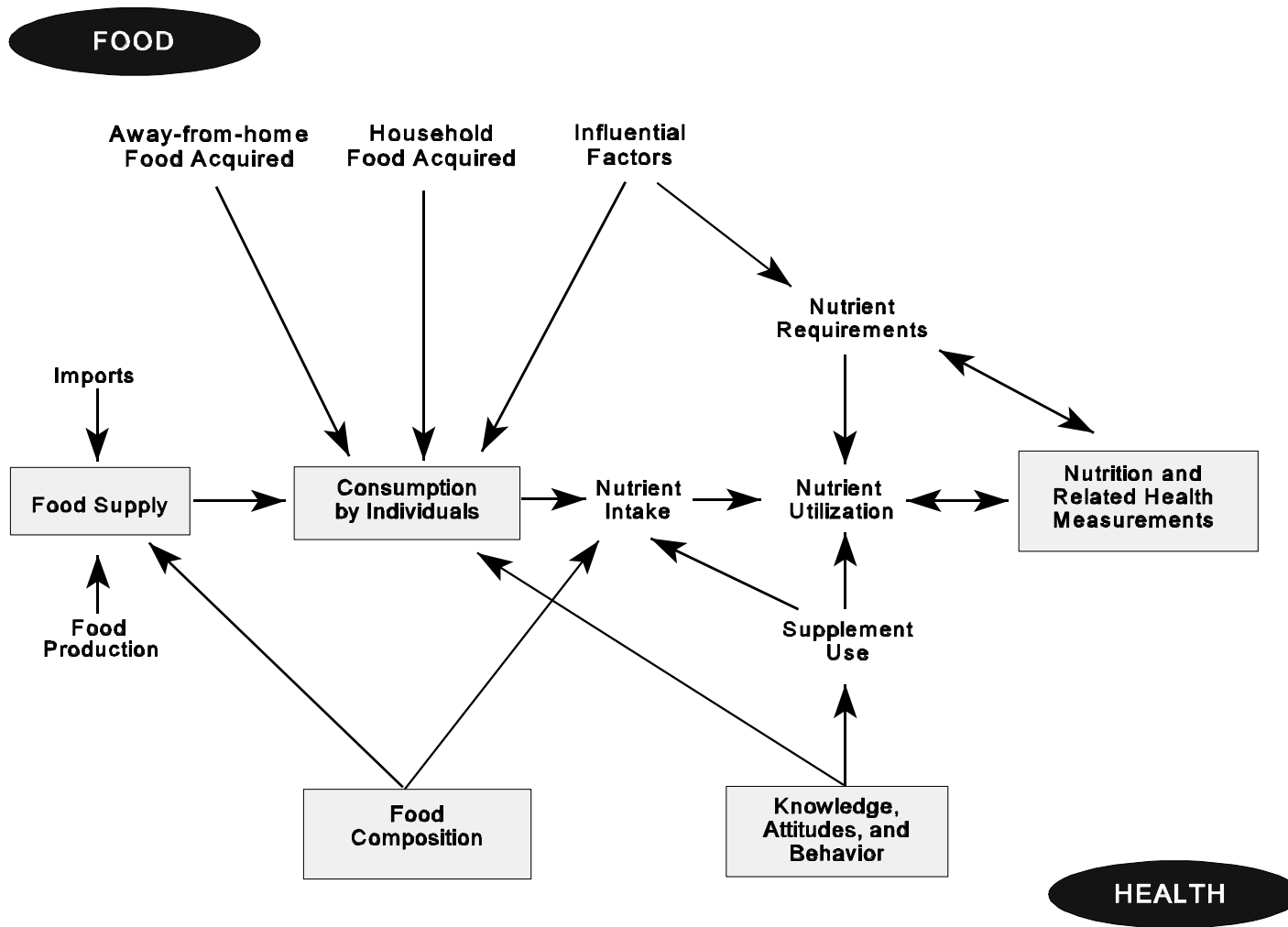
mass). These diet-related conditions increase the risk of certain chronic diseases and health outcomes, such as coronary heart disease, some types of cancer, stroke, gallbladder disease, non-insulin-dependent diabetes, and bone fracture.

The assessment of nutritional status includes taking anthropometric body measurements, collecting results of hematological and biochemical tests, monitoring clinical signs of nutritional deficiency or excess, and assessing dietary intake. Anthropometric body measurements are used to assess low birth weight and growth parameters in children as well as overweight in the general population. Biochemical and hematological measures, such as concentrations of hemoglobin and serum vitamin A, are used in conjunction with dietary intake data to assess conditions such as iron-deficiency anemia and vitamin A status in the population and in high-risk subgroups, such as young children and pregnant women. Major findings on nutrition-related health status are highlighted below.

### *Lipids and health*

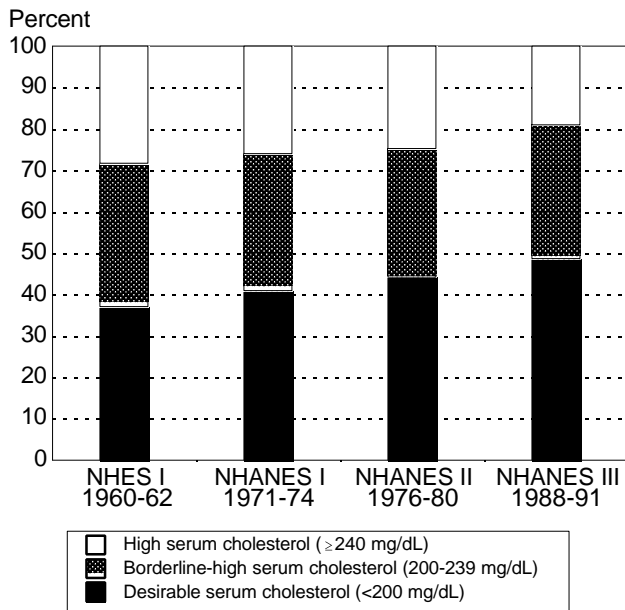
***Americans are decreasing their high serum cholesterol levels.*** High serum cholesterol is a major risk factor for coronary heart disease. Lower dietary intakes of total fat and cholesterol contribute to reduced serum cholesterol levels.

- Between 1960 and 1991, the proportion of adults aged 20-74 years who had high serum total cholesterol levels decreased steadily. Likewise, the proportion of adults who had desirable serum total cholesterol levels increased (figs. ES-2 and ES-3).
- Over the same time period, the proportion of black and white females 20-74 years of age with high serum total cholesterol was higher than that of their male counterparts.



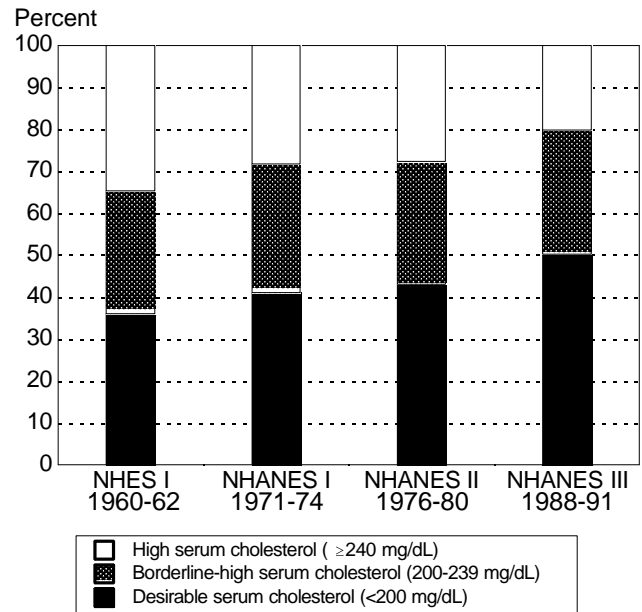
**Figure ES-1.** Relationship of food to health, highlighting the NNMRRP's major components

SOURCE: HHS and USDA (1993).



**Figure ES-2.** Age-adjusted percentage of males 20-74 years of age with desirable, borderline-high-risk, and high serum total cholesterol levels, 1960-62, 1971-74, 1976-80, and 1988-91

SOURCE: HHS, NHES I, 1960-62; NHANES I, 1971-74; NHANES II, 1976-80; NHANES III, 1988-91.



**Figure ES-3.** Age-adjusted percentage of females 20-74 years of age with desirable, borderline-high-risk, and high serum total cholesterol levels, 1960-62, 1971-74, 1976-80, and 1988-91

SOURCE: HHS, NHES I, 1960-62; NHANES I, 1971-74; NHANES II, 1976-80; NHANES III, 1988-91.

- Concurrently, intakes of total fat have decreased slightly for adults and intakes of saturated fatty acids have stayed about the same or decreased slightly. In 1988-91, median total fat intake as a percentage of calories was about 34%, down from about 36% in 1976-80. In 1988-91, median saturated fatty acid intake as a percentage of calories was 12-13%, compared with the 13% found in 1976-80.

***Intakes of total fat and saturated fatty acids remain above recommended levels for a large proportion of the population.***

- Fewer than 20% of children 6-11 years of age and of adolescents and only 21% of adult males and 25% of adult females consumed diets containing recommended levels of total fat ( $\leq 30\%$  of calories) in 1989-91 (table ES-1).
- Median intakes of total fat and saturated fatty acids (as percentages of calories) were similar for males and females of different racial/ethnic groups but tended to be somewhat lower in older than younger adults.

- Median cholesterol intakes were generally within the recommended range ( $<300$  mg/d), except among non-Hispanic black and Mexican-American males 16-59 years of age.

***Most people who were told that their serum cholesterol level was high report that they are following a health professional's advice to lower it.*** However, only about one-half of U.S. adults in 1988-91 reported that they had ever had their serum cholesterol level checked.

- Of those who were told that their serum cholesterol level was high, 85% were told by a physician or other health professional to change their diet, 54% were told to exercise, 47% were told to lose weight, and 20% were told to take medications to lower their high serum cholesterol level.
- Of people who were told to change their diet, 89% said that they were currently following the advice; of people told to lose weight, exercise, and/or take medications, more than 70% said that they were currently following the advice given.

**Table ES-1.** Percentage of people with total fat intake  $\leq 30\%$  of calories,  $>30\%$  and  $\leq 40\%$  of calories, and  $>40\%$  of calories during 3 days, by age, race, income level, Food Stamp Program (FSP) participation, and sex, 1989-91 (%)

Age in years, race, income level, and FSP participation	$\leq 30\%$ <sup>1</sup>		$>30\%$ and $\leq 40\%$		$>40\%$	
	Male	Female	Male	Female	Male	Female
Age						
6-11	18.2	17.7	64.2	66.9	17.6	15.4
12-19	14.0	17.9	67.5	61.1	18.6	21.0
$\geq 20$	20.9	25.2	53.8	53.6	25.3	21.1
Race, $\geq 20$ years						
White	20.6	25.3	53.1	53.7	26.3	21.0
Black	17.0	21.3	62.5	55.5	20.5	23.3
Income level, $\geq 20$ years						
$<131\%$ poverty	21.7	25.9	50.9	53.0	27.4	21.2
131-350% poverty	18.2	26.0	56.0	54.7	25.8	19.3
$>350\%$ poverty	22.3	23.6	52.0	53.4	25.7	23.0
FSP participation, $\geq 20$ years						
Participant	21.5	23.5	48.6	52.7	30.0	23.8
Nonparticipant	21.8	26.9	51.5	53.1	26.7	20.0

<sup>1</sup>Recommended intake.

SOURCE: USDA, CSFII, 1989-91.

***Despite widespread nutrition education efforts, many consumers still do not know enough about dietary fats and cholesterol to make food choices that are consistent with dietary recommendations.***

- Only 26% of U.S. adults in 1990 knew that "saturated fats" and "polyunsaturated fats" were similar in their caloric values or that fats and oils become more saturated when they are hydrogenated, 36% knew that "polyunsaturated fats" were more likely to be liquid than solid, and 54% knew that cholesterol was not the same thing as "saturated fats" or "polyunsaturated fats." (Quotation marks denote actual terms used in questionnaires.)
- Only 32% knew that cholesterol is found only in animal products, and 69% knew that "saturated fats" are usually found in animal products.
- About 60% were aware that "saturated fats" are more likely to raise "blood" cholesterol levels than are "polyunsaturated fats."

***More people are aware of the relationship between dietary cholesterol and health than of the***

***relationship between dietary "fat" and "saturated fat" and health.***

- Eighty-seven percent of female main meal planners and preparers said that they were aware of health problems related to cholesterol intake, 80% said that they were aware of health problems related to "fat" intake, and 65% said that they were aware of health problems related to "saturated fat" intake.
- In general, female main meal planners and preparers who were white, middle-aged, more educated, and from higher income levels were more aware of relationships between health and intake of "fat," "saturated fat," and cholesterol than were those who were black, less than 40 years of age or 60 years of age and older, less educated, and from lower income levels.

Data from the NNMRP have made it possible to track the progress toward achieving the U.S. Department of Health and Human Services' (HHS's) Healthy People 2000 objectives for dietary "fat and saturated fat" intake. Although the percentages of calories from total fat and saturated fatty acids have decreased slightly over time, additional progress is

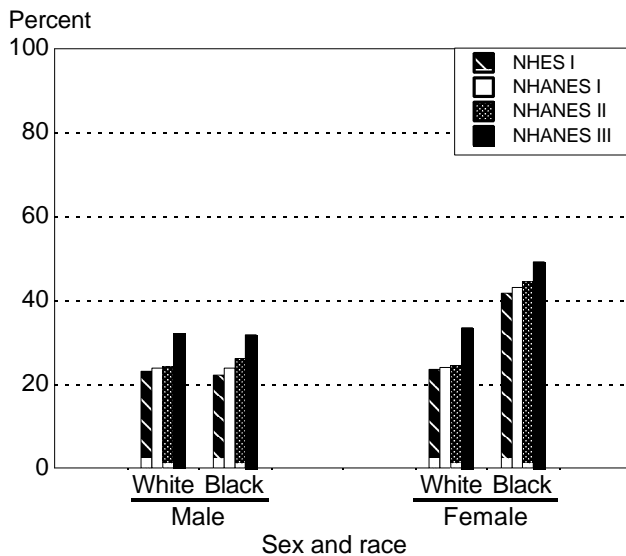
needed to meet population targets set in Healthy People 2000 Objective 2.5: to reduce dietary fat intake to an average of 30% of calories or less and average saturated fatty acid intake to less than 10% of calories.

**Overweight**

**Markedly higher percentages of American adults, adolescents, and children are overweight now than in 1976-80. Because overweight is associated with many chronic diseases and adverse health outcomes, the increased prevalence of overweight is a cause for public health concern.**

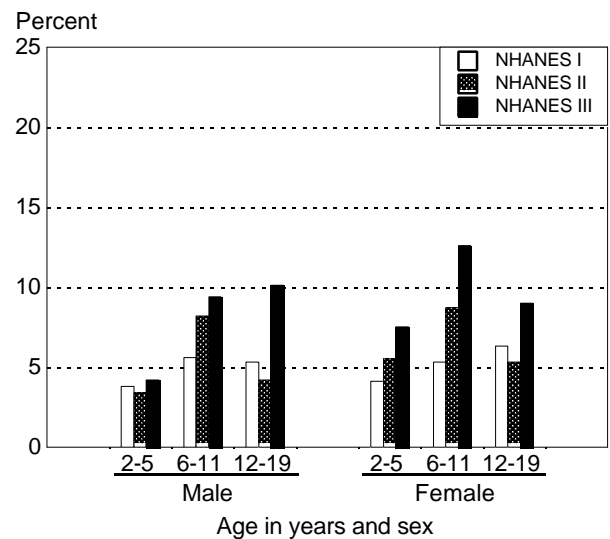
- The age-adjusted prevalence of overweight for adult males and white females increased from about 25% between 1960 and 1980 to 33% in 1988-91. The major portion of the change appeared to occur between 1976-80 and 1988-91. Over the entire time span, the prevalence of overweight was higher for black adult females (42-44% between 1960 and 1980 and 49% in 1988-91) than for any other group (fig. ES-4).

