VITAL & HEALTH STATISTICS

Dietary Intake and Cardiovascular Risk Factors, Part II. Serum Urate, Serum Cholesterol, and Correlates

This report presents analyses of relationships among serum urate, serum cholesterol, and nutritional variables including dietary intake and selected biochemistries among U.S. adults ages 18–74 and 25–74 years by age, sex, race, body mass, and selected behavioral patterns or attributes. These estimates are based on standardized examination findings from the national probability samples of the civilian noninstitutionalized population examined in the first National Health and Nutrition Examination Survey of 1971–75.

Data From the National Health Survey
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Cooperation of the U.S. Bureau of the Census

Under the legislation establishing the National Health Survey, the Public Health Service is authorized to use, insofar as possible, the services or facilities of other Federal, State, or private agencies. In accordance with specifications established by the National Center for Health Statistics, the U.S. Bureau of the Census participated in the design and selection of the sample and carried out the household interview stage of the data collection and certain parts of the statistical processing.

Foreword and acknowledgments

The National Health and Nutrition Examination Survey (NHANES) is the only source of general U.S. population data that provides a direct link between indicators of health and nutritional status and reported dietary intake information. The Congress provided resources in the Departments of Labor and Health, Education, and Welfare, and Related Agencies Appropriation Bill, 1980 to the National Center for Health Statistics (NCHS) to fund an initiative to undertake more detailed analyses of nutrition-related health problems as measured in the first NHANES. As part of this initiative, the Division of Health Examination Statistics funded a contract (No. 223-79-2090) with the School of Public Health at the University of Michigan to examine relationships among dietary intake and cardiovascular risk factors.

The approach and depth of analysis presented in this report differ from most reports from the Division of Health Examination Statistics. This report is based on a statistical rather than a descriptive presentation of the data. The tables and text present the results of a regression analysis that incorporates the full design effect of the complex survey.

Cognizant that the underlying assumptions of traditional statistical analyses are violated to some extent, the degree of which is unknown, the authors and NCHS staff jointly determined that the assumptions made in the analyses presented in this report are reasonable in light of present knowledge. In addition, the authors have presented throughout the text and technical appendix material concerning appropriate qualifications that the reader should consider in interpreting the results and conclusions presented.

Jean Roberts, the NCHS Project Officer, was instrumental in bringing the project to a successful completion. Her continuing interaction with the authors and their cooperation throughout the project aided the Center in dealing with difficult and highly technical analytic issues not faced previously by NCHS.

Robert S. Murphy
Director
Division of Health Examination Statistics

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Symbols

---	Data not available
...	Category not applicable
-	Quantity zero
0.0	Quantity more than zero but less than 0.05
Z	Quantity more than zero but less than 500 where numbers are rounded to thousands
*	Figure does not meet standards of reliability or precision (more than 30 percent relative standard error)
#	Figure suppressed to comply with confidentiality requirements

Dietary Intake and Cardiovascular Risk Factors, Part II. Serum Urate, Serum Cholesterol, and Correlates

by William R. Harlan, M.D.; Alan L. Hull, Ph.D.; Robert P. Schmouder, M.P.H.; Frances E. Thompson, M.P.H.; Frances A. Larkin, Ph.D.; and J. Richard Landis, Ph.D., School of Public Health, University of Michigan

Introduction

Diet and nutritional status have been related to the development of arteriosclerotic disease, primarily ischemic heart disease, when international comparisons are made.[1,2] However, the relationship between dietary patterns and ischemic heart disease becomes less robust or disappears when comparisons are made within countries.[1–5] The existence of a relationship in the United States is particularly controversial with conflicting dietary advice being offered to the public. However, it is generally accepted that personal attributes relate to the risk of developing heart disease. These personal characteristics or risk factors include serum cholesterol, blood pressure, and cigarette smoking, although other variables including body weight, behavioral pattern, and serum urate have been implicated as well.[1,6] What remains controversial is the influence of diet and nutritional status on these risk factors and on the development of disease. The personal and public health implications are important. Clear evidence for a linkage would provide a scientific rationale for public health action and a stronger basis for therapeutic intervention by health providers.[3,4]

The first National Health and Nutrition Examination Survey assessed the nutritional status and dietary intake of a representative sample of the U.S. civilian noninstitutionalized population, and data from this survey provide an opportunity to explore relationships among measures of nutrition, cardiovascular risk factors, and cardiovascular health. Although the primary intent of the survey was to ascertain the nutritional and health status of the U.S. population and not to relate specific nutritional variables to cardiovascular risk factors and disease, the data are broad in scope and reflect "state-of-the-art" reliability and validity. The data may be used to test specific hypotheses regarding nutritional and cardiovascular relationships, but some limitations should be noted. The survey is cross-sectional and accurately reflects only current measures of nutritional and health status and does not disclose prior eating behavior or preexistent or future disease conditions. Thus, the surveyed population can be characterized only in terms of current associations.

The primary focus of analysis must, therefore, be directed to exploring relationships between nutritional patterns and cardiovascular risk factors rather than attempting to predict future disease outcome or explain past episodes. In this report, attention is directed to associations between nutritional variables and risk factors associated with development of coronary artery disease. The nutritional variables were derived from food frequency questionnaires, 24-hour dietary recall histories, physical examination findings, and serum biochemical measurements on the examinees. Additionally, personal habits and attributes, such as cigarette smoking, use of oral contraceptives, psychological well-being, and socioeconomic status were examined in the analysis. Serum cholesterol and serum urate are the dependent variables in this report. Blood pressure and adiposity are also important risk factors but are addressed as dependent variables in a companion analysis of the survey data.[7]

Highlights

Relative weight or body mass (weight/height^2) was found to be an important independent predictor of serum cholesterol and serum urate levels in U.S. adults. It was also an important predictor of blood pressure levels of U.S. adults as determined in the first National Health and Nutrition Examination Survey of 1971–75. This variable, age, and sex accounted for the majority of explained variance. No dietary variables from either the 24-hour dietary recall or the food frequency questionnaire had important or consistent associations with serum cholesterol or serum urate levels except for reported use of alcohol, which was related directly to serum urate concentration. Other attributes and behavioral patterns (such as smoking, psychological well-being, and oral contraceptive use) were not significantly or independently related to the dependent variables. Several unsuspected but provocative associations were found with serum biochemistries. Serum calcium and magnesium levels and serum glutamic oxalacetic transaminase were directly and independently related to serum cholesterol and serum urate, and these latter variables were interrelated. Cross-sectional dietary data from relatively homogeneous subgroup populations were not related to serum cholesterol and serum urate, although other nutritional biochemical measurements were related.

Methods

Data collection in the first National Health and Nutrition Examination Survey (NHANES I) was begun in April 1971, and the initial survey was completed in June 1974. The sample design, plan of operation, and details of data collection have been published,[8,9] and only features of the study pertinent to the present analysis are described here. Teams of the National Center for Health Statistics traveled to 65 primary sampling units (PSU's). A PSU is typically a county or set of contiguous counties. The teams included professional and paraprofessional medical and dental examiners, along with technicians, interviewers, and other staff. The selected sample persons for whom appointments could be made were brought into specially constructed mobile examination centers that were moved into a central location in each PSU area.

Of the 28,043 sample persons selected to represent 194 million persons ages 1–74 years in the U.S. population, the program examined 20,749 or 74 percent of the sample at the 65 locations visited between April 1971 and June 1974. This is an effective response rate of 75 percent when adjustment is made for the effect of oversampling among preschool children, women of childbearing age, the poor, and the elderly.

A subsample of approximately 20 percent (3,854) of those ages 25–74 years in the initial sample received a more detailed examination. An additional sample of 3,059 persons ages 25–74 years was identified to augment the data collected during the detailed examination in April 1971–June 1974. This augmentation survey (NHANES IA) was conducted in 35 additional PSU's between July 1974 and September 1975. These additional groups are referred to as the "detailed" and "augmentation" components, respectively. Several additional measures were collected on persons included in the augmentation survey.[10]

Data presenting breakdowns by race are based on findings from a sample of 27,730 white and black persons, of whom 20,514 were examined. Estimates in this report are based on weighted observations; that is, the data obtained for the examined persons are inflated to the level of the U.S. population from which the sample was drawn using the appropriate weights to account for both sampling fractions and response results. (See appendix I). Analyses included in this report utilized the largest number of persons on whom data were available. Some data were available only on the general and detailed components (20,749), some were available on the detailed and augmented components (6,913), others only on the augmented component (3,054), and some only on the detailed component (3,859). The text and tables indicate the data sources used for each analysis.

Dietary intake

Dietary intake was a primary data source for the relationships described in this report. The information for dietary intake was determined through 24-hour dietary recall and 3-month food frequency recall. A dietary interview was conducted with each sample person to obtain information about his or her total food and drink consumption during the 24 hours—midnight to midnight—preceding the interview. This was followed by questions about the frequency of food intake for the preceding 3 months.[11,12] The parent or other adult responsible for a child's feeding provided information about preschool children. Usually both the parent and child were interviewed for subjects ages 6–12 years.

The dietary interview lasted approximately 20 minutes (with a maximum allowance of 30 minutes) and usually was administered in the mobile examination center. A small percent of the interviews took place in the subjects' homes.

Food portion models were used to assist the respondent in estimating amounts of foods consumed for the 24-hour recall. Models developed for another survey were used with slight modifications.[13] A computer program was used to determine nutrient values of foods consumed. The computer program to process food recall data for nutrient contents was adapted from one developed and used in the Ten-State Nutrition Survey and was based on a program developed originally at Tulane University.[14] The program uses the nutritive values of food items appearing in the U.S. Department of Agriculture Handbook No. 8 (1963), Table 1,[15] as well as information from other sources. Because of the constantly changing food supply, nutrient composition values for new food products were added or updated continually according to information provided by the U.S. Department of Agriculture, food processors, and manufacturers.

Dietary intake measurements considered in this report include the following:

1. Frequency of consumption of the following food groups: butter and margarine, dried beans and peas, breads and cereals, dairy foods (whole milk, eggs, and cheese and cheese dishes), meat and poultry, total fruits and vegetables, desserts and sweets, candy, sweetened beverages, coffee and tea, and snack foods.
2. Frequency of consumption of the following special food groups: complex carbohydrate and fiber-containing foods, high fat foods, meats, sweets, snack foods, coffee and tea, alcohol, proportion of calories as total fat, ratio of saturated to unsaturated fats, cholesterol intake, cholesterol plus saturated/unsaturated fats (linoleic acid only), and fat intake (calculation of dietary cholesterol scores using Keys et al.[16] and Hegsted[17]).
3. Proportion of calories as carbohydrate or protein.
4. Relative dietary purine intake.

Medical and laboratory examination

Complete descriptions of the clinical examination, body measurements, and laboratory assessments are available,[8,10,18,19] and only aspects pertinent to the present analysis are described here. A medical history questionnaire was completed by participants ages 12–74 years. This instrument requested information on health habits and general medical status, as well as specific answers regarding known disease conditions and medical treatments. The medical history questionnaire was reviewed by the examining physician before the scheduled examination.

All examinees received a physical examination with emphasis on nutritional aspects. Blood pressure was recorded in the sitting position near the beginning of the examination for persons ages 6–74 years. The recommendations of the American Heart Association were followed, and a complete discussion of the measurement techniques and sources of variability and diagnostic error is available.[7] After the examination, the physician used standard diagnostic codes[20] to classify the presence of disease as observed. Body measurements including height, weight, and skinfold thickness were made by specially trained technicians using equipment designed for the study and checked weekly and before each examination stand commenced.[18,21,22]

The detailed sample examinees and those in the augmentation survey also completed supplemental questionnaires related to arthritis, respiratory disease, and cardiovascular disease. These examinees also received a more detailed examination related to these conditions. A detailed history on tobacco use, including duration and amount of cigarette smoking, was obtained for this group. These examinees also completed the General Well-being Questionnaire.[23]

Laboratory assessments of adults in the general examination included hematologic examinations and nutritional biochemistries on serum and urine specimens. On the detailed and augmentation samples the following clinical biochemistries were performed on blood samples from nonfasting examinees: total bilirubin, serum glutamic oxalacetic transaminase (SGOT), alkaline phosphatase, calcium, phosphorus, and uric acid. Details regarding examinee preparation, sample collection and standardization, and analytic procedures are described in detail elsewhere.[19] Serum cholesterol determinations on blood samples from nonfasting examinees in the general, detailed, and augmentation national surveys were made by the Lipid Standardization Laboratory, Centers for Disease Control, Public Health Service, Atlanta, Georgia. The method of Abell et al.[24] was modified for a semiautomated production line.[25] SGOT, sodium, and potassium were analyzed individually, and calcium, phosphate, uric acid, and creatinine were analyzed on a Techicon Sequential Multiple Analyzer (SMA) 12/60.[19]

Analysis

Statistical considerations and procedures for statistical analysis are detailed in appendix I. Definitions of selected terms, including those related to the statistical methods, are given in appendix II. The weighted sample and sample design factors were considered in all statistical analyses presented in this report. The general analytical approach was to screen initially for significant relationships among nonnutritional variables as a means of identifying interrelationships that could confound the further analyses. Relationships were then sought between nutritional and nonnutritional variables, and, where necessary, potentially confounding variables were controlled. For analysis, the population was divided into age, race, and sex groups. The category of "other" racial groups was not considered in further analyses because of the small numbers and the heterogeneity of the group. The following age ranges were used: 18–24, 25–34, 35–44, 45–54, 55–64, and 65–74 years. Each age, race, and sex group was examined separately.