- The prevalence of overweight also increased in children and adolescents between 1971 and 1991, regardless of the criteria used to define overweight. In two analyses of data from the third National Health and Nutrition Examination Survey (NHANES III 1988-91), body mass index (BMI) above certain age- and sex-specific percentiles was used to define overweight. (BMI is a ratio relating body weight to height. It is calculated by dividing weight in kilograms by the square of height in meters.) On the basis of cutoff values associated with the 95th percentiles in the first NHANES (NHANES I 1971-74), the prevalence of overweight was 9% for males and 13% for females 6-11 years of age, and about 10% for adolescent males and 9% for adolescent females 12-19 years of age (fig. ES-5). When the BMI cutoff values corresponding to the 85th percentiles from the second NHANES (NHANES II 1976-80) were used, the prevalence of overweight in 1988-91 was 20% for adolescent males and 22% for adolescent females 12-19 years of age. In 1976-80, 15% of adolescents were overweight. This definition was used for tracking Healthy People 2000 Objective 2.3, which specifies that the prevalence of



**Figure ES-4.** Age-adjusted percentage of people 20-74 years of age who are overweight (high BMI), by sex and race, 1960-62, 1971-74, 1976-80, and 1988-91

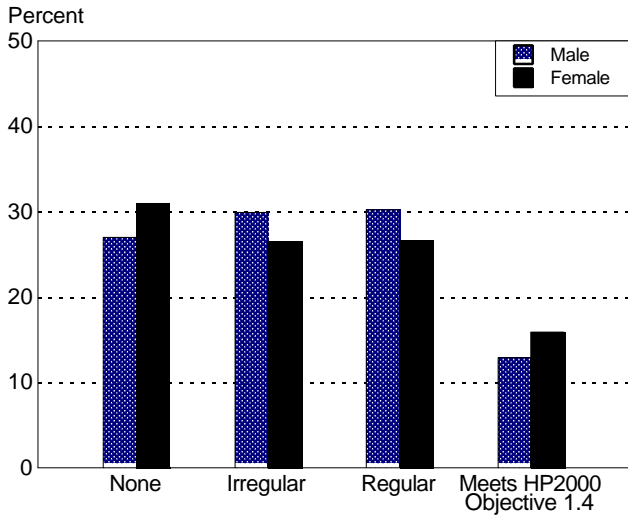
SOURCE: HHS, NHES I, 1960-62; NHANES I, 1971-74; NHANES II, 1976-80; NHANES III, 1988-91.



**Figure ES-5.** Percentage of children and adolescents 2-19 years of age who have high weight for height (2-5 years of age) or are overweight (6-19 years of age), by age and sex, 1971-74, 1976-80, and 1988-91

SOURCE: HHS, NHANES I, 1971-74; NHANES II, 1976-80; NHANES III, 1988-91.





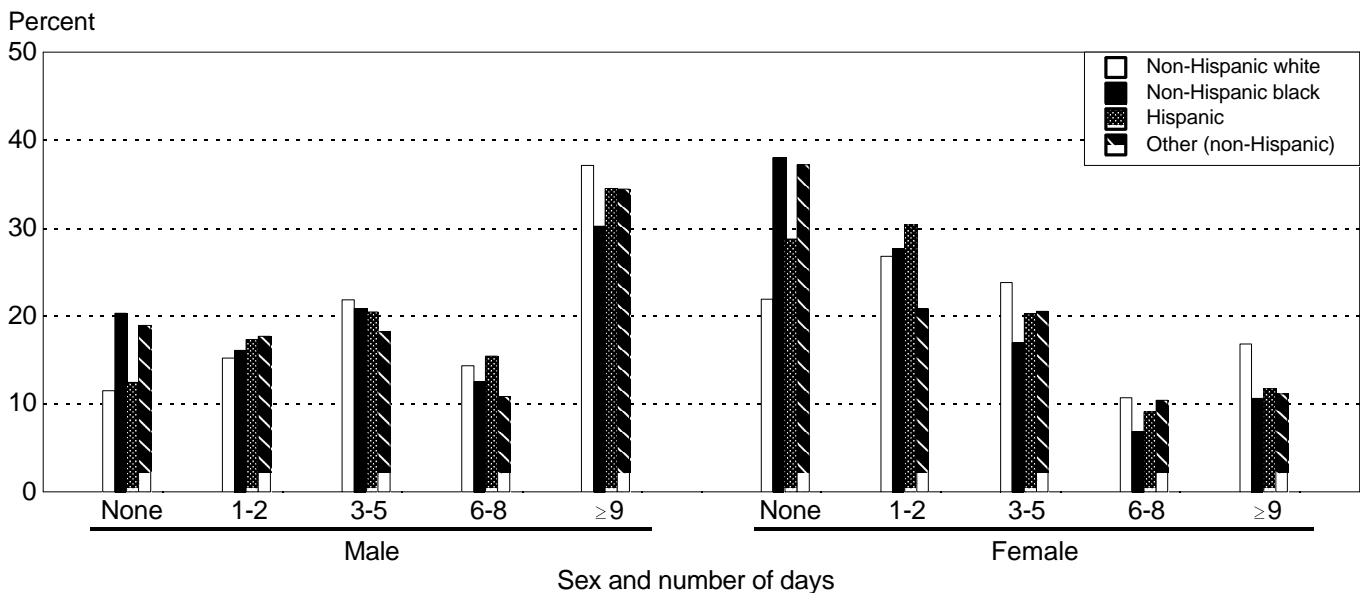
**Figure ES-6.** Prevalence of physical activity among people 20 years of age and older and percentage meeting the Healthy People 2000 (HP2000) objective for vigorous physical activity, by sex, 1992

SOURCE: HHS, BRFSS, 1992.

overweight in adolescents 12-19 years of age be no more than 15%. (See also "Maternal and Child Health and Nutrition" and "Concerns for Low-Income, High-Risk Populations," below.)

- The prevalence of overweight has increased considerably despite only small changes in reported food energy intakes. However, reported food energy intakes were not above recommended values. Overweight is caused by energy imbalance (food energy intake in excess of energy expenditure). More than half of adults have a sedentary life-style. Fewer than one-third participate in regular physical activity (fig. ES-6). These observations, along with data from experimental and clinical studies and other surveys, suggest that 1) recommended food energy intakes are too high in relation to physical activity, 2) underreporting occurs when some people report their food consumption, and/or 3) levels of physical activity are low.

- Among students in grades 9-12 in 1990, non-Hispanic white and Hispanic males were more likely than non-Hispanic black males and males of other races/ethnicities (non-Hispanic) to report that they did not participate in any vigorous physical activity in the past 14 days (fig. ES-7). Nearly 40% of non-Hispanic black females, 29% of Hispanic females, 22% of non-Hispanic white females, and nearly 40% of females of other races/ethnicities (non-Hispanic) reported no vigorous physical activity in the past 14 days.



**Figure ES-7.** Frequency of participation in vigorous physical activity over the past 14 days among high school students, by sex and race/ethnicity, 1990

SOURCE: HHS, YRBS, 1990.

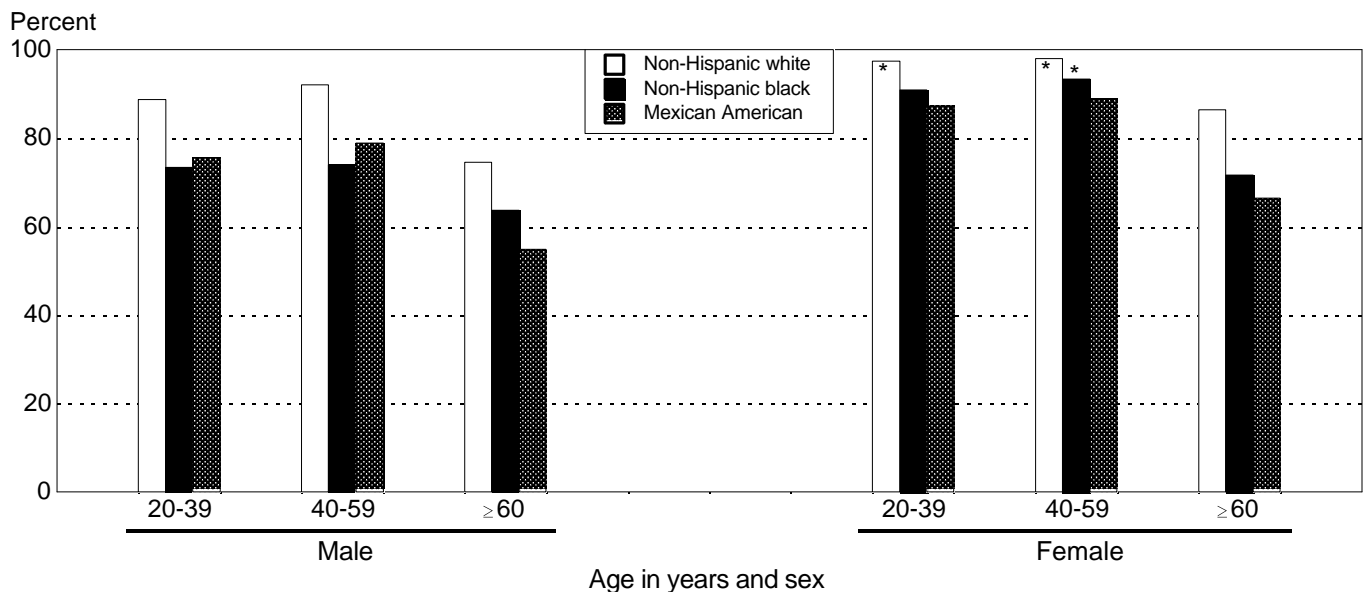
Disturbingly lower levels of vigorous activity were noted with each subsequent year of high school, especially in females.

- People often did not perceive their body weight status correctly (figs. ES-8 and ES-9). Regardless of weight status, the proportion of non-Hispanic white females 20 years of age and older who considered themselves overweight was higher than that of females in other racial/ethnic groups in 1988-91. Body weight was less of a concern for non-Hispanic black adolescent females than it was for female adolescents of other racial/ethnic backgrounds. Among a military population of enlisted female trainees surveyed in 1993, a fairly high percentage (29%) of relatively lean women perceived themselves as overweight.
- On average, 30% of males and 53% of females in 1988-91 reported that they had tried to lose weight in the past 12 months (fig. ES-10). Dieting and exercise were the weight-loss practices most frequently reported by people 18 years of age and older. Women were more likely than men to cite use of vitamins, meal replacements, or over-the-counter products for weight loss and to participate in organized weight-loss programs.

The reasons for the sharp increase in the prevalence of overweight since 1976-80 are not clear. Age-adjusted prevalence of overweight for adults was 33% in 1988-91. Evidence from several NNMRRP surveys collected during this time period suggests that energy intakes exceed energy expenditures, probably because of low levels of physical activity.

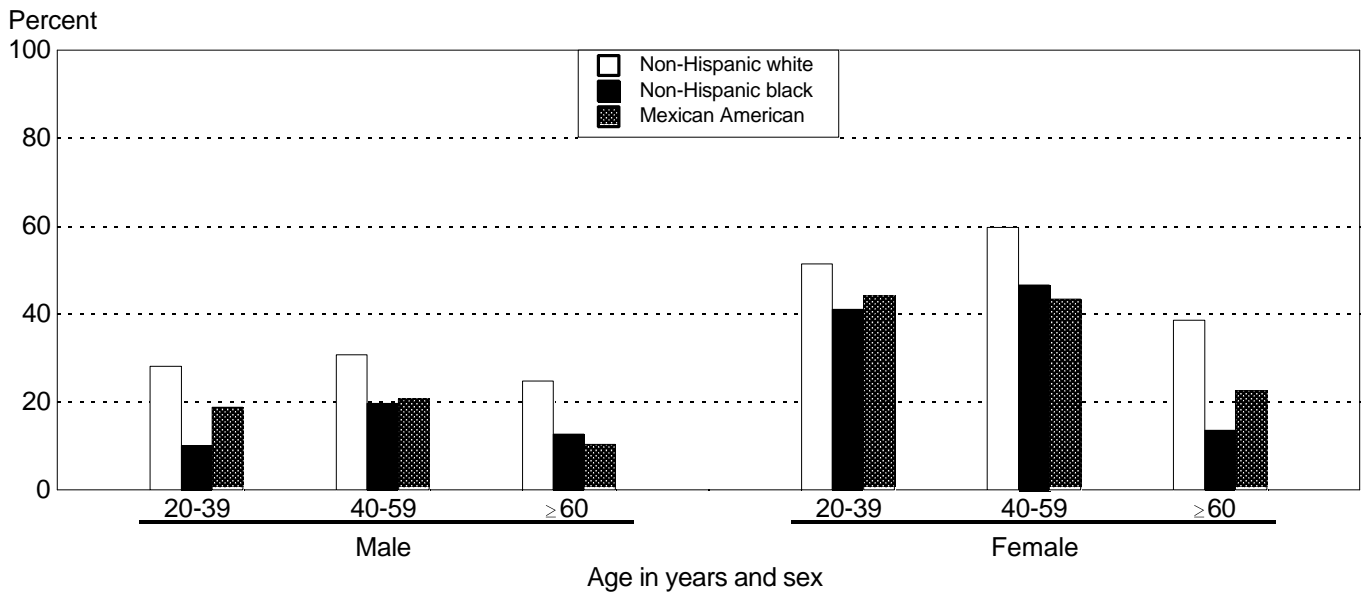
The goal of Healthy People 2000 Objective 1.4 is to increase to at least 20% the proportion of people aged 18 years and older—and to at least 75% the proportion of children and adolescents aged 6-17 years—who engage in vigorous physical activity that promotes the development and maintenance of cardiorespiratory fitness 3 or more days per week for 20 or more minutes per occasion. In 1992, only 13% of male and 16% of female adults reported physical activities or exercise vigorous enough to meet this objective (fig. ES-6). In 1990, 36% of male and 15% of female high school students, on average, reported that they exercised vigorously for 20 or more minutes on 9 or more days in the past 14 days.

The goal of Healthy People 2000 Objective 1.5 is to reduce to no more than 15% the proportion of people 6 years of age and older who engage in no leisure-time physical activity. In 1992, 27% of male and 31% of female adults surveyed said that they did not



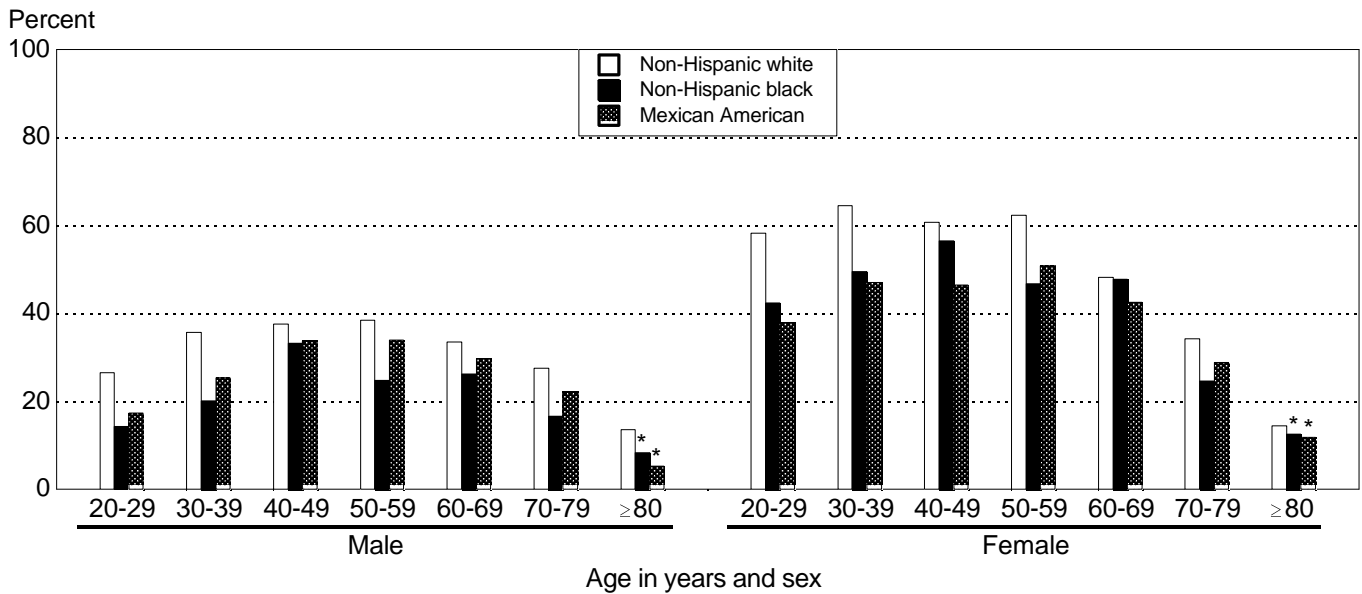
**Figure ES-8.** Self-perceived overweight: percentage of overweight people 20 years of age and older who think they are overweight, by age, sex, and race/ethnicity, 1988-91

SOURCE: HHS, NHANES III, 1988-91.



**Figure ES-9.** Self-perceived overweight: percentage of people 20 years of age and older who think they are overweight but are not overweight, by age, sex, and race/ethnicity, 1988-91

SOURCE: HHS, NHANES III, 1988-91.



**Figure ES-10.** Percentage of people 20 years of age and older who have tried to lose weight during the past 12 months, by age, sex, and race/ethnicity, 1988-91

SOURCE: HHS, NHANES III, 1988-91.

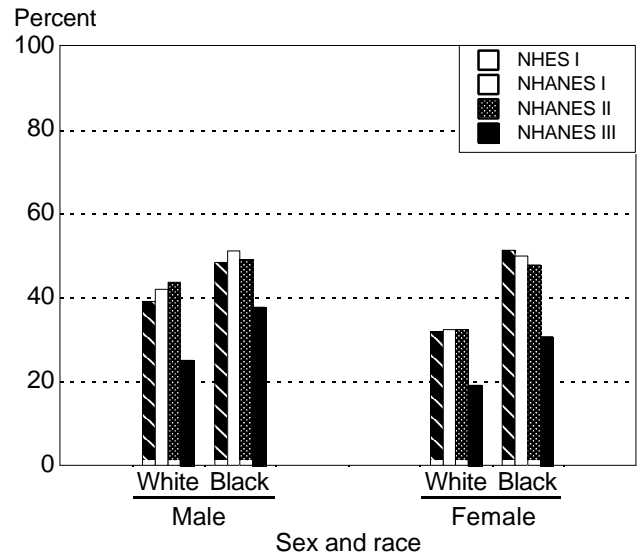
participate in any physical activity in the past month. The goal of Healthy People 2000 Objective 1.3 is to increase to at least 30% the proportion of people 6 years of age and older who engage regularly, preferably daily, in light to moderate physical activity for at least 30 minutes per day. In 1992, 30% of male and 27% of female adults reported that they participated in regular physical activity (fig. ES-6).

Judging by the trends observed, Americans will not attain Healthy People 2000 Objective 2.3—to reduce the prevalence of overweight in adults to no more than 20% and in adolescents, to no more than 15%—by the year 2000. Increases in overweight are likely to increase health-care costs. Similarly, current levels of physical activity make it unlikely that Healthy People 2000 objectives related to activity (1.3, 1.4, and 1.5) will be achieved. It is unlikely that the prevalence of overweight will decrease without making substantial progress toward meeting the Healthy People 2000 physical-activity objectives.

### Hypertension

**Although the prevalence of hypertension has decreased since 1960, hypertension remains a public health problem. As many as 50 million Americans have elevated blood pressure or take antihypertensive medications.** Epidemiological studies have linked prevalence of hypertension to dietary intakes of several essential minerals. For example, consistent positive associations have been shown between higher dietary salt (sodium) intake and hypertension. Low calcium and potassium intakes have been associated with higher prevalence of hypertension. Inverse associations have been reported between serum magnesium and blood pressure.

- Between 1960 and 1980, the prevalence of hypertension remained relatively stable. However, by 1988-91, a striking drop in prevalence was observed (fig. ES-11). This finding was unexpected, given the positive association between overweight and hypertension and the increase in the prevalence of overweight in the U.S. population between 1976-80 and 1988-91. The age-adjusted prevalence of hypertension between 1960 and 1991 was consistently higher in blacks than in whites. Procedural differences among the surveys may account for part of the decrease in prevalence seen in recent years, although the extent of their



**Figure ES-11.** Age-adjusted percentage of people 20-74 years of age who have hypertension, by sex and race, 1960-62, 1971-74, 1976-80, and 1988-91

SOURCE: HHS, NHES I, 1960-62; NHANES I, 1971-74; NHANES II, 1976-80; NHANES III, 1988-91.

contribution cannot be determined. Some of the decrease has been attributed to primary prevention, such as following advice from health-care professionals to lower sodium intake, to lose weight if overweight, and to increase physical activity.

- Hypertension remains a substantial problem in middle-aged and elderly people (table ES-2). In 1988-91, the overall prevalence of hypertension was 25% in adults 20 years of age and older. The prevalence of hypertension was higher with each decade of age for both males and females, and it was higher for males than for females 20-59 years of age. In older people, the prevalence of hypertension was higher in females. About 75% of females 80 years of age and older had high blood pressure compared with 60% of males in the same age group.
- In 1988-91, median intakes of sodium from food were above recommended levels, and median intakes of calcium and potassium from food were below recommended levels. Sodium intakes were similar for non-Hispanic whites, non-Hispanic blacks, and Mexican Americans. However, median potassium and calcium intakes were lower for non-Hispanic blacks, who are at highest risk for development of hypertension, than for the other two groups.

**Table ES-2.** Percentage of people 20 years of age and older who have hypertension, by sex, age, and race/ethnicity, 1988-91 (%)<sup>1</sup>

Sex and age in years	All groups	Non-Hispanic white	Non-Hispanic black	Mexican American
Overall population				
Total, crude	25.4	25.8	30.9	15.6
Total, age-adjusted	25.4	24.5	34.0	23.8
Male				
20-29	5.1	4.3*	8.2	3.3
30-39	13.0	12.8	20.9	9.3
40-49	24.4	23.4	36.8	22.4
50-59	42.2	41.8	55.9	36.0
60-69	52.1	51.3	63.6	53.8
70-79	60.7	60.3	68.0	52.1
≥80	60.5	60.3	62.4	70.5*
Total, crude	25.7	26.4	31.6	15.5
Total, age-adjusted	27.0	26.4	35.3	24.4
Female				
20-29	1.0*	0.8*	2.4*	1.1*
30-39	6.2	5.0	12.1	6.5
40-49	14.4	12.7	30.5	10.7
50-59	38.8	36.8	47.9	33.5
60-69	53.5	50.9	77.8	59.3
70-79	67.6	66.9	72.6	67.0
≥80	74.7	74.3	80.5	71.0
Total, crude	25.1	25.3	30.2	15.7
Total, age-adjusted	23.7	22.4	32.6	22.9

<sup>1</sup>Excludes pregnant females. "All groups" includes data for racial/ethnic groups not shown separately. "Hypertension" was defined as mean systolic blood pressure ≥140 mm Hg, mean diastolic blood pressure ≥90 mm Hg, or under current treatment for hypertension with a prescription medication. These values represent the mean of six or fewer blood pressure measurements. An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation.

SOURCE: HHS, NHANES III, 1988-91.

- In 1989-91, 88% of female main meal planners and preparers were aware of health problems related to salt or sodium intake. The proportion of women in this group who were aware of this diet-health relationship was higher among those with higher incomes. A substantial proportion of Americans appears to be trying to limit salt used at the table; about 58% of males and 68% of females reported never using salt, using "lite" salt, or rarely using ordinary table salt.
- In 1988-91, most people with diagnosed hypertension were told by a physician to take medications and/or to change their diet. About 90% reported that they were complying with advice to change their diet, and 76% reported that they were complying with advice to take medications. About half of those who were told they had

hypertension were told to lose weight to control their blood pressure, and about three-quarters of these individuals reported that they were complying with this advice. About 30% were told to increase exercise, stop smoking, restrict alcohol consumption, reduce stress, and/or change some other aspect of their life-style to control their blood pressure; almost two-thirds said that they were following the advice given.

To achieve Healthy People 2000 Objective 2.9—to decrease salt and sodium intake so at least 65% of home meal preparers prepare food without adding salt, at least 80% of people avoid using salt at the table, and at least 40% of adults regularly purchase food with modified or lower sodium content—Americans will have to decrease their intake of salt and sodium. Many people are apparently

trying to avoid using salt at the table. However, because the major portion of dietary sodium is provided by sodium added to processed foods and home-, deli-, and restaurant-prepared foods, greater reductions in sodium consumption may be achieved by reducing sodium used to process and prepare foods and by encouraging consumers to select products that are lower in sodium.

### *Calcium and osteoporosis*

**Many Americans are not getting the calcium they need to maintain optimal bone health and prevent age-related bone loss.** Development of osteopenia (less-than-optimal bone density) and osteoporosis (decreased bone mass) is associated with loss of bone mineral, including calcium. Low calcium intake and lack of weight-bearing exercise, among other factors, contribute to bone loss.

- Many people, particularly adolescents, adult females, and elderly people across racial/ethnic groups and non-Hispanic black adult males, consumed less than the recommended amount of calcium from food in 1988-91. Mean calcium intakes from food in the U.S. population have not changed substantially since 1977-78.
- In 1988-91, median calcium intakes from foods were below recommended levels for male and female adolescents other than non-Hispanic white males. Achieving peak bone mass and maintaining bone mass appear to be related to adequate calcium intake in adolescence and early adulthood. Because of the high rates of bone accretion during adolescence, continued monitoring of calcium intake is important.
- In 1988-91, bone density was measured for the first time in a nationally representative sample of Americans. Among females 50 years of age and older, femoral osteopenia occurred in 39% of non-Hispanic whites, 29% of non-Hispanic blacks, and 36% of Mexican Americans. Prevalence estimates for osteoporosis in these three groups were 21%, 10%, and 16%, respectively. Significant bone accretion occurs during adolescence and early adulthood. The low calcium intakes from food by many adolescents and adults, particularly females, suggest that many Americans are not getting the calcium they need to maintain optimal bone health and prevent age-related bone loss.

- About 67% of female main meal planners and preparers were aware of health problems associated with the quantity of calcium consumed. About 50% of female main meal planners and preparers from households with incomes <131% of the Federal Poverty Income guidelines (i.e., low incomes) were aware of these associations.

### *Maternal and child health and nutrition*

**Diets and nutritional status of pregnant women, mothers, and children continue to be causes for public health concern.**

- Data on the dietary intakes of pregnant women in 1988-91 indicate that mean intakes from food were lower than recommended levels for several key nutrients (folate, calcium, vitamin B<sub>6</sub>, iron, zinc, and magnesium). This is evident across racial/ethnic groups. (The intake data did not include vitamin and mineral supplements.)
- The prevalences of breastfeeding among mothers 15-44 years of age and the proportion of their babies who were breastfed for 4 or more months were lower among mothers who were black, younger, or living below the poverty level (table ES-3). Among infants born in 1984-86, 55% were breastfed, up from 46% of infants born in 1978-80. Although it appears that the overall prevalence of breastfeeding is increasing slightly over time, it is still below the goals set in Healthy People 2000 Objective 2.11, which states that at least 75% of mothers breastfeed their babies in the early postpartum period. It also states that at least 50% of all mothers breastfeed until their babies are 5-6 months of age. About 30% and 34% of all infants were breastfed for this long in 1978-80 and 1984-86, respectively (data not shown). Although there has been some increase in the percentage of infants who are breastfed, greater emphasis is needed to encourage more mothers to initiate breastfeeding and to breastfeed longer.
- In 1988-91, the prevalences of shortness and thinness among children and adolescents were about 5% or lower, indicating that these conditions did not occur with greater frequency than expected for children and adolescents in the overall population (5%) (table ES-4). The prevalence of overweight in children and adolescents is discussed as a part of the findings under "Overweight" (above).

**Table ES-3.** Prevalence of breastfeeding among mothers 15-44 years of age and proportion of their babies who were breastfed for 4 or more months, by year of baby's birth and selected characteristics of the mothers, 1978-80 and 1984-86 (%)<sup>1</sup>

Characteristics of mother	Ever breastfed		Breastfed for ≥4 months	
	1978-80	1984-86	1978-80	1984-86
Overall population	46.1	55.0	65.3	61.9
Race				
White	50.3	59.9	65.4	62.6
Black	22.8	23.4	60.1	50.1
Educational level				
<9 years	26.4*	49.1	⌘	52.3
9-11 years	33.7	34.5	72.2	66.5
12 years	42.8	51.9	57.8	55.5
≥13 years	63.4	75.0	71.7	66.9
Age				
<20 years	25.0	16.6	50.7	46.2
20-29 years	48.4	57.2	61.3	58.7
30-39 years	52.1	66.7	83.1	71.0
40-44 years	⌘	⌘	⌘	⌘
Region of residence				
Northeast	38.4	63.5	59.3	69.1
South	49.8	45.6	64.4	55.5
Midwest	35.5	51.3	64.0	56.6
West	65.7	68.8	70.4	68.0
Poverty status				
<100% poverty	30.7	27.3	54.4	55.5
≥100% poverty	50.0	62.3	66.9	62.7

<sup>1</sup>An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation; ⌘ indicates that minimum-sample-size requirements were not met.

SOURCE: HHS, NSFG, 1982 and 1988.

**Table ES-4.** Prevalence of shortness, thinness, high weight for recumbent length, high weight for height, and overweight in children and adolescents in the U.S. population, by age and sex, 1988-91 (%)<sup>1</sup>

Growth-status indicators for selected age groups	Male	Female
<b>Shortness</b>		
Low recumbent length for age		
2-5 months	4.9*	3.7*
6-11 months	4.4	3.9*
12-23 months	3.8	3.5
Low height for age		
2-5 years	5.2	5.1
6-11 years	4.7	4.1
12-17 years	6.1	1.5*
<b>Thinness</b>		
Low weight for recumbent length		
2-5 months	1.3*	—
6-11 months	1.6*	2.7*
12-23 months	3.4	3.2*
Low weight for height		
2-5 years	2.7	0.6*
6-9 years	2.6*	3.6
<b>High weight for recumbent length</b>		
2-5 months	11.9	12.0
6-11 months	8.5	11.5
12-23 months	10.5	10.6
<b>High weight for height</b>		
2-5 years	4.2	7.5
<b>Overweight</b>		
6-11 years	9.4	12.6
12-19 years	10.1	9.0

<sup>1</sup>Excludes pregnant females. For low recumbent length for age and low weight for recumbent length for children 6-23 months of age, percentages are those below the NCHS growth chart 5th percentiles (Hamill et al., 1979). For high weight for recumbent length for children 6-23 months of age, and for high weight for height for children 2-5 years of age, percentages are those above the NCHS growth chart 95th percentiles (Hamill et al., 1979). For low height for age for children 2-17 years of age and low weight for height for children 2-9 years of age, percentages are those below the NCHS growth chart 5th percentiles (Hamill et al., 1979). For overweight children 6-19 years of age, percentages are those above the NHANES I 95th percentile of body mass index for age (Must et al., 1991). An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation; a dash (—) indicates that the observed percentage was 0.0.

SOURCE: HHS, NHANES III, 1988-91.



## Dietary status

Data collected in the NNMRRP surveys and surveillance systems provide information on the dietary status of the U.S. population. Dietary status is assessed by examining the types and amounts of foods, food components, and nutrients consumed. An evaluation of total nutrient intake requires that both food and nonfood nutrient sources be considered.