In general, the independent variable was divided into strata bounded by appropriate percentile cut-off points, and means and standard errors were determined for the dependent variable within those strata. Because body mass (weight/height^2) was consistently related to many of the dependent variables, quintile strata of this variable were used to control for this confounding influence. When significant and apparently important interrelationships between nutritional and nonnutritional variables were discovered, potentially confounding relationships were examined by controlling for the confounding variable and by use of multivariate analysis. Apparent relationships were assessed in three ways before inferring biologic importance to the relationship. Tests of statistical significance were used to contrast values for the dependent variables within strata. A probability of 5 percent or less that the finding was the result of chance was taken as statistically significant. The relationships were examined for consistency within age, sex, and race groups. Finally, the quantitative differences were used to arrive at inferences regarding the biologic importance of relationships.

Each independent variable found to have a significant and consistent relationship to the dependent variable on univariate analysis was entered into a multiple regression analysis against the dependent variable.

Findings

Serum cholesterol

Body mass index and skinfold thickness

Serum cholesterol levels for adults have been described by age, sex, and race in an earlier report.[26] Serum cholesterol concentration was related to body mass index (Quetelet's index or weight/height^2). In the present report, national estimates for the population were separated into quintile strata of body mass index (BMI), and the serum cholesterol levels were compared for those in each quintile strata (tables 1 and 2 and figures 1 and 2). For the total group of males and for white and black subgroups, successively greater quintile strata of BMI were associated with higher serum cholesterol levels. The progression of serum cholesterol levels with higher BMI was less consistent for black males, reflecting in part greater variances and smaller sample sizes. The mean differences in serum cholesterol between the highest and lowest quintile strata of BMI were 31 milligrams/deciliter (mg/dl) for all males, 30 mg/dl for white males, and 39 mg/dl for black males. Serum cholesterol is higher with age in men through 64 years and then lower at ages 65–74 years.[26] The influence of age on cholesterol was also apparent within each quintile strata of BMI (table 1). Within each age range, the relationship of serum cholesterol to BMI was not progressive, although statistically significant cholesterol differences were found between the lowest and highest quintile strata of BMI, and these differences were relatively consistent, ranging from 19 to 31 mg/dl.

Similar relationships were found for women (table 2 and figure 1). Mean serum cholesterol was higher for successively greater quintile strata of body mass index for the total group and for white and black females. The differences in mean serum cholesterol between the lowest and highest quintile strata were 36 mg/dl, 36 mg/dl, and 34 mg/dl for all females, white females, and black females, respectively. Within each quintile strata of body mass index the mean serum cholesterol tended to be lower in black women than white. When cross-classified by age and BMI quintile strata, the independent effect of age and BMI on cholesterol concentration was apparent (figure 2). Within each quintile strata, serum cholesterol increased with age, although the differences were less consistent in the 55–64- and 65–74-year age groups. The magnitude of BMI effect on cholesterol was slightly less for females than males when age was controlled, although the age effect within quintile strata of BMI was similar for both sexes. Therefore, for both men and women, body mass index has an influence on serum cholesterol concentration that is independent of age, sex, and race.

Skinfold thickness is an indirect measure of subcutaneous fat tissue that correlates well with body adiposity and, to a lesser degree, with body mass index.[27,28] For analysis, the skinfold thicknesses from two sites, the triceps and subscapular areas, were combined. This combination of measurements affords assessment of limb (triceps) and truncal (subscapular) adiposity and provides a more representative sample of subcutaneous fat. The relationships between skinfold thickness and serum cholesterol levels were similar to those for BMI and serum cholesterol (tables 3 and 4). At progressively greater quintile strata of skinfold thickness, serum cholesterol concentration was higher. This effect was observed for males and females, white and black persons, and generally for each adult age range (figure 3). The magnitude of serum cholesterol differences between the highest and lowest quintile strata was similar when skinfold thickness was the independent variable to that found when BMI was the independent variable. The association between skinfold thickness and serum cholesterol was independent of sex, race, and age.

Because body mass has a pervasive influence on serum cholesterol concentration, weight/height^2 was used in subsequent analyses to control for this possible effect. This parameter was selected because the effect is equivalent to that of skinfolds, and it is a readily available clinical assessment.

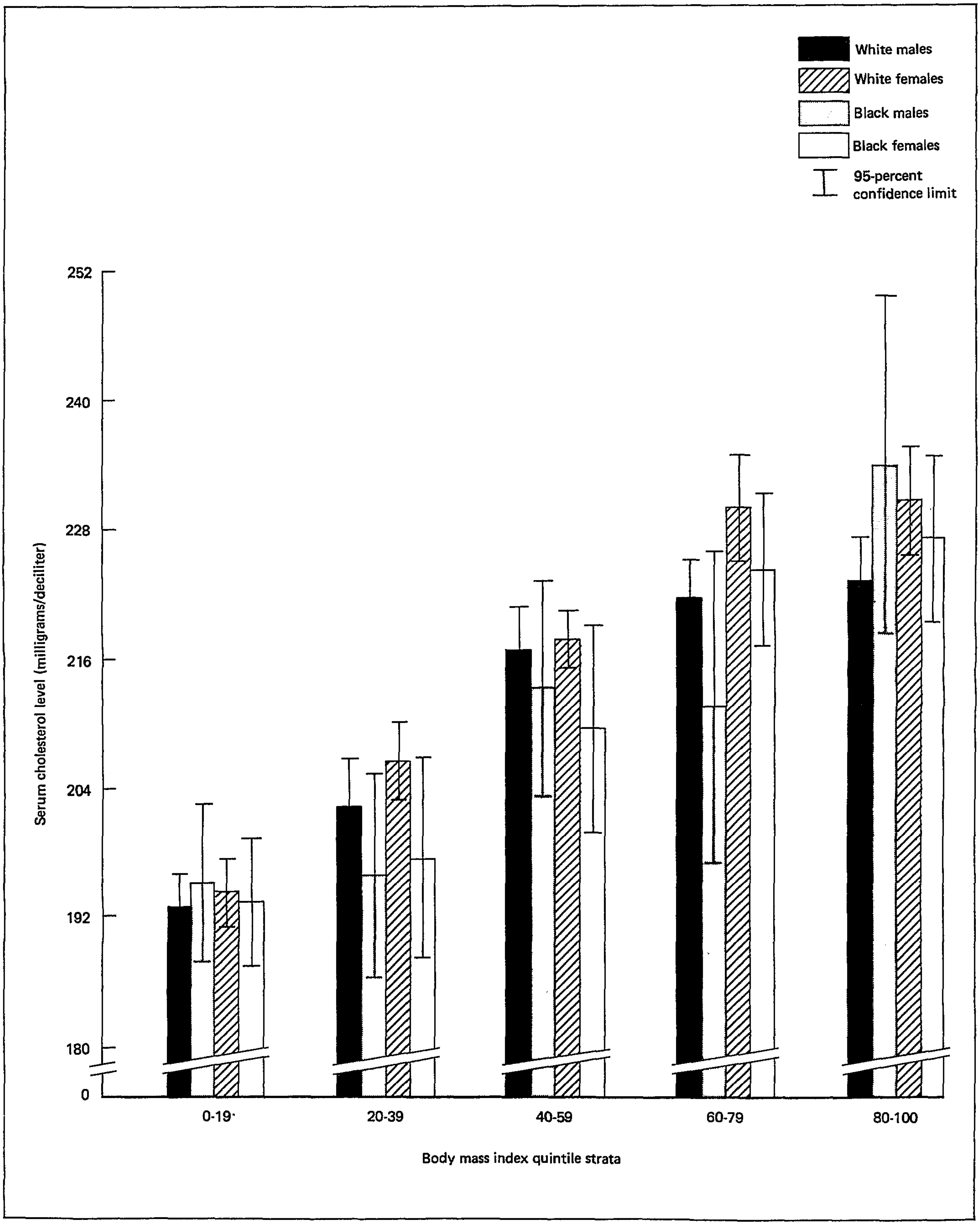

Figure 1. Mean serum cholesterol levels in quintile strata of body mass index for adults 18-74 years of age by race and sex: United States, 1971-74

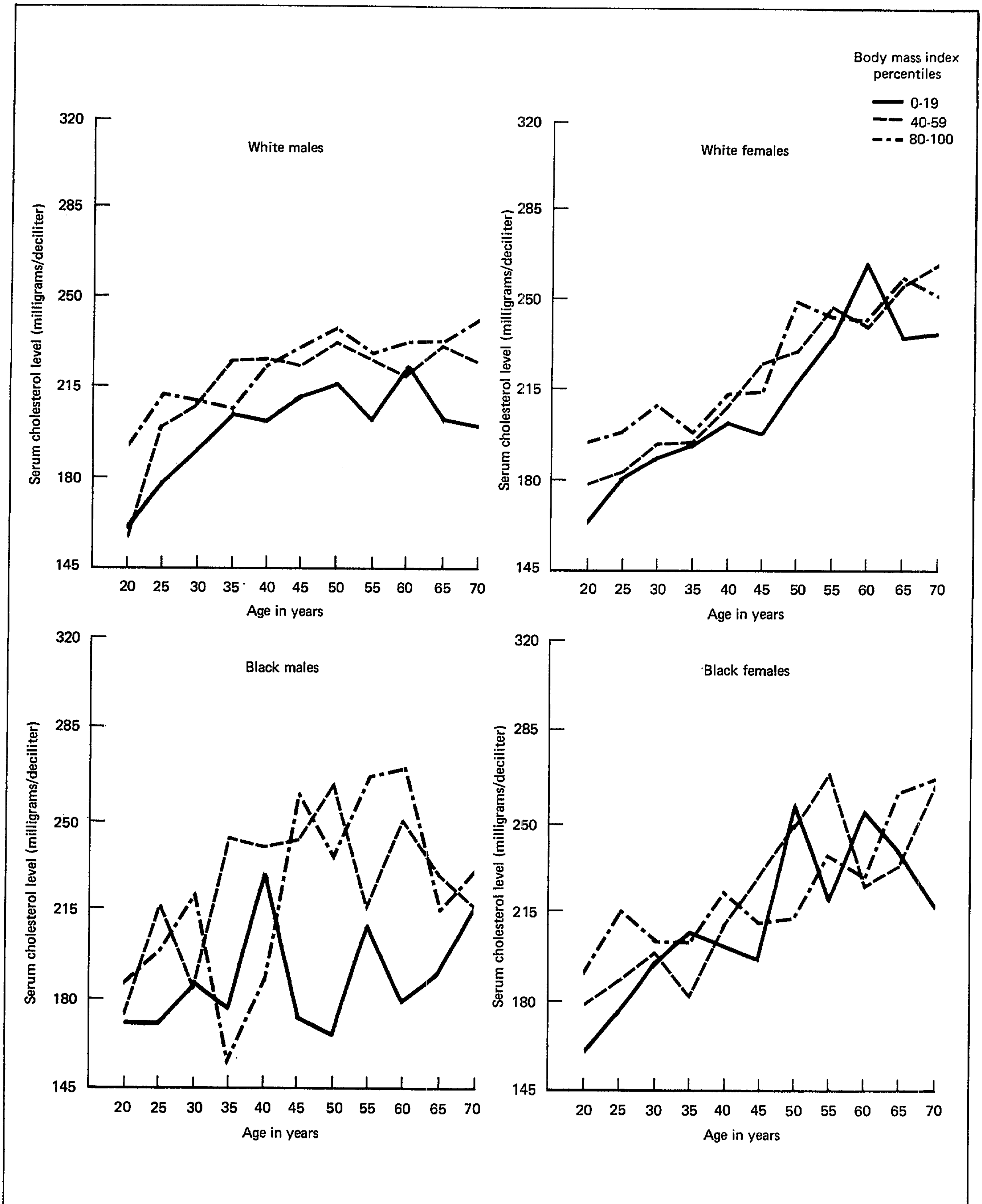

Figure 2. Mean serum cholesterol levels in selected strata of body mass index for white and black males and females by age: United States, 1971-74