Data are available from the NNMRRP on several levels of food consumption—individual intake, household food use, and national food supply—and on dietary supplement use. In addition, data are available from the NNMRRP on related dietary measurements, including food expenditures, food insufficiency, breastfeeding practices, weight-loss practices, reported levels of physical activity, nutrition knowledge, and the awareness of relationships between diet and health.

Estimates of nutrient intakes from food in this report represent only partial estimates because they do not include nutrient intakes from dietary supplements, drinking water, discretionary salt use, or medications and because underreporting of intake may occur. The resulting data may affect estimates of food energy intakes and food and nutrient intakes in relation to recommended levels. Nonetheless, such dietary intake estimates serve a critical role in assessing dietary status and, in turn, in assessing nutritional and nutrition-related health status. The major themes and findings on the dietary status of the U.S. population are highlighted below.

### *Food consumption, nutrient intakes from food, and dietary supplement use*

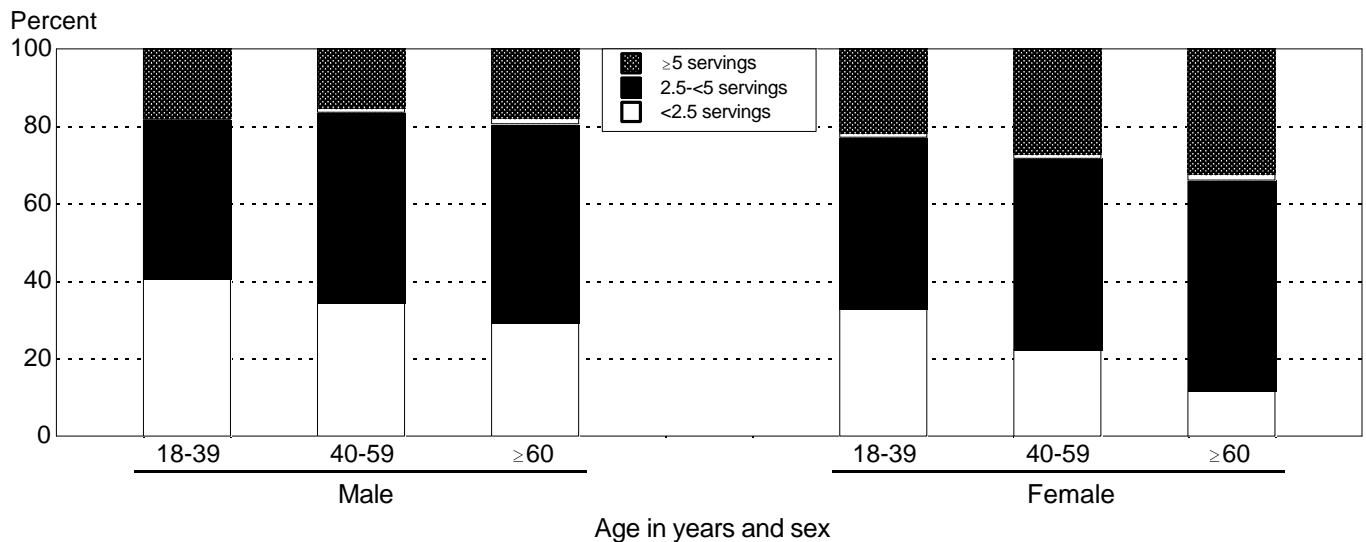
***The abundant U.S. food supply allows most Americans many food choices. Although there are many similarities in the food choices of people in different age, sex, racial, and income groups, there are also some notable differences.***

- Virtually all people reported that they consumed ***meat, poultry, and fish***:
  - higher percentages of white than black adults reported consuming beef, whereas the opposite was true for pork and poultry, and
  - higher percentages of adults with higher than lower incomes reported consuming beef and fish and shellfish.

- Differences in the types of ***milk and milk products*** consumed were observed across age, racial, and income groups:
  - higher percentages of black than white adults reported consuming whole milk, whereas higher percentages of white than black adults reported consuming low-fat and skim milks;
  - higher percentages of adults with lower than higher incomes reported consuming whole milk; and
  - a higher percentage of adults than children reported consuming skim milk.
- ***Fruits*** were consumed less frequently than ***vegetables***. Over a 3-day period, about 30% of adolescents and of adult males and 24% of adult females did not eat any fruits, and about 6% of individuals did not eat any vegetables. These values do not include fruits and vegetables eaten as part of food mixtures. Furthermore,
  - higher percentages of older than younger adults of both sexes reported consuming dark-green and deep-yellow vegetables, lettuce, and other vegetables;
  - higher percentages of adults with higher than lower incomes reported consuming dark-green and deep-yellow vegetables, lettuce, tomatoes, and other vegetables; and
  - higher percentages of black than white adults reported consuming dark-green vegetables, and higher percentages of white than black adults reported consuming deep-yellow vegetables, lettuce, and other vegetables.

The goal of Healthy People 2000 Objective 2.6 is that people consume 5 or more servings of fruits and vegetables per day. This objective reflects the recommendation shown in the 1990 *Dietary Guidelines for Americans* and the Food Guide Pyramid to eat a minimum of 2 servings of fruits and 3 servings of vegetables daily. Fewer than one-third of American adults meet this recommendation (fig. ES-12). Data from 1989-91 suggest that the average daily intake of fruits and vegetables for the general population is about 4 servings.

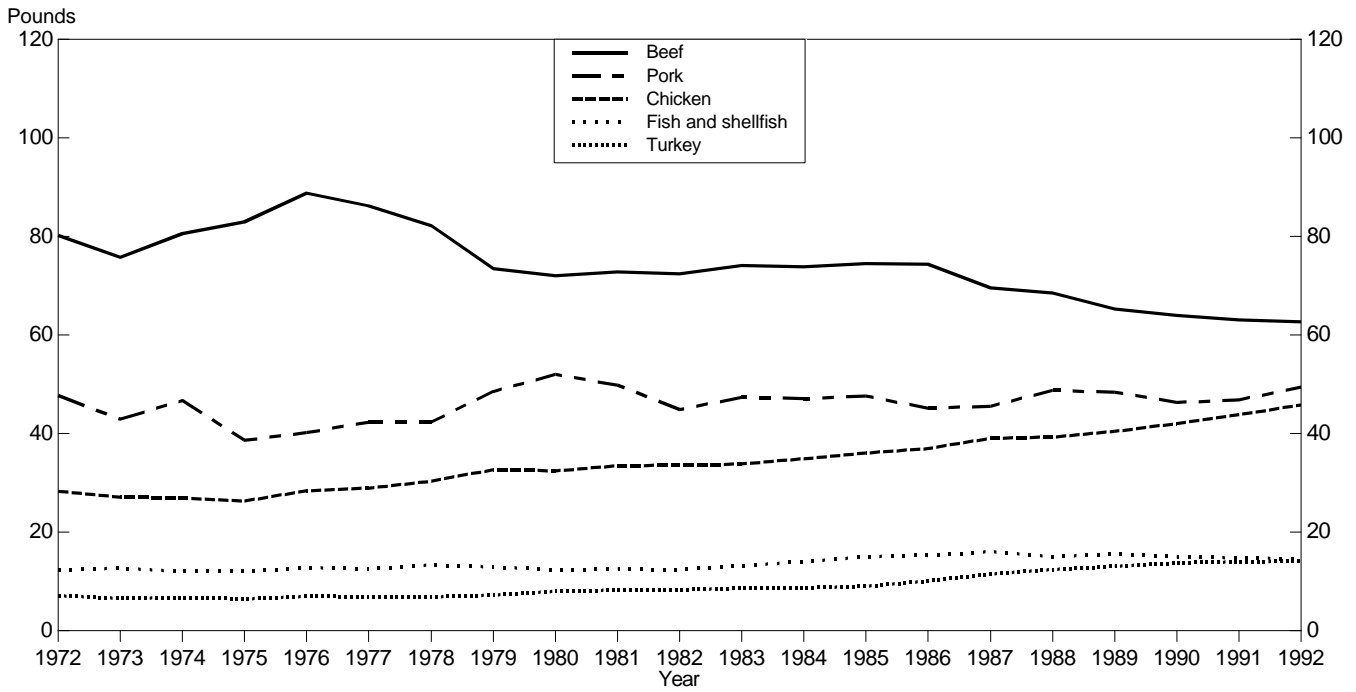
- Virtually all people of all ages consumed ***grain products***:
  - higher percentages of children and adolescents than adults reported consuming mixtures in which the main component is grain, such as pizza, enchiladas, and egg rolls, and adults



**Figure ES-12.** Percent distribution of daily servings of fruits and vegetables consumed by people 18 years of age and older, by age and sex, 1991

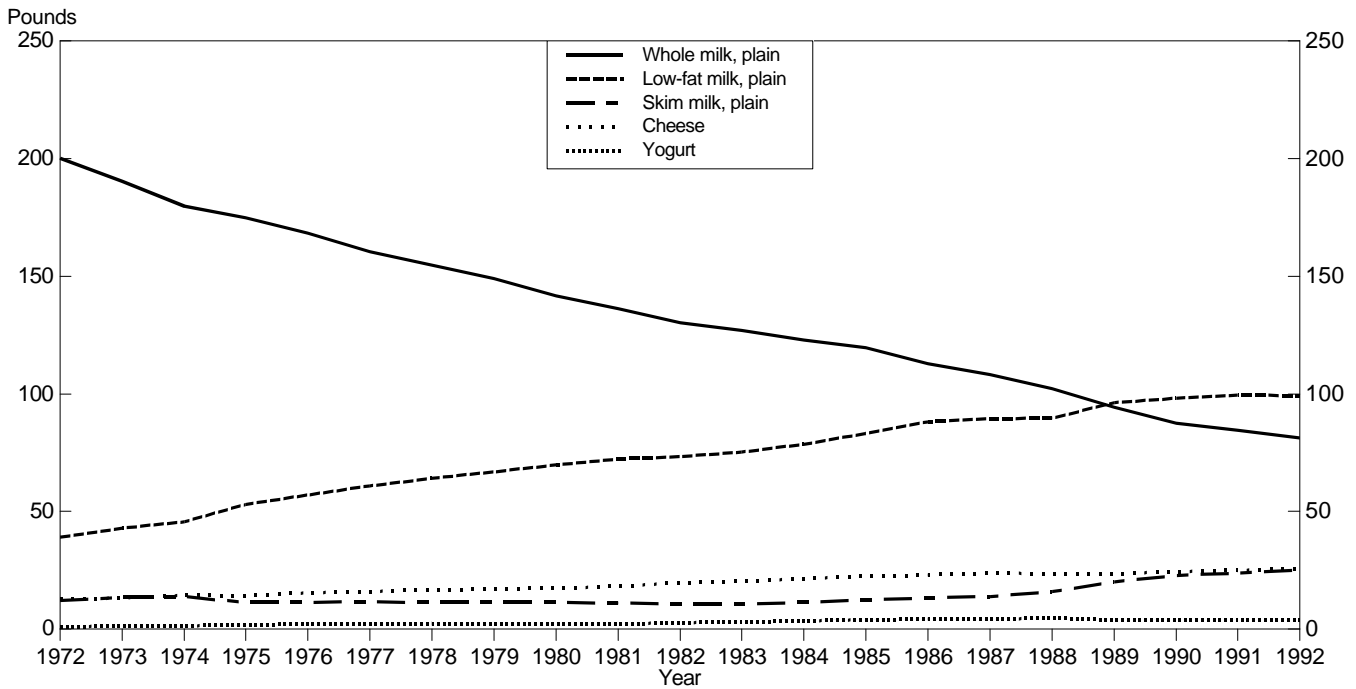
SOURCE: HHS, 5 A Day for Better Health Baseline Survey, 1991.

- 70 years of age and older were least likely to report consuming these products;
  - higher percentages of children 6-11 years of age and adults 70 years of age and older reported consuming cereals and pasta than did adolescents and other adults;
  - higher percentages of white than black adults and of adults with higher than lower incomes reported consuming cakes, cookies, pastries, and pies and crackers, popcorn, pretzels, and corn chips;
  - the percentages of adults reporting consumption of yeast breads and rolls and cereals and pasta were similar across race, sex, and income levels; and
  - the percentages of adults reporting consumption of quick breads, pancakes, and French toast were similar for whites and blacks.
- Higher percentages of black than white adults and of adults with lower than higher incomes reported consuming **eggs** (including whole eggs, egg substitutes, and eggs in other forms).
  - Use of **table fats**, such as butter and margarine, was reported by higher percentages of white than black adults, of older than younger adults, and of adults with higher than lower incomes.
  - Higher percentages of white than black adults and of adults with higher than lower incomes reported consuming salad dressings, which often contain **oil**.
  - Higher percentages of adults with higher than lower incomes, higher percentages of whites than blacks, and higher percentages of younger than older people reported consuming **candy**.
  - Higher percentages of adolescents and young adults reported consuming regular **soft drinks** than did other age groups.
- Trends in the amounts of food available for consumption suggest that Americans are slowly changing their eating patterns toward more healthful diets. However, a considerable gap still appears to exist between what Americans are eating and what they should be eating.***
- On a per capita basis, less red meat and more poultry were available for consumption in 1992 than in 1972 (fig. ES-13). Per capita annual availability of shell eggs also decreased considerably, from 268 in 1972 to 180 in 1992.
  - Per capita availability of lower-fat milk increased while availability of whole milk decreased (fig. ES-14). However, the greater availability of



**Figure ES-13.** Annual per capita consumption of meat, poultry, and fish and shellfish, by year, 1972-92

SOURCE: USDA, U.S. Food Supply, 1970-92 (Putnam and Allshouse, 1993).



**Figure ES-14.** Annual per capita consumption of milk, yogurt, and cheese, by year, 1972-92

SOURCE: USDA, U.S. Food Supply, 1970-92 (Putnam and Allshouse, 1993).

lower-fat fluid milk appears to have been accompanied by an increase in the availability of fluid-cream products and cheese.

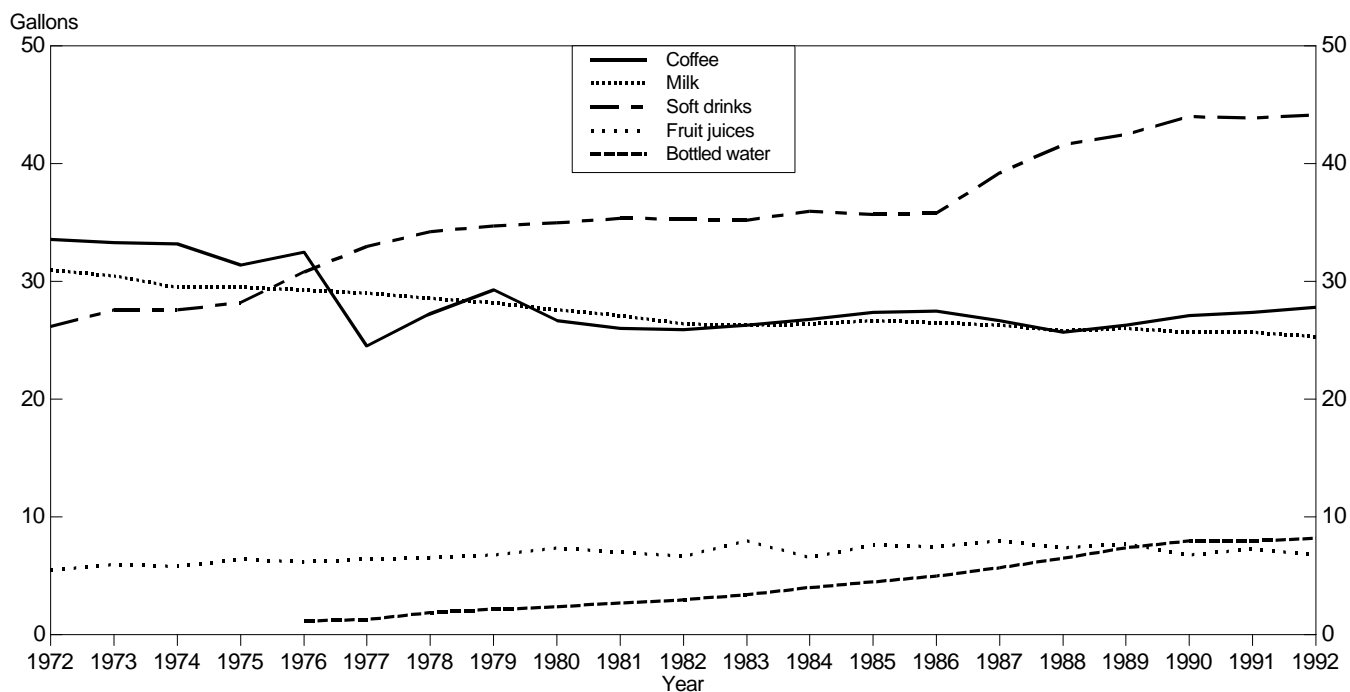
- Per capita availability of grains, fruits, vegetables, and legumes increased between 1972 and 1992.
- Caloric sweeteners available for consumption reached a high of 143 lb per capita in 1992. A large portion of this increase can be attributed to the use of corn sweeteners, mainly high-fructose corn syrup. Per capita availability of low-calorie sweeteners (mainly aspartame and saccharin) has more than tripled since 1980.
- Between 1972 and 1992, availability of regular and low-calorie soft drinks climbed from 26 to 44 gal per capita. By 1976, per capita availability of soft drinks had become greater than that of milk, fruit juices, coffee, or bottled water (fig. ES-15).

***Certain population subgroups are consuming diets that provide less-than-recommended amounts of some nutrients.***

- Reported median food energy intakes were below recommended energy intakes for most adolescents

and adults in 1988-91. However, the increased prevalence of overweight suggests that this finding reflects underreporting in surveys as well as low energy expenditures, rather than underconsumption (see "Overweight" discussion, above). The lack of change in the prevalence of nutrient intakes below recommended values suggests that dietary quality has not changed substantially.

- Median intakes of vitamin A, vitamin E, vitamin B<sub>6</sub>, zinc, and copper from food were below recommended values for most age, sex, and racial/ethnic subgroups.
- Median calcium intakes from food were below recommended values for non-Hispanic black children 1-11 years of age, all adolescents except non-Hispanic white males 12-15 years of age, all females aged 20 years and older, non-Hispanic black males 20-59 years of age, and all males 60 years of age and older.
- Median iron intakes from food were below recommended values for children 1-2 years of age, female adolescents 12-19 years of age, and female adults 20-59 years of age across racial/ethnic groups.



**Figure ES-15.** Annual per capita consumption of selected nonalcoholic beverages, by year, 1972-92

SOURCE: USDA, U.S. Food Supply, 1970-92 (Putnam and Allshouse, 1993).

- Median intakes of magnesium from food were below recommended values for all adolescents and adults except adolescent males 12-15 years of age.
- Median folate intakes from food were below recommended values for non-Hispanic black females 16 years of age and older and for Mexican-American females 60 years of age and older.
- Lunches provided in the National School Lunch Program contributed more fat in 1992 than recommended in the 1990 *Dietary Guidelines for Americans*.

### ***Many Americans take dietary supplements.***

- At least 35-40% of Americans took dietary supplements between 1988 and 1991. Females were more likely to take supplements than males, and non-Hispanic whites and older adults were more likely to take supplements than non-Hispanic blacks and younger adults.
- In 1986, people with incomes at or above the poverty level were more likely to use supplements than those with incomes below the poverty level. Use was also higher in adults who were more educated and their children than in adults who were less educated and their children.
- In 1986, more than 70% of all supplements used by adults and children were taken daily. The supplements most commonly used by adults were vitamin-mineral combinations and single vitamins and minerals (specifically, vitamin C and calcium), whereas for children 2-6 years of age, the most commonly used supplements were multivitamins.
- The ability to examine excessive intakes of vitamins and minerals in the TRONM was limited because a product-specific data base to use for calculating quantitative intakes of nutrients from supplements has not been developed.

### ***Food insufficiency***

***Some Americans are not always getting enough to eat.*** Nutritional status is a critical factor in children's development. Recent research findings indicate that inadequate food intake due to lack of money or resources (i.e., food insufficiency) is likely to impair growth and cognitive development.

- About 9-13% of people living in low-income households or families experience some degree of food insufficiency.
- In 1988-91, Mexican Americans and non-Hispanic blacks were more likely than non-Hispanic whites to report that they sometimes or often did not have enough food to eat (table ES-5). For low-income households, the prevalence of food insufficiency in 1989-91 was higher among blacks than whites, and Food Stamp Program participants were more likely to report a food-insufficiency problem than nonparticipants (table ES-6).

### ***Household food expenditures***

#### ***Americans changed their patterns of spending for different types of food and for food away from home between 1980 and 1992.***

- Per person spending (expressed in 1988 dollars here) in urban households decreased 37% for beef and 19% for pork between 1980 and 1992, whereas spending for poultry climbed 20%. Yearly fluctuations between 1980 and 1992 were seen for fish and seafood. Purchases of eggs declined by about one-third, and purchases of fresh whole milk fell by one-half during that same period.
- Per person spending for fresh fruits and vegetables in urban households dropped between 1980 and 1992. The decline for fresh vegetables (11%) was not as dramatic as the decline for fresh fruits (22%). Purchases of processed fruits and vegetables remained relatively stable during this time.
- Between 1980 and 1992, per person spending for frozen prepared food in urban households nearly doubled (fig. ES-16). During this time, purchases of potato chips, nuts, and similar types of snack foods climbed nearly 60%, and purchases of carbonated drinks rose by 21%.
- Between 1980 and 1992, urban households spent more than one-third of their total food expenses on food away from home.
- The share of total food expenditures for food away from home increased during the 1980s across racial and income groups (figs. ES-17 and ES-18).

**Table ES-5.** Prevalence of a reported family food-sufficiency problem in individuals, by race/ethnicity and poverty status, 1988-91 (%)<sup>1</sup>

Race/ethnicity and poverty status	Enough food	Sometimes not enough	Often not enough
Overall population	96.1	3.3	0.6*
Race/ethnicity			
Non-Hispanic white	97.4	2.1	0.5*
Non-Hispanic black	92.7	6.7	0.6*
Mexican American	84.5	14.2	1.3
Poverty status			
≥100% poverty	98.3	1.5	0.1*
<100% poverty	84.1	13.2	2.7*
<131% poverty	87.0	10.7	2.2*

<sup>1</sup>An asterisk (\*) indicates a statistic that is potentially unreliable because of a large coefficient of variation.

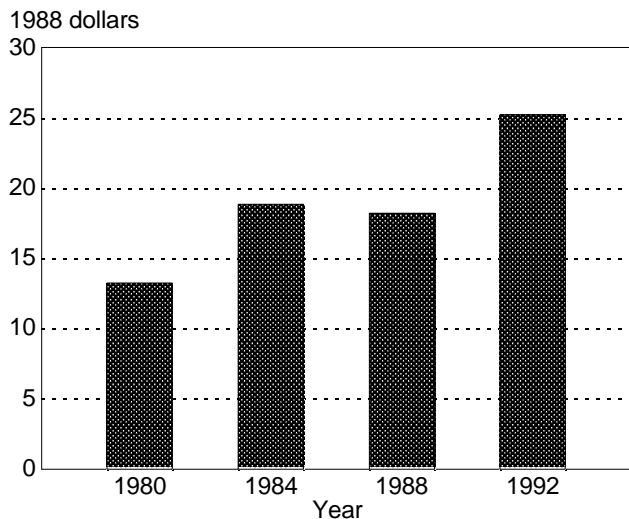
SOURCE: HHS, NHANES III, 1988-91.

**Table ES-6.** Household food sufficiency of the low-income population, by Food Stamp Program (FSP) participation and race, 1989-91 (%)<sup>1</sup>

FSP participation and race	Enough of the kinds of food we want	Enough, but not always what we want	Sometimes not enough	Often not enough
Overall low-income population	53.9	36.7	7.2*	1.9*
FSP participation				
Participant	43.0	43.3	10.2*	3.5*
Nonparticipant	58.7	33.8	5.9*	1.2*
Race				
White	58.2	34.4	5.9*	1.2*
Black	44.3	42.7	8.9*	4.0*

<sup>1</sup>Based on households with gross incomes <131% of the Federal Poverty Income guideline. An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation.

SOURCE: USDA, CSFII, 1989-91.



**Figure ES-16.** Average annual expenditures per person in urban households for frozen prepared foods, 1980, 1984, 1988, and 1992

SOURCE: DOL, CES, 1980-92 (Smallwood et al., 1994).

Spending for food away from home peaked in 1990, began to decline in 1991, and continued to decrease in 1992.

- In urban households, the share of total food expenditures between 1980 and 1992 for food away

from home was generally higher in white households than in black and other-race households and was higher in households with higher incomes.

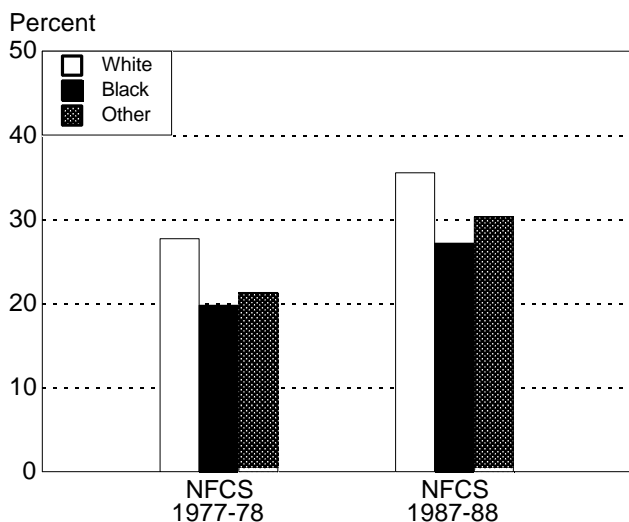
- Eating away from home is also common among children, who often eat lunch and sometimes breakfast at school. In 1992, the National School Lunch Program and School Breakfast Program provided two of the three major meals for 1 in 10 school-age children, and one of the three major meals for more than half of school-age children on school days.

*Turning awareness into action*

*People who are aware of diet and health relationships may be motivated to follow eating habits consistent with dietary recommendations.*

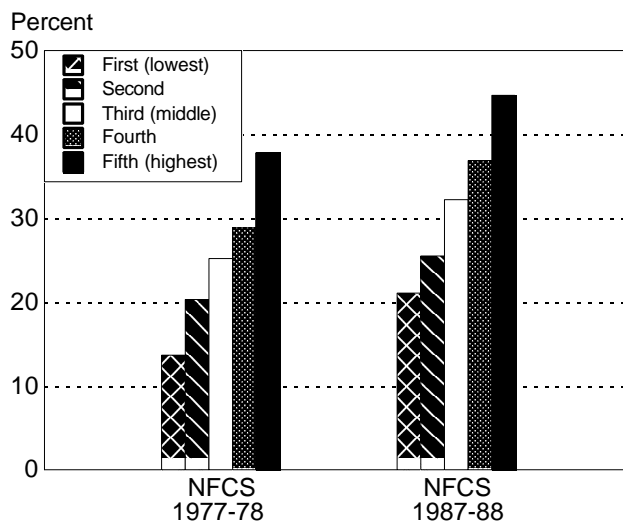
However, awareness does not automatically translate into action.

- In general, awareness of diet and health relationships among female main meal planners and preparers in 1989-91 was lowest for those who were black, less educated, and from lower-income households. Younger and older women were less likely to be aware of diet and health relationships than were middle-aged women.



**Figure ES-17.** Percentage of total food expenditures spent on food away from home, by race, 1977-78 and 1987-88

SOURCE: USDA, NFCS, 1977-78 and 1987-88 (Lutz et al., 1992).



**Figure ES-18.** Percentage of total food expenditures spent on food away from home, by income quintile, 1977-78 and 1987-88

SOURCE: USDA, NFCS, 1977-78 and 1987-88 (Lutz et al., 1992).

- Even though, in general, female main meal planners and preparers who were aware of diet and health relationships were more likely than those who were not aware of diet and health relationships to believe that following the principles of the 1990 *Dietary Guidelines for Americans* was highly important to them personally, little difference was found between the dietary intakes of those who were aware and those who were not aware of diet and health relationships. This finding underscores the need for research about what causes people to change their dietary behavior.

### *Food composition data*

***High-quality data on the composition of foods as they are actually eaten are critical for estimating nutrient intakes of Americans and for comparing intakes over time.*** However, it is difficult to maintain a complete and current food composition data base because the types of foods available in the marketplace are constantly changing and the food composition data available by brand name are limited.

***Maintaining a complete and current food composition data base requires that all foods, including traditional ethnic foods and new foods introduced into the marketplace, be characterized and that the data be updated continually, as improved methodologies are developed.*** Priority must be given to analyzing commonly consumed foods and foods that are primary sources of nutrients associated with public health issues in the United States.

***The high cost of analyzing the nutritional composition of foods makes maintaining an accurate food composition data base difficult.*** The development of acceptable assay methods that are faster and less expensive than current methods will help to bring down the costs of food analysis.

***For nutrition monitoring purposes, the food composition data for total fat, fatty acids including trans fatty acids, dietary fiber, carotenes, folate, sodium, and cholesterol need to be improved and expanded. Data on the selenium content of foods should be added to the Survey Nutrient Data Base.***

- The methodology for determining the total fat content of foods is in critical need of improvement.

There is no "gold standard" method for determining total fat, and there are considerable differences in the results obtained with the different methods and by different laboratories. Because the total fat content of foods affects nutrition monitoring and public health issues—such as the energy content of foods and the percent of calories from fat—it is important that accurate and comparable data be available for the total fat content of foods in the American diet.

- Consistency in the measurement of the total fat content of foods is becoming problematic because of differences in the traditionally used definition of "total fat" and that used in the Nutrition Labeling and Education Act (NLEA) of 1990 (Public Law 101-535). Accepted assay methods for "total fat," as defined by the NLEA, have yet to be developed. Efforts will have to be made to ensure that a consistent definition of "total fat" is used for foods incorporated into the U.S. Department of Agriculture (USDA) Nutrient Data Base for Standard Reference and the USDA Nutrient Data Base for Individual Food Intake Surveys (Survey Nutrient Data Base).

### **Concerns for low-income, high-risk populations**

NNMRRP surveys provide information on the dietary, nutritional, and nutrition-related health status of different population groups. By comparing the prevalence estimates of these groups, characteristics of the groups most at risk for nutrition-related health problems can be identified. Selected findings on populations at nutritional risk are listed below. The groups at risk differ depending on the risk factor being considered.

***The risk of nutrition-related health problems is high among people with low incomes. Certain subpopulations, such as elderly people, some minorities, pregnant women, infants, and children, are also at nutritional risk, particularly those with low incomes.***

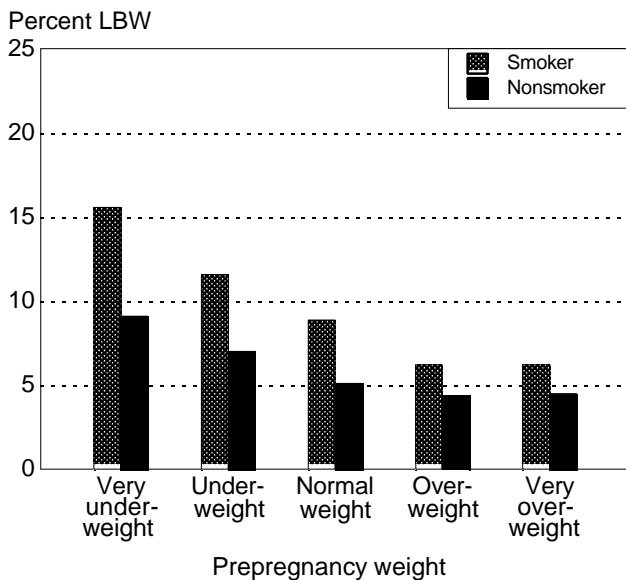
- Among low-income pregnant females, non-Hispanic blacks of all ages and adolescents across racial/ethnic groups had the highest prevalences of *anemia* in 1992.