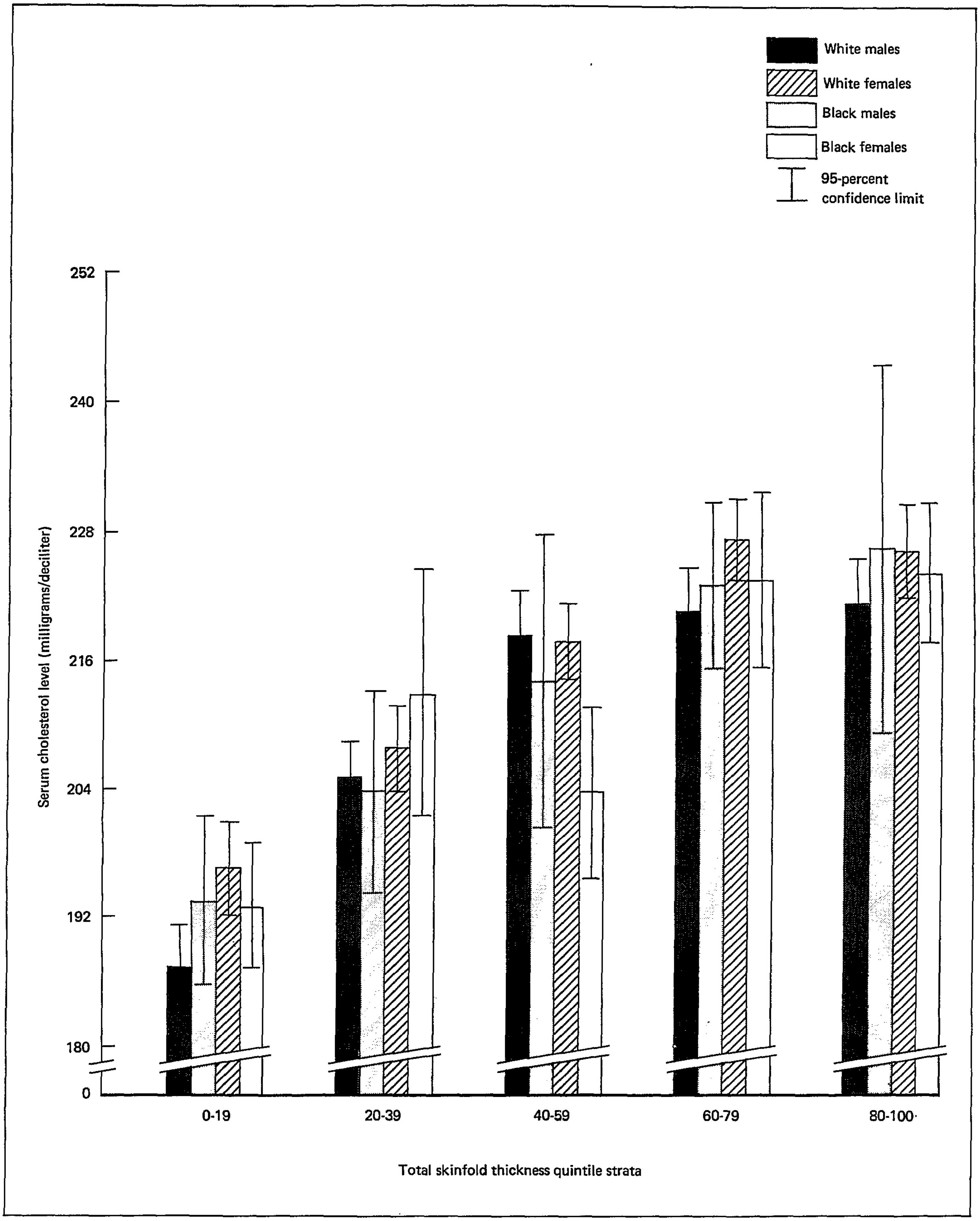

Figure 3. Mean serum cholesterol levels in quintile strata of total skinfolds for adults 18-74 years of age by race and sex: United States, 1971-74

Blood pressure

Serum cholesterol levels were determined for four strata of systolic and diastolic blood pressure for males and females (tables 5–8). Cutoff points for the strata were the 15th, 50th, and 85th percentiles. Because therapy for hypertension may raise plasma lipids, examinees reporting treatment for blood pressure were excluded from analysis.[29] For systolic pressure (tables 5 and 6), there were statistically significant differences between mean serum cholesterol concentrations in the lower (0–15) percentile stratum and upper (85–100) percentile stratum of systolic pressure. The higher the pressure, the greater the serum cholesterol. This relationship was observed for both sexes and both races, and the mean difference between the lowest and highest percentile strata was 25 mg/dl for males and 46 mg/dl for females. When age was controlled, the relationship persisted but the differences were less and tended to be greater in younger adults and decreasing (and even reversing in females 65–74 years) in those over 35 years of age. The relationship persisted when body mass index was controlled. Mean differences between low and high strata ranged from 11 to 63 mg/dl and were greatest in the lowest quartile stratum of BMI. When sex and age were controlled, similar trends were noted, but the differences were smaller or inconsistent. However, the numbers of examinees within the groups were small and the variability relatively large.

For diastolic blood pressure, the relationships were generally similar to those for systolic pressure (tables 7 and 8). Higher diastolic pressure was associated with higher mean serum cholesterol, and this relationship persisted when race, sex, and body mass index were controlled singly. However, in those ages 45 years and over, a positive relationship was no longer present. The magnitudes of mean serum cholesterol differences when stratified by diastolic pressure were similar to those when systolic pressure was used for stratification. However, controlling for age and sex together led to a dissipation of the relationship between diastolic pressure and serum cholesterol.

Dietary intake

Reported dietary intake was separated into categories, and the relationships between the dietary intake categories and serum cholesterol concentration were determined. Particular attention was directed to dietary intake of total fat, saturated/unsaturated fats, and cholesterol because of the reported association between these nutrients and serum cholesterol levels.[1,5] Frequency of food consumption and a detailed 24-hour food intake were analyzed separately. In general, there were no consistent or strong relationships.

The frequency of fatty food consumption was determined from the food frequency questionnaire, which describes the number of times a particular food was consumed (table 9). For the total group and for both races and sexes, there was an inverse relationship between reported frequency of fatty food consumption and serum cholesterol. This trend persisted when body mass index was controlled. However, controlling for age or age and sex dissipated any consistent trends. This is not surprising because of conflicting trends for dietary intake and serum cholesterol in progressively older groups. Serum cholesterol is higher in older groups, while dietary fat intake is lower.[11,26] Therefore, an inverse relationship would be expected when all ages are considered, but when age is controlled, the relationship might change. No consistent or important relationships were found between serum cholesterol concentration and the following reported food frequencies: complex carbohydrate (including fiber), fatty food/complex carbohydrate ratio, coffee and tea consumption, alcohol intake, and refined sugar intake.

Data from the 24-hour dietary recall were used to explore relationships between specific proportions of nutrient intake and serum cholesterol levels. The 24-hour dietary recall provides a quantitative assessment, but this is representative of only one brief period. However, one would expect a direct relationship between food frequency reports and 24-hour recall at the extremes of ingestion of particular foods if the 24-hour recall is representative. The energy consumed by male and female respondents for one 24-hour period was divided at the 15th, 50th, and 85th percentiles (tables 10 and 11). For males, there was an inverse association between total dietary calories and serum cholesterol values when the total group and white males were considered. The same direction of association was present for black males and for quartile strata of BMI, but not all associations were statistically significant.

When age groups were contrasted, no clear patterns were present, and the mean cholesterol differences between high and low energy strata were not significant except for the youngest age group (18–24 years). Females (table 11) had a fairly consistent pattern between total caloric intake and mean serum cholesterol values. As noted for males, the pattern was inverse and persisted when sex, race, and age were controlled, although the level of association and the magnitude of cholesterol differences between the highest and lowest energy groups varied considerably.

Total dietary fat intake, as obtained from the 24-hour dietary recall, tended to be inversely related to cholesterol concentration except when age was controlled (table 12). The pattern resembled that of total calories, which would be expected. The findings were similar for females (table 13), except that a weak but persistently inverse relationship was found when age was controlled.

The proportion of total calories contributed by fat was determined from the 24-hour recall data, which provided total caloric and total fat intake (table 14). There were no statistically significant or consistent differences in serum cholesterol levels when proportion of fat calories was stratified.

Total polyunsaturated fatty acids were not available in the food composition tables, but linoleic acid, which constitutes approximately 90 percent of the total polyunsaturates in the U.S. diet, was available from the 24-hour recall. A ratio of linoleic to total saturated fatty acids was developed and used as a surrogate measure of polyunsaturated/saturated fatty acids (table 15). When stratified by this measure, only small, inconsistent, and statistically insignificant differences were found for serum cholesterol values.

Dietary cholesterol represents a fraction of the total fat consumed, but intake does not necessarily parallel total fat intake. Cholesterol intake differed for males and females. No clear pattern of association was found for either males or females, and there were no statistically significant differences between serum cholesterol values at different levels of dietary cholesterol (tables 16 and 17).

Dietary sodium and potassium were calculated from the 24-hour recall. The ratio of dietary sodium to potassium was found to be related to blood pressure[7] and was, therefore, applied to serum cholesterol. An inverse pattern of association was found for serum cholesterol (table 18). When mean serum cholesterol values were compared in the low and high sodium/potassium strata, a statistically significant ($p < 0.001$) difference was found for the total group and for females and white respondents. The trend was in the same direction but less strong for males and black respondents. When age was controlled, the association was no longer statistically significant but remained inverse.

Other nutrients from the 24-hour dietary recall were analyzed, but no statistically significant, consistent associations were found.

Behavioral and demographic variables

The recent use of oral contraceptive agents was associated with significantly higher serum cholesterol levels for some females (table 19). White females reporting current use of oral contraceptive agents had significantly higher serum cholesterol concentrations than those reporting no use within the past 6 months. The differences were most prominent for white females ages 18–24 years (amounting to 20 mg/dl) and were small for those ages 25–34 and 35–44 years (5 mg/dl). Information on the use of oral contraceptive agents was limited to women ages 18–44 years.

For black females, higher serum cholesterol values were observed to be higher among users only for the 18–24-year age group, and the pattern was reversed in those ages 25–44 years, but the numbers of oral contraceptive users were relatively small in these older groups. When body mass index was controlled, the positive association between oral contraceptive use and serum cholesterol was strengthened for the younger group (ages 18–24 years) and tended to shift the observed association from negative to positive for females ages 25–44 years.

Socioeconomic status was scored using educational attainment and income levels.[30] This scale uses measures of income and educational attainment rather than occupation and was created so that the five categories fit a Gaussian distribution with approximately 15 percent of the sample in the two extreme categories. The lowest category had income of $4,000 or less and education of grade school or less, while the highest contained people with college education and income of $10,000 or more. Serum cholesterol levels were significantly higher in the lowest socioeconomic class for the total group, for females, and for white persons (table 20), and the mean differences between the lowest and highest strata ranged from 15 mg/dl for the total group to 27 mg/dl for females and 17 mg/dl for white respondents. This inverse pattern persisted when body mass index was controlled. When age and sex were controlled, a significant inverse trend was found for females only, while males tended to have a direct relationship. However, the number of respondents categorized in the low category by age was small and the variability of serum cholesterol values was great.

When serum cholesterol was contrasted across the four regions of the contiguous United States, small but statistically significant differences were found among the regions (table 21). For males, cholesterol levels were higher in the Northeast; and for females, serum cholesterol levels were observed to be higher in the Northeast and lowest in the West. Levels were highest for white respondents living in the Northeast and were observed to be highest for black respondents living in the Midwest. The differences by region were small and rarely exceeded 5 mg/dl. Controlling for age and BMI did not lead to a consistent pattern for males or females.

Respondents in the detailed and augmentation surveys completed a survey of General Well-Being (GWB).[23] The higher the score, the greater the self-rated physical and psychological status. For the total group of males and for all white males the higher GWB scores were observed to be associated with higher serum cholesterol levels (table 22). The reverse pattern was found for black males, but the numbers were small. None of these differences was statistically significant. No consistent trends were found when age or body mass index were controlled, and no consistent trends were found for females (table 23).

Cigarette smoking was analyzed, but no relationship to serum cholesterol concentration was found.

Clinical hematology and biochemistries

Hemoglobin concentration was related to serum cholesterol (tables 24 and 25). Significant mean differences in serum cholesterol levels were found between the lowest and highest strata for males and for white males, but the differences for black males were not significant. Within all age ranges except 55–64 years, a similar pattern was found (table 24). However, when body mass index was controlled the differences diminished. Similar relationships were found for females but the consistency and magnitude of differences were greater (and in general significant). The mean differences between the lowest and highest hemoglobin groups averaged 20 mg/dl for all females and 10 mg/dl for all males.

Serum glutamic oxalacetic transaminase (SGOT) is often used as a test for subtle impairment of liver function, although the main application is determination of major acute injury to tissues such as liver and cardiac muscle. For the total group and for both sexes and both races, higher strata of SGOT were associated with significantly higher mean serum cholesterol levels (table 26). The differences in cholesterol between the highest and lowest strata of SGOT in these groups ranged from 6 to 24 units/milliliter. The relationship was more prominent for females. When age was controlled, a clear positive relationship was apparent only for ages 25–54 years. Controlling for body mass index did not change the positive relationship for females, but it was less consistent for males after body mass index was taken into account.