- Among low-income women participating in government-supported service programs, the prevalence of **low birth weight** in 1992 was higher for those who smoked (fig. ES-19) or who had low prepregnancy weight, less-than-ideal weight gain during pregnancy, or anemia during pregnancy than it was for other women in that sample. Low prepregnancy weight, less-than-ideal weight gain, and anemia are often related to maternal diet and nutrient intake. Effective prenatal care can beneficially affect the latter two nutrition-related factors.
- Mothers who were younger, black, or living below the poverty level were less likely to **breastfeed** their babies than were other mothers (table ES-3).
- In 1992, about 10% of a population of low-income children and adolescents participating in government-supported service programs had high weight for height, which is higher than the percentage expected for the overall U.S. population (5%) but similar to the percentage found in children in the overall U.S. population (10%). The prevalence of **shortness** in this subpopulation—about 9%—may reflect, in part, the racial/ethnic composition of low-income families who participated in these programs. The prevalence of

**thinness** among low-income children was about 3%, which is less than expected for the overall U.S. population (5%) but similar to that found in the overall U.S. population (about 3%) (table ES-4).

- Mexican-American children and adolescents 6-19 years of age had a relatively high prevalence of **overweight** and a relatively low prevalence of **thinness** compared with the U.S. population of children and adolescents as a whole.
- The mean BMI of American Indian school children in 1990-91 was higher than that of children in the overall U.S. population in 1988-91, suggesting that the prevalence of **overweight** is likely to be higher in American Indian children than in other American children.
- In 1988-91, the prevalence of **overweight** was highest in females with incomes below 131% of poverty in all racial/ethnic groups, ranging from 45% for non-Hispanic whites to 50% for Mexican Americans and 51% for non-Hispanic blacks. For non-Hispanic blacks, the prevalence of overweight was much higher in females than in males (28%). For non-Hispanic black and Mexican-American males, the prevalence of overweight was lowest in the low-income group.
- Non-Hispanic white males with incomes below poverty in 1988-91 had a higher age-adjusted prevalence of **high serum total cholesterol** levels than males in other racial/ethnic or income groups.
- In 1988-91, non-Hispanic black males and females had higher age-adjusted prevalences of **hypertension** than did non-Hispanic whites or Mexican Americans (table ES-2). Non-Hispanic white and non-Hispanic black females with incomes below the poverty level had higher age-adjusted prevalences of hypertension than did females with higher incomes in these two groups.
- **Hypertension** remains a substantial problem in middle-aged and elderly people. In 1988-91, about 75% of females 80 years of age and older had high blood pressure compared with 60% of males in that group (table ES-2).
- The prevalence of femoral **osteoporosis** in females 50 years of age and older was 21% for non-Hispanic whites, 10% for non-Hispanic blacks, and 16% for Mexican Americans in 1988-91. Although



**Figure ES-19.** Low-birth-weight (LBW) prevalence among low-income, high-risk females who smoked and did not smoke during pregnancy, by prepregnancy weight, 1992

SOURCE: HHS, PNSS, 1992.

the prevalence of osteoporosis was only 6% among non-Hispanic white females 50-59 years of age, it rose in each succeeding decade of age, reaching 52% among the group 80 years of age and older.

- Female main meal planners and preparers who were black or from low-income households were less likely to be *aware of diet-health relationships* than were females who were white or from higher-income households. Higher percentages of adults with low incomes and of black adults reported eating certain foods containing higher levels of total fat (e.g., whole milk) and cholesterol (e.g., whole milk and eggs) than of adults with higher incomes and of white adults. Lower percentages of adults with low incomes and of black adults reported using fats and oils.
- Percentages of low-income adults and of black adults who had *total fat intakes* within the recommended range ( $\leq 30\%$  of calories) were somewhat lower than percentages of higher-income and of white adults (table ES-1).
- Median *calcium intakes* from food were below recommended values for non-Hispanic black children 1-11 years of age, all adolescents except non-Hispanic white males 12-15 years of age, females 20 years of age and older, non-Hispanic black males 20-59 years of age, and males 60 years of age and older.
- Children 1-2 years of age, female adolescents, and female adults 20-59 years of age had median *iron intakes* from food that were below recommended values.
- Non-Hispanic black females 16 years of age and older and Mexican-American females 60 years of age and older had median *folate intakes* from food that were below recommended values.
- Pregnant females had lower-than-recommended mean intakes from food of *folate, calcium, vitamin B<sub>6</sub>, iron, zinc, and magnesium*. Pregnant non-Hispanic black females had a mean calcium intake that was lower than that of non-Hispanic white and Mexican-American pregnant females.
- Low-income adolescents and adults (but not children) in 1989-91 had lower mean intakes of vitamins and minerals that were considered current or potential public health concerns in the second

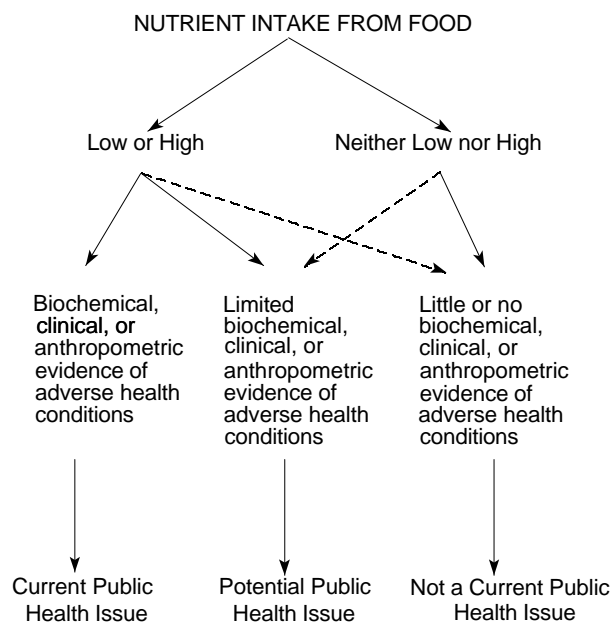
nutrition monitoring report—*vitamin A, vitamin C, vitamin B<sub>6</sub>, folate, calcium, iron, and zinc*—than did adolescents and adults from higher-income groups. However, mean intakes of the low-income groups were not more likely to be below Recommended Dietary Allowance (RDA) values than mean intakes of higher-income groups.

- People in low-income households or families were more likely to report that they experienced *food insufficiency* than people in households or families with higher incomes (tables ES-5 and ES-6). About 9-13% of people in low-income households experienced some degree of food insufficiency, compared with about 4% in the overall U.S. population. Mexican Americans and non-Hispanic blacks were more likely than non-Hispanic whites to report that they sometimes or often did not have enough food to eat.

## Assessments

The decision-making process developed for the second nutrition monitoring report was used to assess monitoring priority status for food components in the TRONM. As shown in figure ES-20, the evaluation of each food component begins with the dietary intake data. However, the evidence for adverse health consequences ultimately determines the categorization of the component. NNMRRP data that were available as of June 1994 were used for assessing monitoring priority status. The decision to start evaluating each food component by considering the dietary intake data was made because such data were available for most of the food components by June 1994. Analyses of much of the biochemical and clinical data on nutritional status were not completed by then.

Nutrient intake data collected in NHANES III 1988-91 and the Continuing Survey of Food Intakes by Individuals (CSFII) 1989-91 were used with contemporaneous information on nutritional status and nutrition-related health status from the NNMRRP and, in some instances, the general biomedical literature, to update the assessment of the public health monitoring priority for each food component. When nutrient intake data were not available from these surveys, data from the Food and Drug Administration's (FDA's) Total Diet Study (1982-89) were used. Each food component was considered independently.



**Figure ES-20.** Decision-making process used to categorize food components by monitoring priority status

SOURCE: Modified from LSRO (1989).

Evidence for health consequences was provided mainly by the biochemical and clinical data from the NNMRRP. The criteria established by authoritative groups for assessing specific diseases and health conditions were used to evaluate these data. As noted by the Joint Nutrition Monitoring Evaluation Committee of HHS and USDA in the first nutrition monitoring report in 1986, "Much can be inferred about the nutritional status of the population, even with imperfect data judged by imperfect criteria, especially when a wider knowledge of nutrition is brought to bear." In this regard, the Expert Consultants and the Life Sciences Research Office (LSRO) used their experience and judgment in categorizing food components.

Food components were assigned to three categories of public health issues: current public health issues, potential public health issues for which further study is required, and not current public health issues (table ES-7). High-priority monitoring status is recommended for food components considered current public health issues. Monitoring efforts for these components should include biochemical, clinical, and anthropometric assessments, as appropriate. Moderate-priority monitoring status is recommended for food components considered

potential public health issues, with continued assessment in at least those subgroups suspected to be at risk. Food components not considered current public health issues are recommended for lower-priority monitoring status; continued assessment should include, at a minimum, estimation of dietary intake. Assigning food components to this category does not necessarily indicate that there are no known health problems associated with these components, but that the prevalence of such problems on a national basis is known or expected to be so low that a lower level of monitoring effort than for food components in the other categories is appropriate.

The assignments of food components to particular monitoring classifications should be regarded as provisional. It is likely that as new data from the NNMRRP and other sources become available, future assessments of public health significance and of the levels of monitoring needed will result in changes in the categorization of some food components. More detailed assessments of individual nutrients can be found in the main report.

### Current public health issues

The following criteria were used to assign current public health issue status to a food component. If median intakes of a food component fell below the recommended values (usually the 1989 RDA), undernutrition was considered to be a possible problem. Additional evidence of a nutritional problem based on clinical or biochemical data from the NNMRRP was needed to determine that the component should be considered a current public health issue. Such clinical and biochemical data were accorded more weight than were the dietary intake data. If such data were not available from the NNMRRP, information in the general medical literature was used to assess the possibility that the specified component be considered a current public health issue. The interpretation of dietary intake data was complicated by the lack of information on total nutrient intakes (i.e., intakes from dietary supplements and from foods).

High intakes of food components were also assessed, although the RDA was less useful in identifying potential public health problems related to excessive intake. If the median intake was near or above the recommended value and the distribution of intakes was skewed to the side of high intakes, the

**Table ES-7.** Classification of food components as public health issues in the TRONM<sup>1</sup>

Current public health issues	Potential public health issues for which further study is required	Not current public health issues
Food energy	→ Total carbohydrate	Thiamin
Total fat	Dietary fiber	Riboflavin
Saturated fatty acids	Sugars‡	Niacin
Cholesterol	Polyunsaturated and monounsaturated fatty acids‡	Iodine‡
Alcohol	<i>Trans</i> fatty acids‡	
Iron	Fat substitutes‡	
Calcium	→ Protein	
Sodium	Vitamin A	
	Antioxidant vitamins	
	Vitamin C	
	→ Vitamin E	
	Carotenes	
	Folate	
	Vitamin B <sub>6</sub>	
	→ Vitamin B <sub>12</sub>	
	→ Magnesium	
	Potassium	
	Zinc	
	→ Copper	
	Selenium‡	
	→ Phosphorus	
	Fluoride	

<sup>1</sup>Arrows (→) point to components whose monitoring priority status has changed since the second report on nutrition monitoring was published (LSRO, 1989). Double daggers (‡) indicate components that are being evaluated for the first time for the NNMRRP.

SOURCE: LSRO, 1995.

possibility of deleterious health effects was evaluated. Consumption from dietary supplements should also be considered when effects of high intakes are considered. However, estimates of total nutrient intakes from foods and dietary supplements were not available for the preparation of the TRONM, so estimates of nutrient intakes were based only on nutrients provided by food. Standards established by other expert groups and specified in the assessments below were applied to evaluate components for which there is evidence that excessive intakes are harmful, such as food energy, total fat, saturated fatty acids, cholesterol, and sodium. Confirmatory clinical or biochemical evidence from the NNMRRP data or from other sources about adverse effects resulting from high intakes is required for the categorization of high intakes as current or potential public health issues.

Food components meeting the criteria for classification as current public health issues are food energy, total fat, saturated fatty acids, cholesterol, alcohol, iron, calcium, and sodium (table ES-7). Except for iron and calcium, these food components were classified as current public health issues because of evidence of adverse effects of high intakes. The classification of these nutrients as current public health issues was consistent with their classification in the first and second nutrition monitoring reports.

#### *Food energy*

Although median intakes of food energy reported by adolescents and adults in 1988-91 were below recommended levels, approximately one-fifth of the adolescents and one-third of the adults were

overweight. The high prevalence of overweight indicates that energy balance is a continuing public health problem (i.e., that food energy intakes exceed energy expenditures for many Americans).

### *Total fat, saturated fatty acids, and cholesterol*

Median intakes of total fat and saturated fatty acids for most adults, adolescents, and children older than 2 years of age in 1988-91 were above recommended values ( $\leq 30\%$  of calories for total fat and 8-10% of calories for saturated fatty acids). Median intakes of cholesterol were generally within the recommended range of 300 mg/d or less. Although serum total cholesterol levels and median intakes of total fat, saturated fatty acids, and cholesterol appear to be decreasing, substantial proportions of the U.S. population still have high serum total cholesterol levels and high intakes of total fat, saturated fatty acids, and cholesterol. High intakes of total fats, saturated fatty acids, and cholesterol are associated with elevated blood lipids, a risk factor for coronary heart disease.

### *Alcohol*

Intake of alcohol is considered a current public health issue because alcoholic beverages are a source of food energy and may displace other sources of nutrients and because of the serious public health and social consequences of excessive alcohol intake.

### *Iron and calcium*

Low intakes of iron and calcium are of public health concern. Median intakes of iron from food were below RDA values for children 1-2 years of age and for adolescent and adult females in 1988-91. Prevalences of low hemoglobin levels indicative of anemia were generally higher in these groups than in other age-sex groups. A comprehensive assessment of iron status will require that multiple biochemical and hematologic indicators of iron status be evaluated.

Median calcium intakes from food were consistently below RDA values for adolescent and adult females and for males of most age and racial/ethnic groups. Current calcium intakes by these groups may be

insufficient to attain optimal peak adult bone mass and to prevent age-related loss of bone mass.

### *Sodium*

In 1988-91, median intakes of sodium from food alone, excluding salt added at the table, were above the recommended maximum value of 2,400 mg/d. High sodium intakes are associated with high prevalences of hypertension.

### **Potential public health issues for which further study is required**

The following criteria were used to classify a food component as a potential public health issue for which further study is required to determine the nature and extent of the potential problem. If median intakes were low by the criteria described above and data on health or nutritional status were not available from the NNMRRP or any other source to assess the potential for deficiency, then the component was considered a potential public health issue for which further study is required. If the median intakes were above the recommended values (usually the 1989 RDA) for a population subgroup, then in most cases, few individuals would be at risk of deficiency in that subgroup. However, if additional evidence from the NNMRRP or other sources indicated that the potential for deficiency existed in at least some groups in the population, the food component was considered a potential public health issue for which further study is required.

The following food components met the criteria for classification as potential public health issues for which further study is required (table ES-7): total carbohydrate and certain carbohydrate constituents (dietary fiber and sugars); certain fat constituents (polyunsaturated and monounsaturated fatty acids and *trans* fatty acids) and substances used as fat substitutes, including modified fats, proteins, gums, and dietary fiber; protein; vitamin A; antioxidant vitamins (vitamin C, vitamin E, and carotenes); certain water-soluble vitamins (folate, vitamin B<sub>6</sub>, and vitamin B<sub>12</sub>); and several minerals (magnesium, potassium, zinc, copper, selenium, phosphorus and fluoride). This group of food components is diverse and the reasons for classifying them as potential public health issues are varied. (These reasons are

summarized for each component in the main report.) Some changes occurred since the second report in the evaluation of nutrients considered to be potential public health issues. The classifications changed for total carbohydrate, protein, vitamin E, vitamin B<sub>12</sub>, magnesium, copper, and phosphorus, now potential public health issues rather than not current public health issues. The change in the classification of total carbohydrate was made on the basis of Healthy People 2000 Objective 2.6—to increase consumption of fruits, vegetables, and grains, which are rich sources of complex carbohydrates and dietary fiber. This objective reflects the recommendations shown in the 1990 *Dietary Guidelines for Americans* and the Food Guide Pyramid to eat a minimum of 2 servings of fruit and 3 servings of vegetables daily and 6 or more daily servings of grain products. Changes in the classification of the other nutrients were made on the basis of evidence from the general biomedical literature, rather than on the basis of evidence of changes in intakes of these nutrients or of changes in the nutritional and nutrition-related health status of the U.S. population. This is the first assessment for the NNMRP of monitoring priority status for polyunsaturated and monounsaturated fatty acids, *trans* fatty acids, fat substitutes, sugars, selenium, and iodine.

#### *Total carbohydrate and carbohydrate constituents*

In 1989-91, median intakes of total carbohydrate and dietary fiber (a carbohydrate constituent) were lower than recommended values. Eating fruits, vegetables, and grain products, which contain complex carbohydrates including dietary fiber, is associated with maintenance of health. Higher intakes of soluble and insoluble fiber fractions have been associated with lower serum cholesterol levels and a lower risk of colon cancer, respectively. The consumption of carbohydrate-containing foods needs to be monitored so that progress toward meeting Healthy People 2000 Objective 2.6 (for increasing consumption of fruits, vegetables, and grain products) can be evaluated.

Sugars (simple carbohydrates) provide food energy, may contribute to energy intakes in excess of energy expenditures, and may displace other sources of nutrients. The consumption of sucrose in particular is also associated with the development of dental caries. When the fat content of food is reduced, the

sugar content may increase and result in higher intakes of sugars by people who consume fat-free, low-fat, or reduced-fat foods. Because there is concern about high intakes of sugars, it is preferable to replace fat in the diet with sources of complex carbohydrates such as fruits, vegetables, and grain products, rather than sugars. The monitoring of sugars intake is needed to track the sources of carbohydrates in the U.S. diet.

#### *Polyunsaturated and monounsaturated fatty acids, trans fatty acids, and fat substitutes*

Median intakes of polyunsaturated and saturated fatty acids were within recommended ranges ( $\leq 10\%$  of calories and  $\leq 15\%$  of calories, respectively) in 1988-91. When substituted for saturated fatty acids in the diet, polyunsaturated and monounsaturated fatty acids lower serum low-density-lipoprotein (LDL) cholesterol (elevated serum levels of LDL cholesterol are a risk factor for coronary heart disease).

High dietary levels of *trans* fatty acids, another type of unsaturated fatty acid found naturally in meat and dairy products and produced during hydrogenation of vegetable oils to produce solid fats, may increase levels of serum total and LDL cholesterol. Questions remain, however, about whether *trans* fatty acids actually have this effect. Intakes of *trans* fatty acids cannot be determined because the necessary food composition data are not yet available. Intakes of polyunsaturated, monounsaturated, and *trans* fatty acids should be monitored in conjunction with the monitoring of total fat, saturated fatty acids, and cholesterol and with the assessment of the levels of serum total, high-density-lipoprotein (HDL), and LDL cholesterol.

With the many new developments in fat substitutes and high consumer demand for low-fat and fat-free foods, fat substitutes (including modified fats, proteins, gums, and dietary fiber) are being incorporated into many foods. Because the increased consumption of these substances could result in significant changes in the U.S. diet, including lower fat intakes, lower intakes of fat-soluble vitamins, and higher intakes of carbohydrates, consumption of foods containing these substances should be monitored.

## *Protein*

Median intakes of protein from food were well above RDA values for most demographic groups in 1988-91. Clinical studies have provided evidence that high protein intakes increase urinary calcium excretion when calcium intakes are low, and some epidemiological evidence suggests that higher intakes of animal protein are associated with higher prevalences of hip fractures in women over 50 years of age.

In adults 60 years of age and older, median protein intakes were somewhat lower than they were for other age groups, although they were still at or above the RDA. Protein requirements of older people may be higher when food energy intakes are low. Because of high protein intakes by most age-sex groups, including those who have low calcium intakes, and because of the potential for low protein and low food energy intakes by elderly people, the monitoring of dietary protein intakes should continue.

## *Vitamin A*

Median intakes of vitamin A from food in 1988-91 were below RDA values for adults and some subgroups of older children, but the prevalence of low serum levels of vitamin A was very low in these groups. Median vitamin A intakes of younger children were above RDA values, but the prevalence of low serum vitamin A levels in younger children was relatively high when the cutoff values for adults and adolescents were used. The misuse of high doses of preformed vitamin A in dietary supplements may lead to high intakes of vitamin A. Because of adverse health effects associated with low and high intakes of vitamin A, it continues to be classified as a potential public health issue.

## *Antioxidant vitamins (vitamin C, vitamin E, and carotenes)*

Epidemiological and clinical studies suggest that antioxidants in food can lower the risk of heart disease, some forms of cancer, cataracts, and macular degeneration, one of the leading causes of visual loss among people aged 65 years and older. In 1988-91, median intakes of vitamin C from food were above RDA values for population subgroups, but interpreting these data is difficult because 1) the

range of intakes necessary for optimal antioxidant activity of vitamin C remains unknown and 2) interpretive criteria are needed for serum vitamin C values obtained with the more sensitive and specific methods used in NHANES III 1988-91.

Median intakes of vitamin E from food were below RDA values for all population subgroups of people 1 year of age and older. Dietary vitamin E intakes are difficult to interpret, however, because of the addition to foods of vitamin E as  $\alpha$ -tocopherol (to provide antioxidant functions) and in an esterified form (to provide a dietary source of vitamin E). Thus, the vitamin E contents of a food when the food is analyzed and when it is eaten are likely to differ, so the food composition data on vitamin E have little meaning in the evaluation of vitamin E intakes. Serum levels of vitamin E were measured in NHANES III 1988-91, but criteria for their interpretation remain to be developed.

The nutritional status of carotenes was not evaluated because of a lack of interpretive criteria for assessing dietary intakes and serum levels of carotenes. The evaluation of the antioxidant vitamin status of the U.S. population requires improved criteria for the evaluation of dietary intake and serum concentrations of antioxidant nutrients. Additional research is needed on the biochemical and health effects of diets containing specified levels and combinations of antioxidant nutrients.

## *Certain water-soluble vitamins (folate, vitamin B<sub>6</sub>, and vitamin B<sub>12</sub>)*

Median intakes of folate from food were higher than 1989 RDA values for all age, sex, and racial/ethnic groups except non-Hispanic black females 16 years of age and older and Mexican-American females 60 years of age and older. Serum and red blood cell levels of folate were measured in NHANES III 1988-94, but because of analytical problems related to the kit used in NHANES III 1988-91, the biochemical indices of folate status were not evaluated in time for consideration in this report. In light of epidemiological evidence that low serum folate levels are associated with elevated serum homocysteine levels (a risk factor for atherosclerosis) and that the use of dietary supplements containing folate by females before they become pregnant and during early pregnancy is associated with a decreased incidence of some types of neural-tube defects in

some populations, monitoring of folate status is needed. However, the prevalence of neural-tube defects in the U.S. population is sufficiently low that national surveys and surveillance systems would not be able to detect changes in that prevalence in response to changes in folate intakes.

Low serum levels of vitamin B<sub>6</sub> have also been associated with elevated homocysteine levels, as well as with biochemical and clinical signs of deficiency. Median intakes of vitamin B<sub>6</sub> from food were below RDA values for adults and adolescents in 1988-91, more so for females than males, and for females 6-11 years of age. Further research is needed on vitamin B<sub>6</sub> requirements and on techniques for assessing vitamin B<sub>6</sub> nutritional status so that the public health importance of these intakes can be interpreted effectively.

Median intakes of vitamin B<sub>12</sub> from food were above RDA values in 1988-91 for all age, sex, and racial/ethnic groups in the U.S. population. However, intakes from food and dietary supplements may not provide sufficient vitamin B<sub>12</sub> if absorption is impaired, as it appears to be in some elderly people. Serum concentrations of vitamin B<sub>12</sub>, which will be available for NHANES III 1991-94, may prove to be more useful than dietary data for evaluating vitamin B<sub>12</sub> status. Further investigations and monitoring of activities should focus on elderly people.

*Certain minerals (magnesium, potassium, zinc, copper, selenium, phosphorus, and fluoride)*

In 1988-91, median intakes of magnesium, potassium, zinc, and copper from food were lower than RDA or Estimated Safe and Adequate Daily Dietary Intake (ESADDI) values for some population subgroups. The significance of the observed low dietary intakes of these minerals for nutritional status or nutrition-related health status cannot be evaluated from survey data until adequate biochemical and/or clinical indicators are available. Meanwhile, because epidemiological and clinical studies have suggested that certain of these minerals are associated with hypertension (potassium and, possibly, magnesium), growth retardation in children (zinc), and ventricular arrhythmias (copper), these minerals were classified as potential public health issues.

Data from the Total Diet Study (1982-89) indicate that mean selenium intakes from food were above RDA values for all age and sex groups assessed. Serum selenium levels were measured in NHANES III 1988-91, but the analyses were not completed in time for consideration in this report. Because evidence from epidemiological and laboratory studies has suggested that low selenium levels are associated with higher risk of cancer or heart disease and because incidents of selenium toxicity have been reported in the United States, monitoring of selenium status should be included in nutrition monitoring activities.

Median phosphorus intakes from food were near or above RDA values in 1988-91; however, calcium intakes from food were below RDA values for adolescent and adult females and for males of most age and racial/ethnic groups. Because high phosphorus and protein intakes may increase calcium losses when calcium intakes are low, phosphorus was classified as a potential public health issue. (See "Protein," above.)

Data are not currently available in the NNMRRP surveys for evaluating fluoride intakes from food or water. However, food contributes only small amounts of fluoride, and monitoring the diet for fluoride intake is not very useful for current public health concerns. Because mild dental fluorosis (mottled teeth) is associated with high fluoride intakes, fluoride was classified as a potential public health issue. Dental-examination data from NHANES III 1988-91 may provide a means to estimate the prevalence of mottled teeth and, thus, of high fluoride intakes.

### **Not current public health issues**

The following criteria were used to classify food components as not current public health issues. For mean intakes above the recommended values (usually the 1989 RDA) for a population subgroup, in most cases, few individuals would likely be at risk of deficiency in that subgroup. If the biochemical and clinical evidence available from the NNMRRP or other sources did not suggest the presence of a nutritional-deficiency problem for a particular component, it was not considered to be a current public health issue with respect to deficiency in the



population surveyed. For intakes below recommended values, if data from the NNMRRP or elsewhere did not indicate that there was a nutritional-deficiency problem for a component, it was not considered to be a current public health issue. Nutrients considered not to be current public health issues were thiamin, riboflavin, niacin, and iodine (table ES-7).

Classification of thiamin, riboflavin, and niacin as nutrients that are not current public health issues is consistent with the monitoring priority assignments in the second nutrition monitoring report. This is the first assessment for the NNMRRP of the monitoring priority status of iodine.

### *Thiamin, riboflavin, and niacin*

Median intakes of thiamin, riboflavin, and niacin from food were generally above RDA values in 1988-91, and no other evidence suggests that intakes of these vitamins pose a public health problem. However, because there is some indication that intakes may be low in some groups of Hispanic females, monitoring intakes of these vitamins should continue, with a focus on these subpopulations.

### *Iodine*

Data from the Total Diet Study (1982-89) indicated that mean iodine intakes from food were above RDA values for all age and sex groups assessed. No epidemiological or clinical evidence suggests that low or high iodine intakes are currently of public health concern in the United States.

## **Recommendations for future monitoring and research activities**

### *Monitoring needs*

The NNMRRP should monitor intakes from food and dietary supplements for all of the food components evaluated in the TRONM with the exception of fluoride and, possibly, vitamin E. In addition, for food components that are current public health issues, the program should monitor appropriate anthropometric, biochemical, and clinical indices of nutritional status and nutrition-related health status for food energy, total fat, saturated fatty acids,

cholesterol, iron, calcium, and sodium. For food components that are potential public health concerns, the program should monitor appropriate biochemical and clinical indices of nutritional status and nutrition-related health status. The monitoring of biochemical and clinical indices is not recommended for food components that are not current public health issues; however, the monitoring of dietary intakes of those components should continue.

### *Research needs*

During the course of interpreting and evaluating NNMRRP data for the TRONM, the Expert Consultants and LSRO identified information needed to improve future monitoring efforts. Additional research is required to obtain this information. The most immediate research needs are 1) to develop interpretive criteria to link nutrition monitoring data to functional or health outcomes, 2) to improve biochemical assays, and 3) to improve food composition data. Table ES-8 presents recommendations for those food components requiring further research. If more than one research need is indicated for a given food component, the research need considered of highest priority for use in interpreting existing data and in comparisons with data collected in future surveys is listed first. However, all research action listed for each nutrient should be considered of high priority.

## **Recommendations for the National Nutrition Monitoring and Related Research Program**

The United States' national nutrition monitoring system takes a broad, multidisciplinary approach to monitoring the nutritional and nutrition-related health status of the U.S. population, with particular emphasis on high-risk subgroups, such as low-income and certain minority groups. The cornerstone surveys of the NNMRRP (CSFII and NHANES) provide a unique opportunity for the comprehensive and coordinated evaluation of the dietary, behavioral, anthropometric, clinical, and biochemical status of the U.S. population and certain subgroups considered to be at high risk for nutrition-related problems.

The need to continue these two cornerstone surveys and adjunct activities at a national level is critical for several reasons. First, within each survey cycle, data on many factors related to diet and health are

**Table ES-8. Recommendations for further research for national nutrition monitoring in the United States**

Classification and food component <sup>1</sup>	Recommended research action <sup>2</sup>
<b>Current public health issue</b>	
Food energy	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li></ul>
Total fat	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
Saturated fatty acids	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
Cholesterol	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
Iron	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li></ul>
Calcium	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li></ul>
Sodium	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
<b>Potential public health issue for which further study is required</b>	
Total carbohydrate	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
Dietary fiber	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li><li>● Improve food composition data.</li></ul>
Sugars	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes (e.g., metabolic effects of sugars such as high-fructose corn syrup).</li><li>● Improve food composition data.</li></ul>
Monounsaturated fatty acids	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
Polyunsaturated fatty acids	<ul style="list-style-type: none"><li>● Improve food composition data.</li></ul>
<i>Trans</i> fatty acids	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li><li>● Improve food composition data.</li></ul>
Protein	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes (e.g., effects of high phosphorus and high protein intakes on bone density when calcium intakes are low).</li></ul>
Fat substitutes	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes (e.g., cutoff values for serum retinol in children).</li><li>● Improve food composition data.</li></ul>
Vitamin A	<ul style="list-style-type: none"><li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li><li>● Improve food composition data.</li></ul>

**Table ES-8. Recommendations for further research for national nutrition monitoring in the United States —continued**

Classification and food component <sup>1</sup>	Recommended research action <sup>2</sup>
Carotenes	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve food composition data.</li> </ul>
Vitamin C	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve biochemical assays.</li> <li>● Improve food composition data.</li> </ul>
Vitamin E	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> </ul>
Folate	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve biochemical assays.</li> <li>● Improve food composition data.</li> </ul>
Vitamin B <sub>6</sub>	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve biochemical assays.</li> </ul>
Magnesium	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> </ul>
Potassium	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> </ul>
Zinc	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve biochemical assays.</li> </ul>
Copper	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> <li>● Improve food composition data.</li> </ul>
Selenium	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes.</li> </ul>
Phosphorus	<ul style="list-style-type: none"> <li>● Develop interpretive criteria to link monitoring data to functional outcomes or health outcomes (e.g., effects of high phosphorus and high protein on bone density when calcium intakes are low).</li> </ul>

<sup>1</sup>Further research actions are not recommended at this time for nutrition monitoring purposes for food components not listed here (alcohol, fluoride, iodine, vitamin B<sub>12</sub>, thiamin, riboflavin, and niacin), although further monitoring is recommended for all of them.