Serum calcium level distribution in the population was divided into strata at the 15th, 50th, and 85th percentiles (table 27 and figure 4). A consistent and large difference in mean serum cholesterol was found

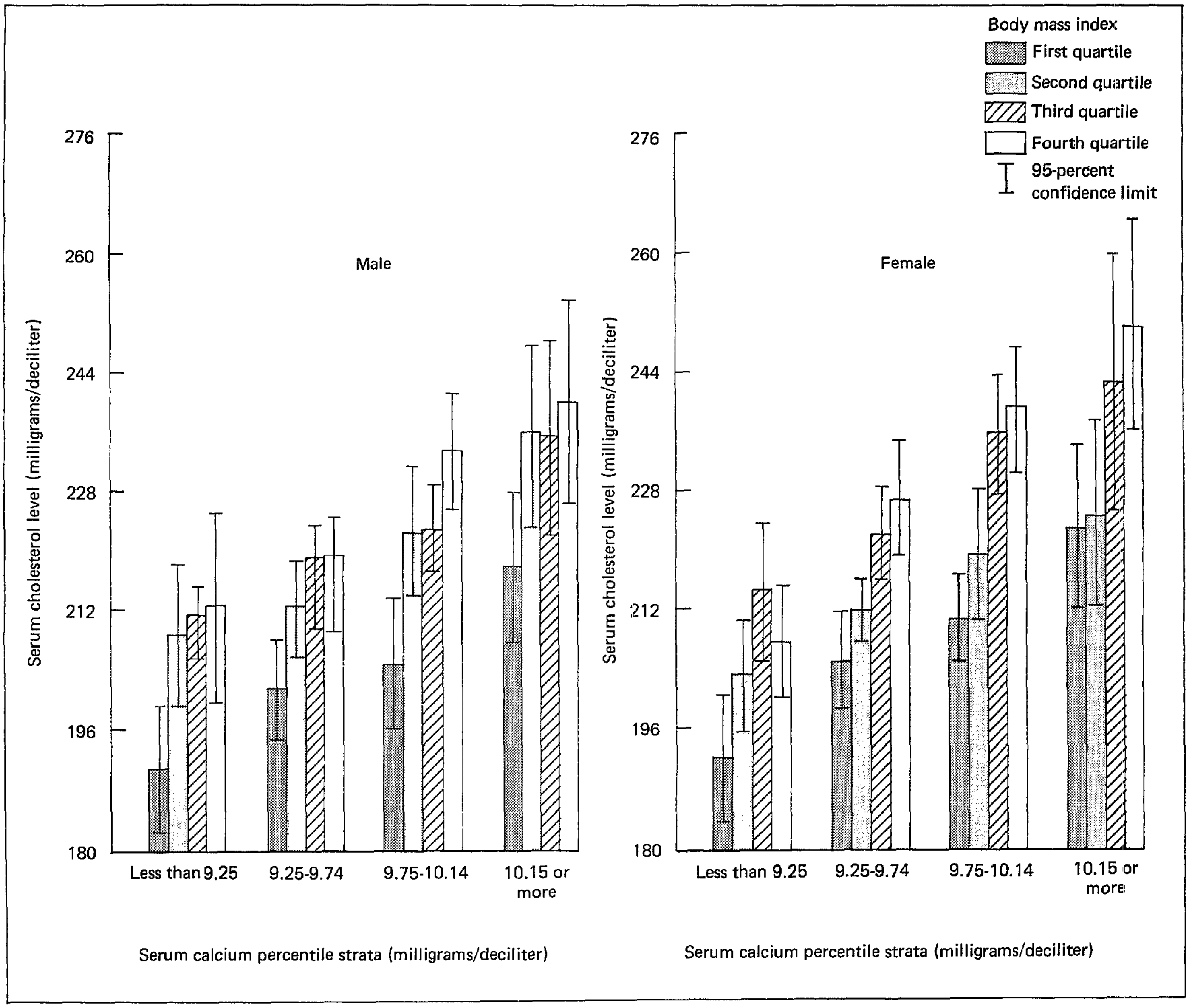

Figure 4. Mean serum cholesterol levels in percentile strata of serum calcium levels within BMI quartile strata for males and females 25-74 years of age: United States, 1971-75

when the population was stratified by serum calcium levels. This relationship was positive with higher serum cholesterol being associated with higher serum calcium and was generally progressive through all strata of serum calcium concentration. The relationship was not altered when sex, race, age, body mass index, or age and sex were controlled. The magnitude of mean differences in serum cholesterol between the lowest and highest strata of serum calcium was considerable, averaging 29 mg/dl for the group and ranging from –2 (females ages 65–74 years) to 47 mg/dl (males ages 55–64 years). Serum inorganic phosphate and the serum calcium/phosphate ratio were analyzed, but no consistent relationships were found.

Serum magnesium levels were stratified using cutoff points of 1.555, 1.685, and 1.825 mg/dl which are at the 15th, 50th, and 85th percentiles (table 28). There was a consistent, statistically significant positive relationship between mean serum cholesterol concentrations in the lowest and highest strata of serum magnesium. For the entire group the mean difference between lowest and highest strata amounted to 19 mg/dl of serum cholesterol. This positive association was found for both sexes, both races, and after controlling for age, body mass index, and age and sex (figure 5). The relationship was generally progressive through the strata and ranged from 5 to 8 mg/dl after controlling for these factors.

Serum urate levels were stratified separately for males and females because of the considerably different levels for each sex. The cutoff points for adult males

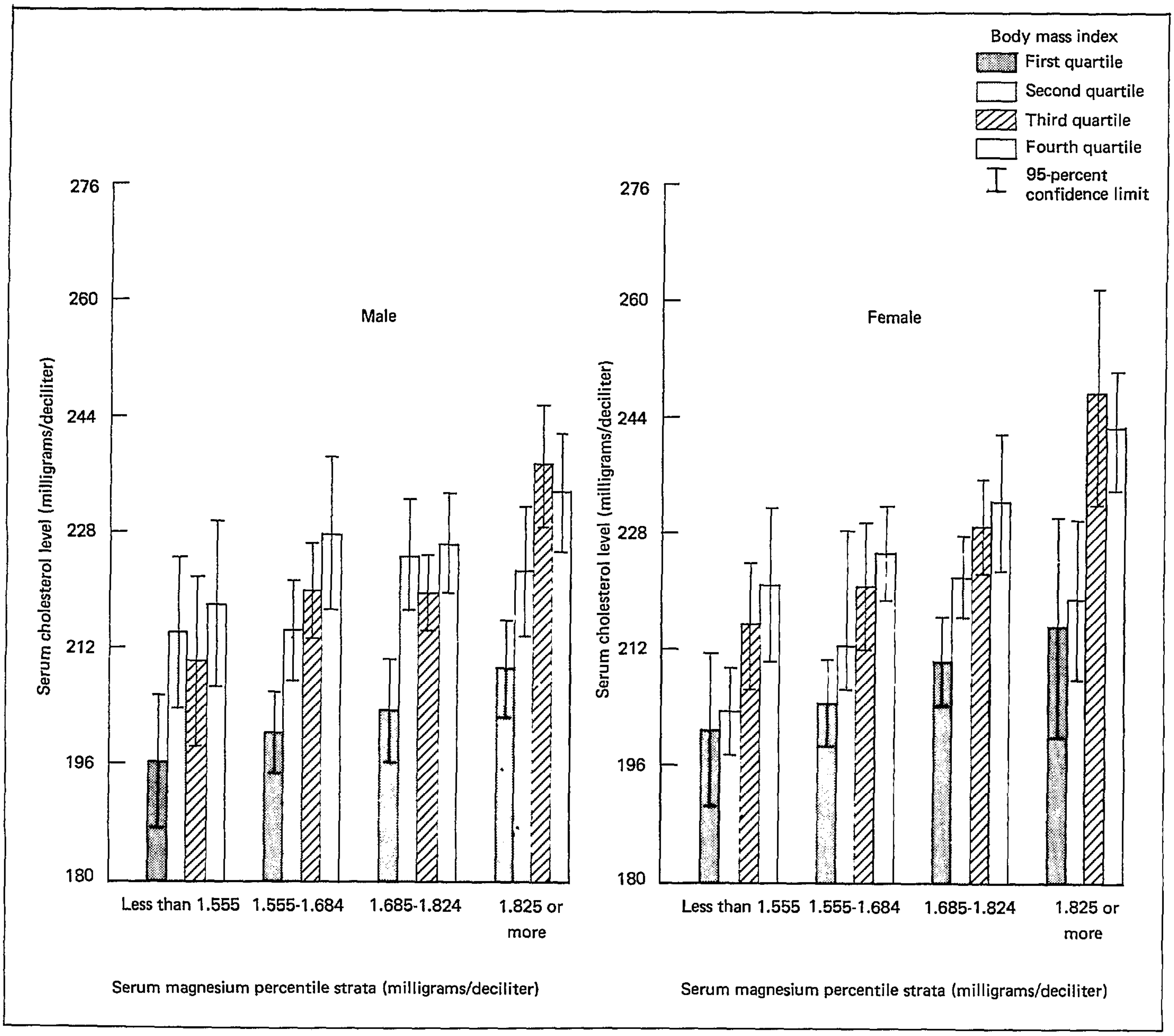

Figure 5. Mean serum cholesterol levels in percentile strata of serum magnesium levels within BMI quartile strata for males and females 25-74 years of age: United States, 1971-75

were 4.95, 6.15, and 7.55 mg/dl; for females, 3.65, 4.65, and 5.95 mg/dl. These are at the 15th, 50th, and 85th percentiles.

There was a positive association between serum urate and serum cholesterol (tables 29 and 30). The differences in mean serum cholesterol were 16 and 22 mg/dl (males and females, respectively) between the highest and lowest strata of serum uric acid. This relationship persisted after controlling for race, age, and body mass index. However, for two subgroups, males in the highest quartile strata of body mass index and females ages 55–64 years, the mean differences were small or reversed, but for other groups the differences ranged from 4 to 45 mg/dl .

Multivariate analyses

Variables that were found to have consistent and important relationships to serum cholesterol were used as independent variables for regression on the dependent variable, serum cholesterol (table A). Males and females were analyzed separately, but race was entered as a dichotomous variable (1 = white, 2 = black). Because serum urate and calcium were available only on examinees in the detailed and augmentation surveys, the regression analysis was confined to this group, ages 25–74 years, and comprising 3,134 males and 3,707 females. Relatively little variance of serum cholesterol was explained; for males the R^2 was 0.12, and for females, 0.20. The standard beta weights provide an indication of the relative influence of the independent variables. For males and females, age, body mass index, and serum calcium clearly had the most important effects. Lesser effects were found for serum urate and serum magnesium. There were some body mass index and socioeconomic status being less differential influences between males and females with important in females, although serum urate was slightly more influential in females.

Despite the lack of clear relationships between dietary fat variables and serum cholesterol, when the dietary variables were assessed individually, these variables were used in predictive models of serum cholesterol that were developed by Keys et al.[16] and Hegsted.[17]

The formulas for the diet scores were as follows:

Keys $1.35\,(2S - P) + 1.52\,(C/1{,}000E)^{1/2}$

Hegsted $2.16\,S - 1.65P + 0.0677C$

where S = proportion of dietary calories from saturated fat

P = proportion of dietary calories from polyunsaturated fat

C = cholesterol intake per day (milligrams)

E = energy intake per day (calories)

For polyunsaturated fatty acids, only linoleic acid intake was available in the nutrient data of NHANES I. However, this fatty acid accounted for over 90 percent of all polyunsaturated fatty acids in the U.S. diet at the time of the survey. The value for linoleic acid was used in the analysis without correction. A score for each examinee was calculated using the two formulas and a correlation determined between these scores and the serum cholesterol values measured during the survey. For each model, only a small, statistically insignificant correlation of less than 0.05 was found between lipid intake scores and serum cholesterol. To compare the relative contribution of dietary lipid and physiologic variables to serum cholesterol concentration, the dietary score, body mass index, and age were regressed against the dependent variable, serum cholesterol (table B). When the beta weights for the independent variables were compared, it was apparent that the dietary score made small and

Table A. Standardized beta coefficients and standard errors for regression of serum cholesterol on selected variables, by sex for adults ages 25–74 years: United States, 1971–75

Variable	Male (N = 3,134) Multiple R = 0.34		Female (N = 3,707) Multiple R = 0.45	
	Beta	Standard error of beta	Beta	Standard error of beta
Body mass index	0.12	0.03	0.05	0.03
Age	0.28	0.03	0.37	0.03
Race	0.04	0.02	–0.01	0.02
Socioeconomic status	0.05	0.03	–0.01	0.02
Systolic blood pressure	–0.04	0.03	–0.01	0.03
General well-being	0.03	0.02	0.00	0.02
Serum urate	0.03	0.03	0.06	0.02
Serum calcium	0.24	0.02	0.14	0.02
Serum glutamic oxalacetic transaminase	–0.05	0.02	0.05	0.02
Serum magnesium	0.08	0.02	0.05	0.02

NOTE: For race, 1 = white, 2 = black, other racial groups excluded.
N = number of examinees.
R = multiple correlation coefficient.

Table B. Bivariate correlation coefficients, standardized beta coefficients, and standard errors for regression of serum cholesterol on computed diet scores, age, and body mass index, by sex for adults ages 25–74 years: United States, 1971–74

Variable	Male (N = 1,753) Mean	Standard error of mean	Correlation coefficient (r)	Standard error	Female (N = 3,424) Mean	Standard error of mean	Correlation coefficient (r)	Standard error
Keys et al. diet score	50.0	0.58	0.02	0.03	48.7	0.47	0.02	0.03
Hegsted diet score	57.8	0.82	-0.03	0.03	44.1	0.66	0.00	0.02
Age	39.4	0.27	0.26	0.03	39.2	0.21	0.37	0.02
Body mass index	25.9	0.11	0.14	0.03	24.9	0.12	0.16	0.02
	Multiple R = 0.29				Multiple R = 0.39			
Regression of serum cholesterol on computed diet scores, age, and body mass index	*Beta*		*Standard error of beta*		*Beta*		*Standard error of beta*	
Keys et al. diet score	0.01		0.02		0.02		0.02	
Age	0.25		0.02		0.36		0.02	
Body mass index	0.13		0.02		0.11		0.02	
Hegsted diet score	-0.02		0.02		0.00		0.02	
Age	0.25		0.02		0.36		0.02	
Body mass index	0.13		0.02		0.11		0.02	
Bivariate correlation between Keys, et al. and Hegsted diet scores	*Correlation coefficient (r)*		*Standard error of r*		*Correlation coefficient (r)*		*Standard error of r*	
	0.83		0.01		0.88		0.01	

NOTE: N = number of examinees.
R = multiple correlation coefficient.
r = simple correlation coefficient.

not statistically significant contributions to explanation of variance. Compared with the major predictors of serum cholesterol levels, age and body mass index, the contribution of dietary lipid was not important.

These findings can be contrasted with those reported by Shekelle and others[5] in a recent longitudinal study of men employed at the Western Electric Company, who were ages 40–55 years on entry into the study. The computed dietary scores were consistently higher in the study of Shekelle et al.[5] Some of the difference may be attributable to the different nutrient data sources used to compute polyunsaturated fat content. In the Western Electric study, archadomic acid was estimated but not in NHANES I. The correlation between the initial dietary score and serum cholesterol was significant and slightly but not significantly higher in the Western Electric study than the national estimates from NHANES I shown in table B. When dietary scores and other relevant variables were regressed against serum cholesterol concentration, the beta weights for body mass index and age were higher in NHANES I than in the Western Electric study, and the beta weights for dietary score were lower. The differences may be attributed to a number of differences in the study, including selected population, age range, variability of dietary reporting, failure to include all polyunsaturated fatty acids in NHANES I, and possibly lack of comparability in the nutrient data bank used for the two studies.

Serum urate

Age, sex, race, body mass index, and geographic region

Serum urate concentration was measured in examinees of the detailed and augmentation surveys. The levels of serum urate by sex and race are presented in table 31 together with selected percentiles in the distribution of these levels. Levels of serum uric acid were higher in males than in females at all ages (table 31 and figure 6). Mean serum urate concentration was not higher in older age groups in males, but there was an age-related difference in urate levels among females. For both males and females, uric acid concentration was slightly but significantly higher in black persons. This racial difference in mean urate concentration reflected higher levels in the upper distribution of urate for all ages.

Uric acid concentration was related to body mass index (BMI) in adult males (table 32 and figure 7). For the total male group, the serum urate difference was 1.2 mg/dl between the lowest and highest quintile strata of BMI. Differences of similar magnitude were found for white and black males. There was a graduated increase in serum urate for progressively greater quintile strata of BMI for males. A similar relationship was observed for adult females with a mean difference of 1.3 mg/dl in mean serum urate between the lowest and highest quintile strata of BMI

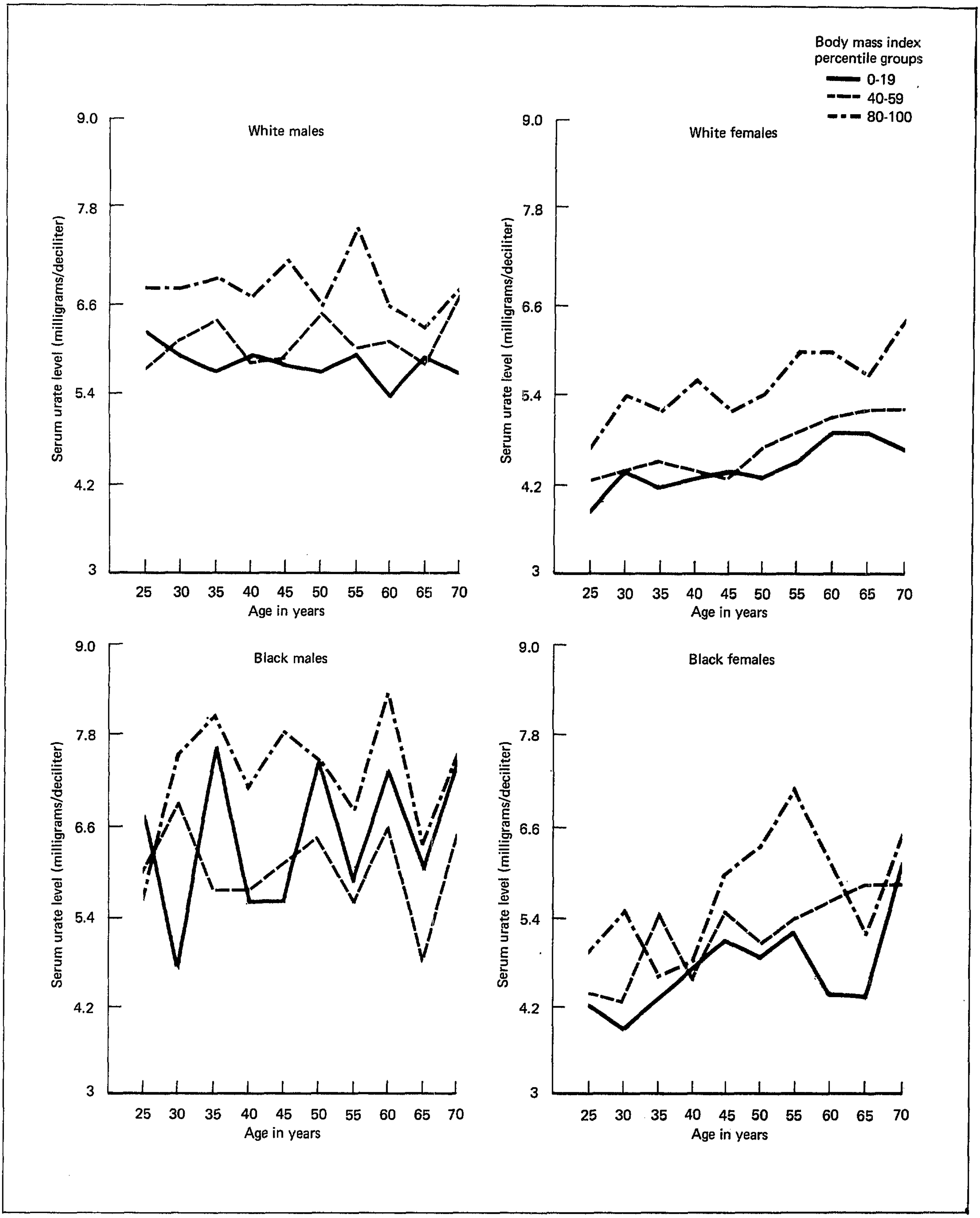

Figure 6. Mean serum urate levels in selected strata of body mass index for white and black males and females by age: United States, 1971-75

(table 33 and figure 7). This observed relationship was not altered by race and age.

Triceps and subscapular skinfold thicknesses were summed to provide a representative estimate of subcutaneous adiposity. When these combined skinfold measurements were divided into quintile strata, a graded positive relationship was found for skinfold thickness and serum urate (tables 34 and 35 and figure 8). Controlling for race and age did not impair this relationship. The differences in mean serum urate between the lowest and highest skinfold thickness strata were less than the differences observed with body mass index, but the differences were statistically significant. Because of the more pervasive influence of BMI in serum urate concentration, this confounding variable was controlled in subsequent analyses.

Mean serum urate concentration was determined for the four geographic regions into which the country was divided for this national study (table 36). There were no significant differences, although serum urate tended to be highest in the Midwest for the total group and for female examinees and highest in the Northeast for male examinees. No prominent confounding of this regional trend was present for race, age, or BMI.

Dietary intake

The food frequency questionnaire provided information on customary dietary intake patterns. No consistent or significant associations were found between serum urate concentrations and the following food and beverage groups: fatty foods, complex carbo-

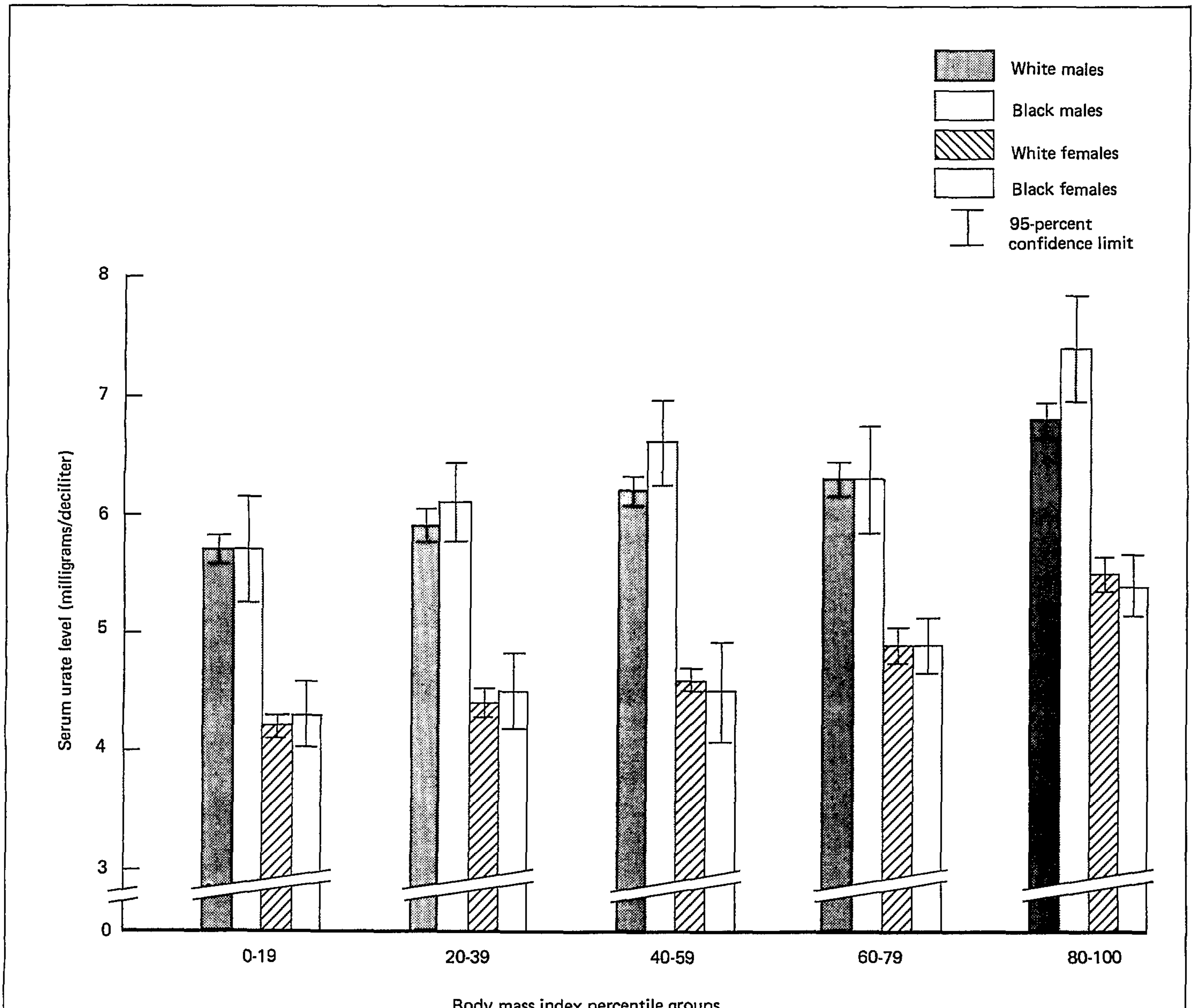

Figure 7. Mean serum urate levels in quintile strata of body mass index for adults 25-74 years of age by race and sex: United States, 1971-75

hydrate/fiber, sugar-containing foods, and coffee-tea consumption.

Reported alcohol consumption was directly and strongly related to serum urate levels. The average weekly consumption of alcoholic beverages was converted to ounces of ethanol per week,[7] and the following four groups were developed according to alcohol consumption: zero ounces / week (oz / wk), 0.001–0.999 oz / wk, 1.000–6.999 oz / wk, and 7.000 oz / wk or more (table 37 and appendix II). For the entire population and for each sex, race, age, and BMI-sex subgroup, abstainers had lower mean serum urate levels than respondents reporting ethanol intake of 7.000 oz / wk or more (figure 9). The differences were significant for all groups except when divided by age and sex where the numbers within each cell were small and the variability relatively great. Abstainers tended to have lower serum urate levels than those with the lowest level of alcohol consumption, but the differences were small and not always statistically significant. On the other hand, the differences in mean serum urate between abstainers and the heaviest consumers of alcohol were consistent, statistically significant, and sizable. The difference for the total group averaged 1.34 mg / dl with the heaviest ethanol consumers having serum urate levels 27 percent higher than abstainers. This magnitude of difference was observed for each sex, race, and age group, and after controlling for body mass index.