<sup>2</sup>Recommended research actions are listed in descending order from the most immediate need for interpreting existing data and for comparisons with data collected in future surveys; however, all research actions listed for each nutrient should be considered high priority. The Expert Consultants and LSRO regarded recommended monitoring activities as separate from recommended research actions. Further monitoring was recommended for all food components (see text).

SOURCE: LSRO, 1995.

collected from a single, large, nationally representative sample of people. Meaningful comparisons of health effects can be made within and among many age, sex, racial/ethnic, and income-level groups. Such comparisons cannot be made with as much confidence with data from surveys that do not use nationally representative samples. Second, continuing to use the complex survey designs of the cornerstone surveys, which require large sample sizes, will minimize such potentially confounding effects as population mobility and variabilities in the distribution of domestic and imported foods throughout the country. Third, centralized laboratory analyses with well-defined protocols and quality-control procedures, although difficult, can be carried out in large surveys such as NHANES, but achieving this uniformity of procedures and quality control across several surveys is much more difficult. Finally, collecting data in future nutrition surveys at the national level should permit comparisons with information from other cycles of these surveys. Trends in the dietary, nutritional, and nutrition-related health status of the U.S. population can then be identified and monitored, and the information can be used to recommend appropriate interventions to improve Americans' health.

Comparability among the surveys has been improved since the publication of the second nutrition monitoring report in 1989. To allow more direct comparisons among surveys, a common set of population descriptors and guidelines for statistical and reporting categories for those descriptors were recommended by the Interagency Board on Nutrition Monitoring and Related Research Survey Comparability Working Group in 1992. A joint policy on variance estimation and statistical reporting standards for NHANES III 1988-91 and CSFII 1989-91 reports was developed by an HNIS/NCHS Analytic Working Group in 1993. That group also developed a set of statistical guidelines for reporting data for the TRONM. As the Expert Consultants and LSRO reviewed data provided for the TRONM, they found the use of the common descriptors and reporting categories vital for comparing results across surveys. Use of these common entities should continue, and further consideration should be given to developing more common descriptors that could be recommended for across-survey comparisons.

The NNMRRP is still evolving. At various points during its evolution, expert committees and other groups have made recommendations for its

improvement. Key publications that include these recommendations are

- *National Survey Data on Food Consumption: Uses and Recommendations,*
- *Nutrition Monitoring in the United States: A Progress Report from the Joint Nutrition Monitoring Evaluation Committee,*
- *Nutrition Monitoring in the United States: An Update Report on Nutrition Monitoring,*
- *Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program; notice,*
- *Nutrition Monitoring: Progress in Developing a Coordinated Program,*
- *Nutrition Monitoring: Data Serve Many Purposes; Users Recommend Improvements,* and
- *Nutrition Monitoring: Establishing a Model Program.*

To strengthen the program and overcome some limitations of the present system, specific gaps in knowledge and recommendations for enhancing the usefulness of the survey data are identified in chapters 3 through 9 of the main report. Recommendations that apply broadly to the NNMRRP are listed below.

## General

- Support basic research and epidemiological studies by Federal agencies and academia or assume the responsibility to do so in order to maximize the NNMRRP's usefulness in nutrition and health monitoring. Conducting basic research or epidemiological studies to establish or evaluate the scientific validity of various interpretive criteria of biochemical and behavioral parameters of nutrition and health is not a primary mission of the NNMRRP. However, the interpretation and use of NNMRRP data for public policy decisions rely upon the validity of the interpretive criteria. Part of the mission of the NNMRRP should be the development of interpretive criteria. The program should provide for research to improve methodology for all aspects of nutritional assessment, including food composition, food consumption, biochemical evaluations, and behavioral indices so that interpretive criteria can be based on the best and most current methodology.

- Develop statistical models to examine relationships and interactions among the many types of data collected for NNMRRP surveys.
- Encourage and support efforts of agencies that participate in the NNMRRP to publish survey and surveillance system data in agency reports and peer-reviewed scientific journals. Although resources for these activities are limited, making data available in a timely fashion to the public, the scientific community, and for public policy consideration is an essential component of the NNMRRP. The agencies should also release the primary data (i.e., reports and data tapes) to the research community as quickly as possible.
- Conduct special studies of high-risk population subgroups (e.g., American Indians, pregnant females, and migrant populations) concurrently with national surveys using comparable data-collection methodologies.
- Develop, standardize, and disseminate nutrition methodologies for comparable use at national, State, local, and community levels to allow for appropriate data comparisons.
- Improve the system for the electronic transfer of nutrition survey data to data base users. This capability enhances the States' abilities to use NNMRRP data. Consideration should be given to implementing a system in which States can obtain NNMRRP data that pertain to their specific needs. Any system for electronic data transfer must require strict adherence to quality-control criteria for inclusion of data and would have to include protection against change by unauthorized individuals or organizations.
- Support the development of a comprehensive catalog of the types of data and analyses available from all surveys and surveillance systems of the NNMRRP. Such a catalog should be patterned after the *Catalog of Electronic Data Products*. The currently available *Nutrition Monitoring in the United States: The Directory of Federal and State Nutrition Monitoring Activities* could be expanded or supplemented by a more comprehensive listing of data that are available on tape, diskette, or CD-ROM or as published reports. Such a comprehensive source document on the entire NNMRRP would be quite valuable to research investigators, State agencies, and others.
- Start planning for the fourth report on nutrition monitoring immediately. The quantity of data generated by the NNMRRP is substantial and the data are complex, requiring careful planning of analyses. Early initiation of planning, including a sharper focus on topics to be included in the next comprehensive 5-year report, is critical.

### **National food-supply determinations and household-based food expenditures**

- Continue to collect reliable food-supply data from a variety of government and private sources and to calculate estimates of the total available food supply, per capita consumption, and nutrient availability annually.
- Continue to collect and analyze data on household food use and expenditures for food at home, including preprepared foods (foods purchased in a ready-to-eat form and taken home for consumption).
- Continue to gather information on the amount of money spent for food away from home. Expand efforts to capture information for food away from home by type of food item and by facility where food is eaten (e.g., school cafeteria, restaurant with counter service, restaurant with waiter-waitress service, and vending machine).

### **Food composition and nutrient data bases**

- Develop acceptable assay methods that are faster and less expensive than current methods. Efforts should involve coordination with the food industry and other groups to increase the accuracy of methods, improve data quality, and make food composition data more accessible.
- Enhance communication between government and the food industry so that the development of food composition methodologies used for food-safety and food-labeling (i.e., regulatory) purposes and those used to generate food composition data for food composition data bases can be coordinated. Such coordination should allow for greater use of brand-specific information in the Survey Nutrient Data Base.

- Improve and expand food composition data for total fat, fatty acids including *trans* fatty acids, fat substitutes, dietary fiber, vitamin A, carotenes, vitamin C, folate, sodium, copper, cholesterol, total carbohydrate, and sugars. Incorporate food composition data for selenium into the Survey Nutrient Data Base.
- Continue to collect and compile food composition data for analytical research purposes and to use, develop, and maintain nutrient data bases for estimating nutrient intakes from food consumption surveys. Maintain the USDA Nutrient Data Base for Standard Reference and the Survey Nutrient Data Base as two separate entities because their data are used in very different ways.
- Continue to develop a survey nutrient data base for trend analysis that will permit food composition data added in the future to be used to analyze food consumption data collected earlier.
- Create and maintain a product-specific data base for the nutrient composition of dietary supplements so that nutrient intakes from supplements—as well as from foods—can be analyzed.

### **Food consumption and nutrient intakes**

- Continue monitoring foods consumed by individuals to examine differences in food consumption patterns among population subgroups and to track progress toward meeting Healthy People 2000 objectives and adopting dietary recommendations in the Food Guide Pyramid and the *Dietary Guidelines for Americans*.
- Monitor nutrient intakes from foods and from dietary supplements.
- Support research to determine the mean and variance of requirements for each nutrient. This information is needed to adequately assess the risk of dietary inadequacies and excesses in the U.S. population.
- Support research to determine whether nutrient requirements of population subgroups differ. Give higher priority to groups at nutritional risk and whose numbers are increasing in the population, such as elderly people.

- Support research to determine the extent of underreporting of food consumption that occurs in nutrition surveys, improve food consumption survey methodology and instruments that minimize underreporting, and develop analytic approaches to adjust for underreporting.
- Continue monitoring the magnitude and severity of food insufficiency in future nutrition monitoring surveys. Identify groups within low-income and other populations at risk for food insufficiency and examine factors that influence the development of food insufficiency.

### **Nutritional status and nutrition-related health status**

- Continue monitoring indicators of nutritional status, including anthropometric, biochemical, hematologic, and clinical measures, and of nutrition-related health conditions, including low birth weight, growth status in children, overweight in adults, serum lipids, hypertension, osteoporosis, and anemia. Monitoring efforts should not be restricted to these conditions and should continue to include other diseases that have a nutritional component, such as diabetes mellitus, dental conditions, and gallbladder disease.
- Develop interpretive criteria to link nutrition monitoring data to functional or health outcomes.
- Conduct studies to improve the validity of biochemical and other methodologies used to assess nutritional status and nutrition-related health status.
- Explore links between nutritional status, particularly anthropometric indicators, and food insufficiency.
- In future nutrition monitoring reports, nutrition monitoring assessments should be based on health conditions and intakes of nutrients of public health concern.

### **Knowledge, attitudes, and behavior assessments**

- Continue coordination among Federal agencies to enhance the collection and use of survey data on diet, nutrition, and health-related knowledge, attitudes, and behavior. Such efforts help reduce

information gaps and duplication of effort, identify and prioritize monitoring needs, and strengthen the links between national surveys and programs that use these data for program planning and evaluation.

- Collect information on people's perceptions of dietary and nutrition issues and of health-related behaviors to improve approaches to translating knowledge into action. Determine the perceived internal and external barriers that keep people from adopting and maintaining healthier food and life-style choices.
- Establish better measures to evaluate physical-activity levels in children, adolescents, and adults.
- Identify and monitor factors that contribute to the low levels of physical activity in the general population and in population subgroups and factors that influence people to become more active and to maintain more active life-styles.
- Collect in-depth information from consumers on their use and understanding of information on the food label, and analyze the data for the general population and for population subgroups. For nutrition monitoring purposes, focus on the impact of the food label's nutrition panel on food purchases and consumption, on what specific information on the nutrition panel is used and found to be valuable, on where food-label information is used (at home and/or in the supermarket), and on the effect of food-label use on subsequent food purchases.

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## Figure notes

**Figure ES-4.** "Overweight" was defined for males as body mass index (BMI)  $\geq 27.8$  kg/m<sup>2</sup> and for females as BMI  $\geq 27.3$  kg/m<sup>2</sup>. Pregnant females were excluded from analyses.

**Figure ES-5.** Percentages for children 2-5 years of age were based on weight for height greater than the NCHS growth chart 95th percentile for age (Hamill et al., 1979). Percentages for children and adolescents 6-19 years of age were based on body mass index greater than the NHANES I 95th percentile for age (Must et al., 1991). Excludes pregnant females.

**Figure ES-6.** "None" was defined as no physical activity in the past month. "Irregular" was defined as any physical activity or pair of activities done for <20 minutes or fewer than 3 times per week. "Regular" was defined as any physical activity or pair of activities done for  $\geq 20$  minutes 3 or more times per week at <50% of functional capacity. The HP2000 definition for "vigorous physical activity" is any rhythmic, repetitive physical activity that uses large muscle groups at  $\geq 60\%$  of maximum heart rate for age 3 or more days per week for  $\geq 20$  minutes per occasion. Maximum heart rate for age equals roughly 220 beats per minute minus age.

**Figure ES-7.** "Vigorous physical activity" was described to respondents as hard exercise done for at least 20 minutes that causes one to breathe heavily and makes the heart beat fast (e.g., playing basketball, jogging, fast dancing, and fast bicycling).



**Figure ES-8.** "Overweight" was defined for males as body mass index (BMI)  $\geq 27.8$  kg/m<sup>2</sup> and for females as BMI  $\geq 27.3$  kg/m<sup>2</sup>. Excludes pregnant females. An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation.

**Figure ES-9.** "Overweight" was defined for males as body mass index (BMI)  $\geq 27.8$  kg/m<sup>2</sup> and for females as BMI  $\geq 27.3$  kg/m<sup>2</sup>. Male and female respondents had a measured BMI  $< 27.8$  and  $< 27.3$  kg/m<sup>2</sup>, respectively. Excludes pregnant females.

**Figure ES-10.** An asterisk (\*) indicates a statistic that is potentially unreliable because of small sample size or large coefficient of variation.

**Figure ES-11.** "Hypertension" was defined as systolic blood pressure  $\geq 140$  mm Hg, diastolic blood pressure  $\geq 90$  mm Hg, or under current treatment for hypertension with a prescription medication. Excludes pregnant females.

**Figure ES-13.** Data are based on boneless, trimmed equivalent.

**Figure ES-15.** "Fruit juices" includes citrus juices (orange, grapefruit, lemon, and lime) and noncitrus juices (apple, grape, and prune).

**Figure ES-19.** Data were collected from low-income, high-risk pregnant females who participated in government-funded prenatal nutrition and food-assistance programs. Measured height and prepregnancy weight were used to calculate body mass index (BMI). Prepregnancy weight categories, as specified for this analysis, were very underweight (BMI 10.0-17.9 kg/m<sup>2</sup>), underweight (BMI 18.0-19.7 kg/m<sup>2</sup>), normal weight (BMI 19.8-27.3 kg/m<sup>2</sup>), overweight (BMI 27.4-31.0 kg/m<sup>2</sup>), and very overweight (BMI 31.1-74.9 kg/m<sup>2</sup>).

**Figure ES-20.** Whenever nutrient intake data were available from surveys, they were used and evaluated by established criteria. When survey data were not available, Total Diet Study data were used and evaluated by established criteria. Dashed lines indicate less likely outcomes.

## Acronyms and abbreviations

**ARS:** Agricultural Research Service, USDA  
**BMI:** body mass index  
**BRFSS:** Behavioral Risk Factor Surveillance System  
**CDC:** Centers for Disease Control and Prevention, HHS  
**CES:** Consumer Expenditure Survey  
**CSFII:** Continuing Survey of Food Intakes by Individuals  
**DHKS:** Diet and Health Knowledge Survey  
**DOD:** U.S. Department of Defense  
**DOL:** U.S. Department of Labor  
**ESADDI:** Estimated Safe and Adequate Daily Dietary Intake  
**FASEB:** Federation of American Societies for Experimental Biology  
**FDA:** Food and Drug Administration, HHS  
**HANES:** Health and Nutrition Examination Survey  
**HHANES:** Hispanic Health and Nutrition Examination Survey 1982-84  
**HHS:** U.S. Department of Health and Human Services  
**HNIS:** Human Nutrition Information Service, USDA (now part of ARS, USDA)  
**IBNMRR:** Interagency Board for Nutrition Monitoring and Related Research  
**LSRO:** Life Sciences Research Office, FASEB  
**NCHS:** National Center for Health Statistics, CDC, HHS  
**NFCS:** Nationwide Food Consumption Survey  
**NHANES I:** first National Health and Nutrition Examination Survey (1971-74)  
**NHANES II:** second National Health and Nutrition Examination Survey (1976-80)  
**NHANES III:** third National Health and Nutrition Examination Survey (1988-94)  
**NHES:** National Health Examination Survey  
**NLEA:** Nutrition Labeling and Education Act of 1990  
**NNMRRP:** National Nutrition Monitoring and Related Research Program  
**NSFG:** National Survey of Family Growth  
**PedNSS:** Pediatric Nutrition Surveillance System  
**PNSS:** Pregnancy Nutrition Surveillance System  
**RDA:** Recommended Dietary Allowance  
**TRONM:** *Third Report on Nutrition Monitoring in the United States*  
**USDA:** U.S. Department of Agriculture  
**YRBS:** Youth Risk Behavior Survey