There are two sources of urate in body fluids, exogenous and endogenous. The exogenous source, diet, may contain sufficient purines to provide 30 to 60 millimoles (0.5 to 1.0 gram) of urate per day.[31] About

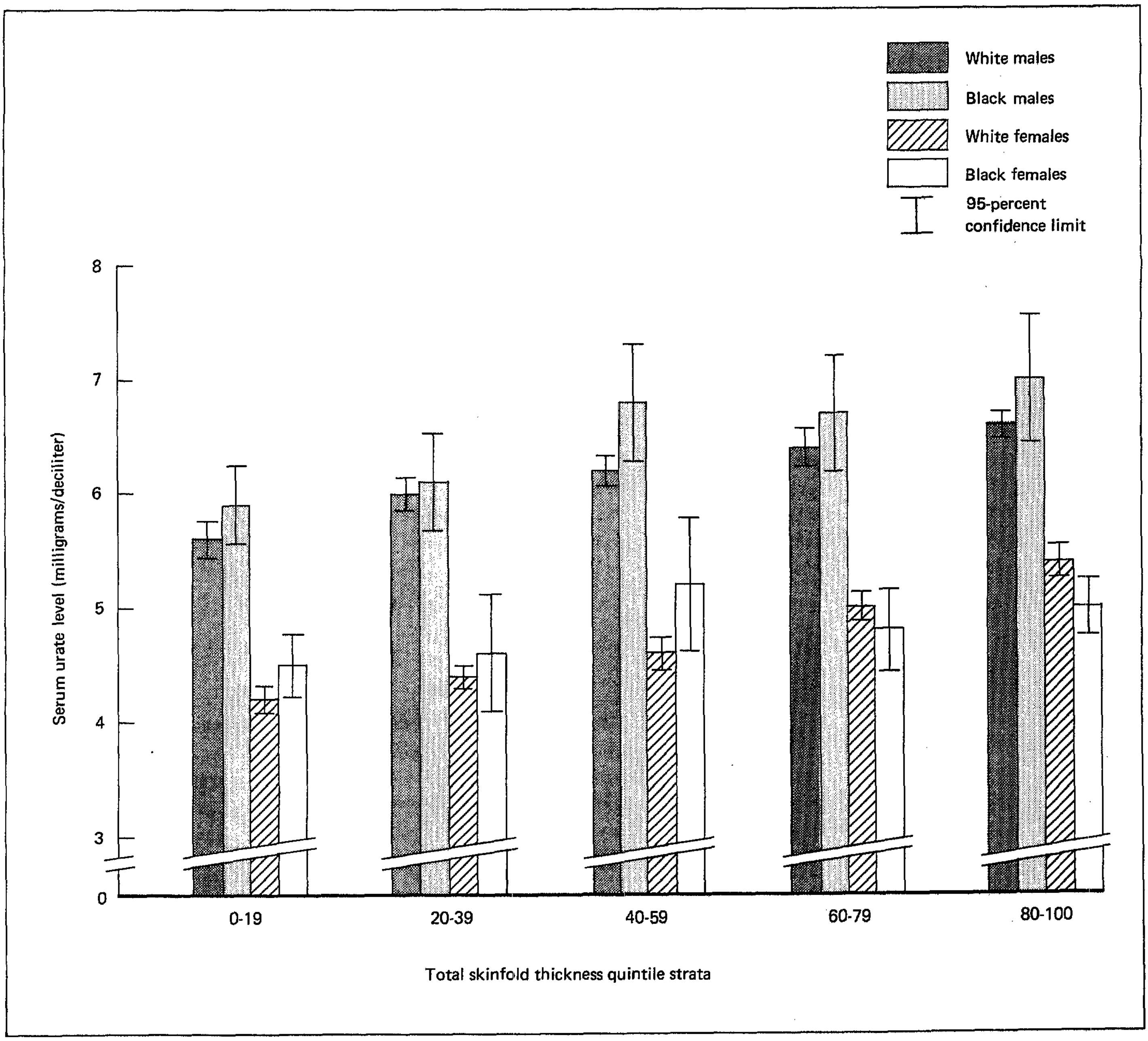

Figure 8. Mean serum urate levels in quintile strata of total skinfolds for adults 25-74 years of age by race and sex: United States, 1971-75

20 percent of dietary purines are destroyed in digestion, but the remainder form urate. Foods particularly rich in purine include glandular meats and meat extracts, and, to a lesser extent, meat, poultry, fish, and legumes. To test for an association between diet and serum urate, the following three food groups were combined: meats, fish, and beans from the food frequency record. It was assumed that individuals who frequently consume purine-rich foods, will ingest increased quantities, but no quantitative measurement was available. Serum urate levels were not significantly different in strata with high purine consumption than in those with lower levels of such consumption (table 38). Higher consumption tended to be associated with higher serum urate levels, although the differences were slight except in the 35–44-year age group. Moreover, there was no consistent pattern when body mass index was controlled. Therefore, no consistent association was found between purine intake and serum urate levels.

The 24-hour dietary recall was used to explore relationships between serum urate and the following variables: total caloric intake; proportion of calories from alcohol; proportion of calories from fat, carbohydrate, and protein; saturated to polyunsaturated fatty acid ratio; and sodium content and sodium to potassium ratio. There were no consistent, statistically significant relationships between consumption of these nutrients and serum urate levels.

Systolic and diastolic blood pressure levels of examinees were stratified at the 15th, 50th, and 85th percentiles, and mean serum urate was determined for those within each strata (tables 39–42). For progressively higher systolic pressure strata, the mean serum urate was greater (tables 39 and 40). The differences in serum urate averaged 0.8 mg/dl between the lowest and highest strata of systolic pressure. The significant differences between extremes of systolic blood pressure persisted for each sex, race, and age group. When body mass index was controlled, the relationship decreased and became inconsistent for males although generally persisted at the same level for females. A similar relationship was observed when diastolic blood pressure was used as the independent variable (tables 41

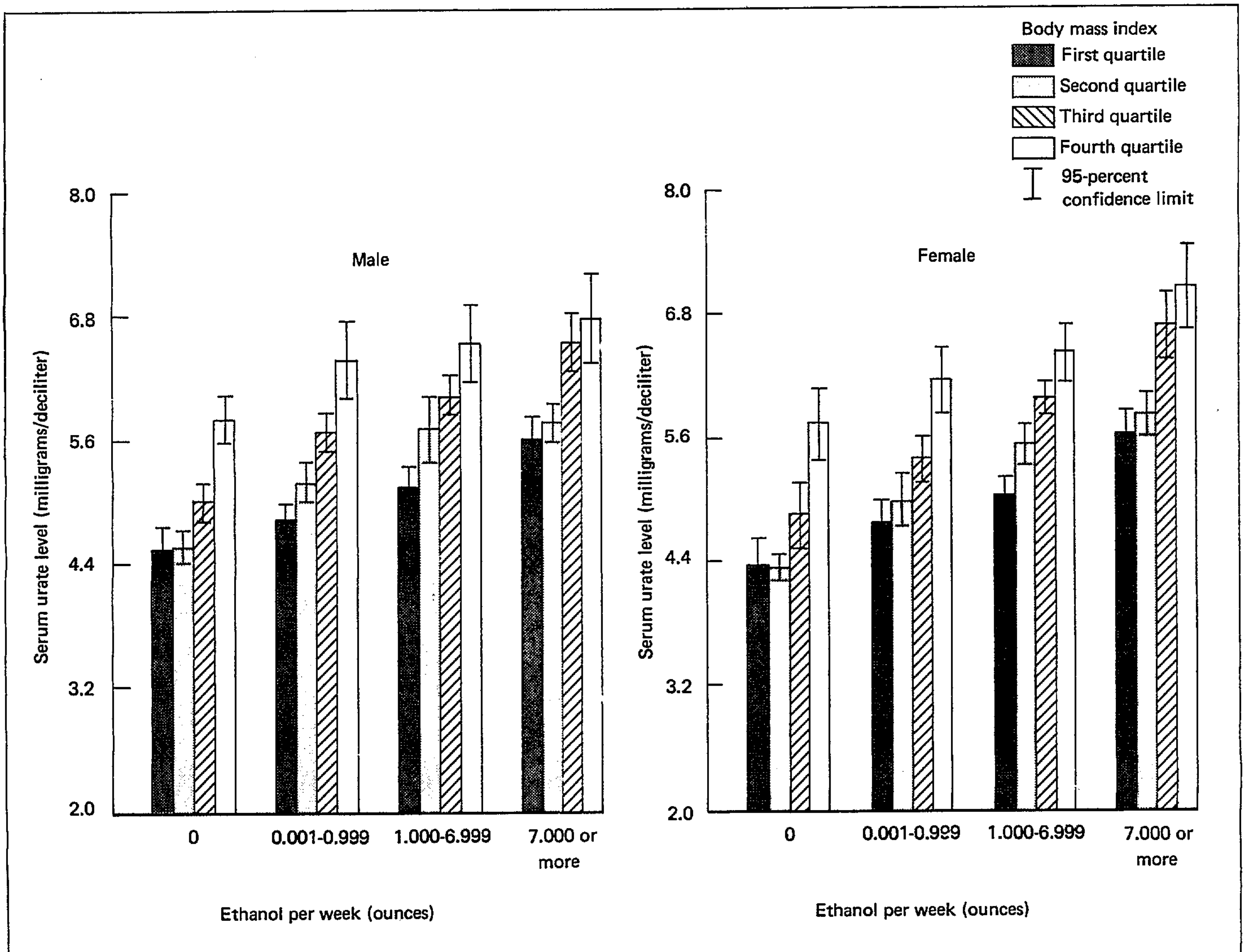

Figure 9. Mean serum urate levels in selected strata of weekly ethanol consumption within BMI quartile strata for males and females 25-74 years of age: United States, 1971-74

and 42). The magnitude of differences between the lowest and highest strata was less, averaging 0.5 mg/dl of serum urate. The differences in serum urate between the lowest and highest strata of disatolic pressure generally persisted across age, sex, and race groups. However, when body mass index was controlled there were no consistent differences among men or among women. The positive trends persisted but with considerably less quantitative differences. Therefore, serum urate is directly related to blood pressure, but the relationship is related partially to the confounding effect of body mass, particularly in males.

Demographic and behavioral variables

Socioeconomic status, general well-being scores, and the reported use of oral contraceptive agents and tobacco were examined, but no relationship was found with serum urate levels.

Clinical hematology and biochemistries

No significant or consistent relationship was found between serum urate and hemoglobin concentration.

For progressively higher levels of serum glutamic oxalacetic transaminase (SGOT), the serum urate concentrations were significantly higher (table 43, figure 10). The mean difference in serum urate was 1.4 mg/dl between groups with the lowest and highest level of SGOT. This significant difference persisted through all sex, race, and age groups except females ages 65–74 years. When body mass index was controlled, the differences in serum urate level between the highest and lowest SGOT strata were slightly less, averaging 0.76 mg/dl or half the difference when BMI was not controlled. Therefore, the relationship between SGOT and serum uric acid is consistent, although it is partially attributable to a confounding relationship to body mass index.

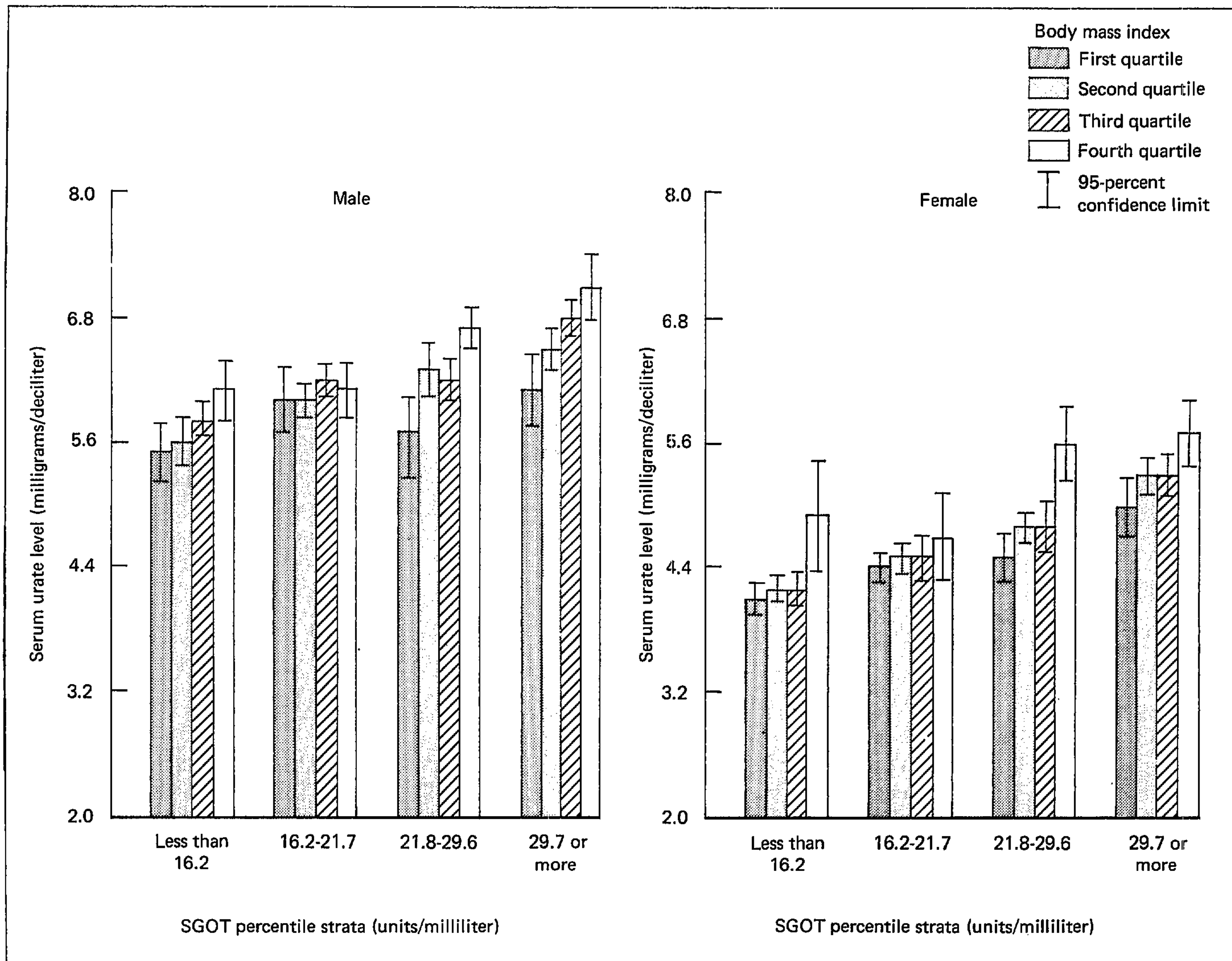

Figure 10. Mean serum urate levels in percentile strata of serum glutamic oxalacetic transaminase (SGOT) within BMI quartile strata for males and females 25-74 years of age: United States, 1971-75

Significant differences in mean serum urate levels were found between those in the lowest and highest strata of serum calcium concentration (table 44). The mean difference was 0.77 mg/dl for the total group. This relationship was present for both sexes and races, but the magnitude of difference was greater for females and black respondents. When age was controlled, a significant, positive relationship was observed except for those ages 55–64 years. When both age and sex were controlled, significant differences were present only for males ages 35–44 and 65–74 years and for females ages 25–34 and 65–74 years. The relationship in females persisted after controlling for BMI but was not significant in males when BMI was considered. No relationship was found with serum inorganic phosphate.

Multivariate analyses

Variables found to have consistent and important relationships to serum urate were entered as independent variables in a regression on the dependent variable, serum urate (table C). Males and females were analyzed separately. Serum urate levels were available only on those examined in the detailed and augmentation surveys and, therefore, this analysis comprised data from 2,731 male and 3,038 female respondents. Relatively little variance was explained as indicated by $R^2 = 0.14$ for males and 0.20 for females. The independent variables with the greatest beta weights for males and females were body mass index, ethanol consumption, and SGOT. For females, age and serum calcium concentration also had relatively high beta weights, while serum calcium had a lesser, but significant beta weight in males. For both males and females, systolic blood pressure levels made a minor but statistically significant contribution, while socioeconomic status, serum cholesterol, and serum magnesium gave minor, statistically insignificant predictions for serum urate concentrations.

Table C. Standardized beta coefficients and standard errors for regression of serum urate on selected variables, by sex for adults ages 25–74 years: United States, 1971–75

Variable	*Male (N = 2,731) Multiple R = 0.37*		*Female (N = 3,038) Multiple R = 0.45*	
	Beta	*Standard error of beta*	*Beta*	*Standard error of beta*
Body mass index	0.32	0.02	0.32	0.02
Age	0.00	0.03	0.11	0.03
Race	0.02	0.02	0.00	0.02
Socioecomonic status	0.00	0.02	–0.01	0.02
Systolic blood pressure	0.03	0.03	0.02	0.03
Ethanol consumption	0.09	0.02	0.10	0.02
Serum cholesterol	0.02	0.02	0.06	0.02
Serum calcium	0.07	0.02	0.11	0.02
Serum glutamic oxalacetic transaminase	0.09	0.02	0.13	0.02
Serum magnesium	–0.05	0.02	0.00	0.02

NOTE: For race, 1 = white, 2 = black, other racial groups excluded.
N = number of examinees.
R = multiple correlation coefficient.

Discussion

Nutritional variables have important relationships to serum cholesterol and serum urate in a population representative of U.S. adults. Among these assessments of nutritional status and dietary intake, body mass and adiposity have the most pervasive and clearly demonstrable relationships.

Body mass index (weight/height^2) and skinfold thickness, which indirectly measures subcutaneous adiposity, are directly related to serum cholesterol and serum urate. This association is present at all ages in adults, for both sexes, and for white and black persons. The magnitude of the association indicates that the relationship has biologic importance. The mean difference in serum cholesterol between the lowest and highest quintile strata of body mass index (BMI) was 31.2 milligrams/deciliter which represents values 16 percent higher in the highest quintile stratum than in the lowest quintile stratum. Similarly, the difference in mean serum urate between the lowest and highest BMI quintile strata was 1.2 mg/dl or 22 percent higher. When combined skinfold thickness (skinfolds at the triceps and subscapular sites) was used as the independent variable, the relationship was similar in magnitude for serum cholesterol but somewhat less for serum urate.

The BMI reflects several tissues (e.g., bone, muscle, and adipose), while skinfold thickness represents primarily adipose tissue. Body mass index and skinfold thickness are intercorrelated, and both have similar relationships to serum cholesterol. Therefore, it is reasonable to infer that their common relationship to cholesterol levels is predicated primarily on a relationship to adiposity. On the other hand, skinfold thickness has a somewhat weaker relationship to serum urate than does BMI, and one might infer that another component measured by BMI—perhaps muscle mass or skeletal frame size—has a relationship to serum urate levels. This inference regarding muscle mass is compatible with the consistently higher levels in males, who have proportionately greater muscle and skeletal mass and less adiposity than females, but sex differences in testosterone also provide a reasonable explanation.[32]

Dietary correlates with serum cholesterol levels were generally inconsistent and of relatively small magnitude. Dietary intake as determined by either the food frequency questionnaire or 24-hour dietary recall did not have statistically significant or consistent relationships with serum cholesterol. Based on interpopulational or intercultural studies and clinical investigations carried out in controlled settings, a relationship would be expected between serum cholesterol and dietary fat, both the amount and type of lipid.[33–35] This anticipated relationship is formalized in the Keys and Hegsted equations, which relate dietary cholesterol and saturated fat directly to serum cholesterol and polyunsaturated fat inversely.[16,17] However, in this cross-sectional survey, no important relationships were found between serum cholesterol and these formulas or their component parameters, saturated fatty acids, polyunsaturated fatty acids, and cholesterol. A similar lack of relationship has been reported in other cross-sectional studies of homogeneous populations.[36–40]

On the other hand, longitudinal studies of populations and studies on metabolic units tend to corroborate a relationship between dietary lipids and serum cholesterol.[5,16,17] The reasons for the disparate findings are unknown but deserve comment. A major problem in population studies is the relatively large within-individual variability of reported dietary intake. This intraindividual variability often exceeds the variability between individuals, particularly in a population with relatively homogeneous eating patterns and food sources. When a single assessment is made in a cross-sectional survey, this problem is magnified and the opportunity to find a relationship diminished. The use of multiple assessments of 24-hour recall or diet diaries decreases the intraindividual variability and can improve the correlation between dietary intake and serum cholesterol.[40,41] It is also apparent from this survey that use of a food frequency questionnaire that assesses customary eating patterns in the preceding 3 months affords no better relationship with serum cholesterol than does a single 24-hour recall. Moreover, in developing predictive models, it should be appreciated that dietary variables will have less predictive power than other nutritional measurements (body mass index, serum biochemistries) that have less variability. In this survey and in a similar study by Shekelle et al.,[5] dietary lipid intake explained far less variance of serum cholesterol than did body mass index. Although the results from this survey do not support the hypothesis that dietary lipid relates to serum cholesterol, they also do not refute an association. Rather, it seems fair to conclude that a large cross-sectional survey of the U.S. population is unlikely to display a clear relationship between dietary intake and serum cholesterol unless the variability of dietary measurement can be decreased.

Several physiological measurements and clinical biochemistry parameters were related to serum cholesterol. Systolic and diastolic blood pressure were directly related to cholesterol levels, and this association obtained for each race, sex, and age group. Because the use of diuretic agents by hypertensive patients may spuriously elevate serum cholesterol, patients receiving antihypertensive medication were removed from analysis.[29] Moreover, controlling for body mass index did not alter this relationship. This is important because body mass is a potentially confounding variable as it is related to both blood pressure and serum cholesterol. However, in multiple regression analysis, systolic blood pressure added little independent explanation of variance. A similar association between higher blood pressure levels and greater serum cholesterol has been found in children and adolescents.[42–44]

The health implications of this association are important. The clustering of two major risk factors for ischemic heart disease in the same individual would have a synergistic effect on atherogenesis and make identification and intervention in these individuals particularly important. Further, it is important to recognize the additive risk association because neither risk factor, blood pressure or serum cholesterol may be sufficiently elevated to attract notice, although the risk of ischemic heart disease would be increased when the synergistic effects are considered.[45,46]

In addition to diet, several other life patterns were explored for an association with serum cholesterol. Current use of oral contraceptives was associated with higher levels of total serum cholesterol, but this effect was noted only in younger women ages 18–24 years, although found for both white and black women, and the effect was independent of body mass index. Cigarette smoking was not related to total serum cholesterol levels, although other studies have indicated that it may be associated with lower levels of high density lipoproteins without producing a major change in total serum cholesterol.[47] Lipoprotein fractions were not measured in NHANES I; therefore, this possibility could not be tested.

Demographic factors were associated with serum cholesterol levels. Survey respondents classified in the lower socioeconomic group by income and educational attainment had significantly higher mean cholesterol values than those who were in the upper middle socioeconomic group. This relationship was observed for both sexes and white and black respondents, and it was independent of BMI but was confounded by age. The inverse relationship between socioeconomic class and serum cholesterol was observed in respondents ages 18–44 years, but a direct relationship was found for persons ages 55–74 years. This reversal of pattern suggests a cohort effect. The cohort of persons age 55 years and over and in the upper middle socioeconomic class may have experienced environmental influences that differ from younger individuals in the same socioeconomic class. For example, the older cohort may have had eating patterns and life styles linked to socioeconomic status that lead to higher serum cholesterol levels, while the reverse was true for the younger cohort. This speculation is compatible with the observed secular changes in eating patterns and mortality from ischemic heart disease that have characterized the past 20 years.[48]

Perceived health status, which reflects self-evaluated psychological well-being, was not related to serum cholesterol levels. This lack of association contrasts somewhat with the inverse relationship between blood pressure and self-assessed well-being that was found in NHANES I.[7] Moreover, the lack of association provides no support for the concept that emotional or psychological tone affects serum cholesterol.

Several hematologic and clinical biochemistry measurements were related to serum cholesterol. Hemoglobin concentration was positively associated with serum cholesterol levels. This relationship was particularly prominent for females, in whom a mean cholesterol difference of 20 mg/dl was found between the lowest and highest 15-percent strata of hemoglobin. The comparable difference in males was 10 mg/dl when the same strata were used. Moreover, a positive association persisted in females after controlling for age and body mass, while the relationship became inconsistent in males with these factors controlled. There is no obvious explanation for the association. One might speculate that a dietary constituent, such as meat, might be related to hemoglobin and cholesterol levels, but in univariate analyses no association was found between serum cholesterol and protein intake.

Strong associations were found between serum cholesterol and levels of serum calcium, and, though unanticipated, the relationship was consistent and potentially important. Mean serum cholesterol differences between the highest (85–100) percentile and lowest (0–15) percentile strata of serum calcium and magnesium were 29 mg/dl and 19 mg/dl, respectively. Therefore, those in the highest strata for these elements had cholesterol values 9 to 17 percent higher than those in the lowest strata. The pattern was present for both sexes, white and black races, and all ages. When body mass index was controlled, the differences in serum cholesterol were increased. In multiple regression analysis, serum calcium concentration had a beta weight that was greater than that for other independent variables except age. This multivariate analysis corroborates the strong, independent relationship to serum cholesterol.

A similar though less robust relationship was found between serum magnesium and cholesterol concentration. Serum inorganic phosphate concentration, which varies reciprocally with serum calcium levels, did not have a relationship to serum cholesterol. The similarity of calcium and magnesium relationships to serum cholesterol is not surprising. Both ions have important roles in neuromuscular transmission, and they share many metabolic characteristics with respect to absorption, storage, and excretion.[49,50] Additionally, nutrition deprivation and disease states associated with abnormalities in one are often accompanied by parallel changes in the other, and both are influenced by parathyroid hormones and renal function. However, no metabolic concept for these ions affords a biologic explanation for their association with levels of circulating cholesterol, and no disease states marked by excesses or deficiencies of calcium or magnesium are accompanied by striking changes in serum cholesterol. A possible explanation is the binding or chelation of calcium of phospholipid, the concentration of which is directly related to cholesterol levels. This provocative relationship deserves further investigation.

Among the other biochemical parameters, serum glutamic oxalacetic transaminase (SGOT) and serum urate had consistent and quantitatively important relationships with serum cholesterol concentration. Higher strata of SGOT were associated with higher values for serum cholesterol. There was a graduated increase in mean cholesterol across the strata of SGOT, with a mean difference of 13 mg/dl between the highest and lowest groups. This trend persisted after accounting for race and sex, but the differences in serum cholesterol were diminished or reversed in respondents ages 55–74 years and in males when body mass index was controlled. SGOT is frequently used to screen for mild liver inflammation or impairment, and in a well population the most common liver toxin is alcohol. It seems likely, therefore, that this relationship reflects liver inflammation secondary to alcohol and a resultant modest increase in serum cholesterol. One might speculate further that the mechanism is an increase in very low density lipoproteins (VLDL), which can accompany altered hepatic metabolism. The VLDL fraction transports a portion of cholesterol, and elevation of this fraction would be associated with an increase in total serum cholesterol. In NHANES I, serum cholesterol was the only lipid measured, and, therefore, this hypothesis cannot be explored further.

Serum cholesterol and serum urate levels were directly related, and adjustment for sex, race, and age did not change this relationship. When body mass was controlled, the same pattern obtained, but the quantitative differences were somewhat less, particularly in males, indicating that adiposity influences the relationship. Studies in other groups and populations have found a relationship between levels of serum urate and serum triglyceride or serum cholesterol.[51,52] In some studies, these relationships dissipated when weight was controlled.[51] The postulated mechanism is similar to that linking SGOT and cholesterol levels. Obesity and perhaps the metabolic pathways linked to production of uric acid are associated with increased production and secretion of VLDL, whose lipid fraction comprises primarily triglyceride and cholesterol. Thus, several metabolic situations including diabetes mellitus and alcohol ingestion would be accompanied by elevated VLDL, serum triglyceride, and, to a lesser degree, increased serum cholesterol. Obesity may coexist in these situations and further confound the relationship.

Serum urate measurements were available on the detailed and augmentation samples of respondents ages 25–74 years. Serum urate level means were 1.5 mg/dl higher in males than in females, and a mean difference of 0.4 mg/dl was found between white and black persons. In successively older groups of men, there were slightly higher levels of serum urate through age 64 years for black men, but little difference for white men. However, in women, mean serum urate was considerably higher in successively older groups for both racial groups through age 64 years and the differences between ages 25 and 74 years averaged 0.8 to 1.0 mg/dl. These sex differences in serum urate and the male and female trends after age 25 are similar to those reported in a population survey of Tecumseh, Michigan[53] and in studies of representative populations in Japan[54] and Israel.[55] In NHANES I and in the Tecumseh study, the higher mean values with increasing age reflect skewing of the distribution to higher values. The finding of higher values in males persists in studies of even diverse populations as does the rise in serum urate levels in progressively older female groups, while male levels are not related to age after 25 years. This does not result from age-related increases in weight in females because the age trends in urate persist after adjusting for body mass index. Menopause may have an influence on this age-related increase in women, although the mechanism is unknown.[54]

The small but consistent difference between black and white examinees persists at all ages and after body mass is controlled. Ethnic variations have been noted in cross-cultural and interpopulational studies,[32] including a small (0.5 mg/dl) but consistently higher serum urate level in white adolescents.[54,56] The explanation for racial differences in the United States is not apparent, but it would not seem to be related to differences in dietary intake, particularly of purine-containing foods, as none of the estimates of food intake, except alcohol, were related to serum urate in this survey. Only small and inconsistent differences in serum urate were noted by geographic region, with levels being slightly but not significantly higher in the Northeast and Midwest, but the differences were 0.1 mg/dl or less.

Reported alcohol consumption was the only dietary variable having an important relationship to serum urate levels. Abstainers, who comprised 27 percent of the adults, had consistently lower levels of uric acid than those who consumed alcohol. At progressively greater levels of reported alcohol intake, serum urate was higher. This relationship held for each sex and race group and at all ages from 25 to 74 years. Interestingly, the differences between black and white persons with respect to serum urate levels were diminished when respondents were categorized by alcohol consumption. Controlling for body mass did not change the pattern of relationship to alcohol ingestion in any subgroup. Historically, excessive alcohol consumption has been related to gout, although the relationship was partially due to associated lead ingestion, which produces Saturnine gout.[57] Excessive acute alcohol ingestion to the point of inebriation commonly promotes elevated uric acid levels, which lead to suppressed renal excretion of uric acid and result in hyperuricemia. On the other hand, only a relatively few reports indicate habitual alcohol intake in noninebriating amounts leads to higher mean serum urate levels.[58,59] The postulated mechanisms for the effect of chronic intake of ethanol include changes in purine synthesis, extracellular fluid volume changes, and the increased ingestion of purines that are present in considerable quantities in beer.[32]

A direct relationship was also found between serum urate and SGOT. This association could be related to the confounding influence of chronic alcohol ingestion, which can produce an elevation of both serum urate and SGOT. However, in the multivariate analysis, both reported alcohol ingestion and SGOT level were independently related to serum urate levels. This suggests that each of these independent variables makes a unique contribution of the variance of serum urate. A possible explanation is that both alcohol ingestion and subtle hepatic inflammation relate to uric acid metabolism, perhaps through different mechanisms. For example, alcohol ingestion may affect renal excretion of urate and thereby lead to elevated serum levels. Alcohol, particularly with large or prolonged ingestion, may also result in subtle changes in hepatic metabolism that affect the rate of synthesis of uric acid. This speculation cannot be resolved by further population data but requires investigation of metabolic alterations.

Among the other clinical biochemistries, serum calcium had a significant relationship to serum urate when the effects of age and body mass index were taken into account. At progressively greater serum calcium concentrations, serum urate levels were higher, and the difference was 0.77 mg/dl of serum urate between the lowest and highest 15 percentile strata of serum calcium. The relationship was consistent in both sexes and in white and black respondents, although it was not consistent over all ages. The association was significant in the multiple regression analysis, and the beta weight was similar to those for SGOT and ethanol consumption. Interestingly, serum magnesium had an inconsistent negative relationship with uric acid in the univariate analysis but a relatively robust negative beta weight in the multiple regression analysis for males. No biologic mechanism or explanation is apparent, but it is of interest that serum calcium and serum magnesium have contrasting rather than similar relationships, a situation not found for their associations with blood pressure[7] or serum cholesterol relationships.

Two measures of social and psychological status were available, but neither had a clear or consistent relationship to serum urate concentration. The general well-being questionnaire, which assesses self-reported psychological and physical well-being, had no association with urate levels. Socioeconomic status, summarized from income level and educational attainment of head of household, also had no association. These observations contrast with reports that uric acid levels are higher in those with higher "social class" or educational attainment.[60,61] Observations suggesting a relationship have been made in groups specifically selected to provide sharp contrasts or dichotomies in achievement. In a general population survey, the extremes of achievement are not so sharply drawn. For example, in a survey of Israeli men, educational attainment had a relatively weak though significant association.[55] However, this does not detract from the interesting finding that economic and educational achievement are not related to serum urate in the general U.S. population.

Although the association between uric acid and blood pressure observed in this survey is discussed in a companion report,[7] the relationship deserves comment. Serum urate was related to systolic and diastolic pressure in each sex, race, and age group, and adjusting for body mass index decreased but did not remove this association. Other population studies[55,62] have found a similar relationship that persists after adjustment for weight or body mass. The reason for this association and the potential biologic mechanisms that might be responsible are not clear, but most speculation has been directed to the kidney and its role in excretion of uric acid and in control of blood pressure.

In multiple regression analysis, only four variables contributed independently to explanation of serum urate levels. Body mass index offered the greatest explanation of variance, but alcohol intake, serum calcium, and SGOT also made significant and independent contributions. Other variables with relationships in univariate analysis but no independent relationship in the multivariate analysis include race, blood pressure, serum cholesterol, and serum magnesium. Therefore, the association for these variables was accounted for by the other significant variables.

The general caveats regarding inferences that may be drawn from a large survey were stated at the outset of this report and deserve comment here. It is apparent that a survey because of its cross-sectional nature cannot effectively describe variables that are associated with subsequent development of disease, that is, risk factors. Physiologic variables and behavior patterns measured at the time of the survey may be altered by prior disease manifestations or treatment, and this may bias or confound valid relationships. In analysis, it is possible to minimize this effect by removing individuals with a prior diagnosis of disease or who receive treatment. However, these individuals are usually important to a relationship, and their removal in analysis may weaken or blur a valid association.

A second reservation relates to the representativeness of variables measured on a single occasion and the variability of the measurement. The two problems are related and are particularly important considerations with respect to nutritional variables. The cross-sectional data from this survey indicate that there are rather marked changes in dietary patterns with age. There may even be a cohort effect with some patterns changing within younger groups who may have responded to public advice regarding diet. Similarly, there are age-related changes in weight, blood pressure, and serum cholesterol that can enhance or negate relationships with other variables.

In addition to the problem of long-term representativeness of a single assessment of dietary patterns, there is considerable variability of that single measurement with respect to characterization of current dietary intake. This problem has been discussed elsewhere, and the conclusion from both theoretical explorations and practical experiences, including that gained in NHANES I, would indicate that current methodology of dietary recall and food frequency questionnaires are unlikely to disclose strong relationships with other variables. In a population with relatively homogeneous dietary patterns, the variability of the measurement, both in terms of technologic measurement and day-to-day variability, exceeds the differences among individuals. The food frequency questionnaire probably affords a more representative assessment of customary dietary intake than does a single 24-hour dietary recall, but the precision of measurement is worse and is semiquantitative at best. Food frequency questionnaires can supplement or confirm eating patterns determined by 24-hour recall, but there is no feasible means of combining quantitative and nonquantitative assessments. When the variability of assessed dietary intake is relatively great, it follows that parameters having less variability (e.g., body mass index and serum biochemistries) will display stronger relationships than dietary variables. Therefore, body mass index and serum biochemistries, which have little variability and can be well-controlled measurements, will appear to have more robust relationships than dietary variables even if a relatively strong relationship were to exist with a dietary variable.

Data from NHANES I can be used as an epidemiologic tool to define interrelationships among cardiovascular variables and nutritional characteristics. The analyses presented here confirm and extend some recognized relationships and suggest others that could be profitably explored. Body mass and, more specifically, adiposity were related to serum cholesterol and urate. From the NHANES I data, it is clear that this relationship extended across all adult age groups and to both sexes and races. Among the unanticipated associations was a consistent, direct relationship between serum cholesterol and urate and serum calcium and magnesium. While the relationships may be an artifact related to binding of calcium by lipoprotein components, this provocative finding deserves further investigation.

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List of detailed tables

Table 1. Serum cholestrol levels of adult males ages 18–74 years within body mass index strata showing means and standard errors of means by race and age: United States, 1971–74

Race and age	*Body mass index (kilograms/meters²)*														
	Less than 21.9095			*21.9095–24.0785*			*24.0786–26.1385*			*26.1386–28.4735*			*28.4736 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	193.1	1.44	1,036	201.7	2.12	1,036	216.7	1.89	1,036	221.1	1.93	1,036	224.3	2.02	1,035
Race															
White	192.8	1.62	804	202.3	2.25	867	217.0	2.02	884	221.7	1.79	924	223.2	2.17	885
Black	195.1	3.79	232	195.9	4.83	169	213.3	5.08	152	211.6	7.40	112	233.9	7.88	180
Age															
18–24 years	170.9	2.54	258	167.4	2.74	203	188.5	3.93	126	197.1	4.04	82	193.1	6.05	87
25–34 years	190.3	2.57	148	196.0	3.78	182	203.0	3.57	160	202.7	2.52	146	212.8	4.59	150
35–44 years	205.9	6.81	87	216.6	5.17	120	223.3	4.97	133	223.4	3.65	163	225.8	5.02	154
45–54 years	205.5	5.92	123	228.7	5.27	131	228.4	3.15	161	235.8	4.46	169	236.8	4.34	176
55–64 years	216.7	5.99	92	223.0	3.84	92	236.1	6.00	124	228.4	4.36	143	237.5	4.98	133
65–74 years	213.4	3.23	328	228.1	2.65	308	223.2	4.32	332	232.1	2.98	333	231.9	5.12	335

[1] Excludes "other" racial groups.

Table 2. Serum cholesterol levels of adult females ages 18–74 years within body mass index strata showing means and standard errors of means by race and age: United States, 1971–74

Race and age	Body mass index (kilograms/meters²)														
	Less than 20.6325			20.6325–22.8135			22.8136–25.3195			25.3196–29.3295			29.3296 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	194.3	1.57	1,661	205.9	1.70	1,661	217.2	1.45	1,658	229.3	2.25	1,660	230.1	2.32	1,660
Race															
White	194.3	1.69	1,413	206.5	1.85	1,468	217.9	1.38	1,396	230.0	2.53	1,302	230.7	2.51	1,171
Black	193.3	3.05	248	197.5	4.76	193	209.6	4.90	262	224.3	3.59	358	227.2	3.91	489
Age															
18–24 years	175.0	2.50	530	182.4	2.24	376	187.0	2.88	282	192.4	5.09	175	200.0	4.77	133
25–34 years	187.3	1.85	502	189.5	1.93	447	198.0	2.91	360	203.9	2.32	268	202.8	3.89	296
35–44 years	198.4	2.99	265	201.5	2.42	349	204.5	2.41	329	215.2	3.46	334	214.7	2.95	357
45–54 years	212.7	4.84	100	223.0	3.28	159	236.5	4.09	171	240.8	4.23	204	237.6	7.45	193
55–64 years	238.6	8.03	73	250.3	5.48	80	238.9	4.85	144	247.7	4.13	171	249.4	3.80	199
65–74 years	235.1	5.19	191	246.3	3.02	250	250.5	3.48	372	253.7	3.43	508	253.6	2.93	482

[1] Excludes "other" racial groups.

Table 3. Serum cholesterol levels of adult males ages 18–74 years within total skinfold (triceps and subscapular) thickness strata showing means and standard errors of means by race and age: United States, 1971–74

Race and age	Total skinfold thickness (millimeters)														
	Less than 16.5			16.5–22.9			23.0–28.9			29.0–36.4			36.5 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	191.6	1.59	1,030	205.9	1.57	1,149	217.9	2.10	1,013	220.6	2.06	972	221.76	2.39	1,015
Race															
White	191.2	1.90	748	205.1	1.64	977	218.2	2.22	903	220.4	2.19	846	221.2	2.26	860
Black	193.4	4.00	282	203.8	4.85	172	214.1	7.06	110	223.1	3.91	126	226.6	8.80	155
Age															
18–24 years	169.1	3.10	260	170.0	2.79	180	183.6	4.38	116	194.3	4.14	88	191.9	4.82	112
25–34 years	189.5	3.37	147	194.2	3.37	183	203.2	3.93	151	210.6	3.74	135	207.5	4.07	170
35-44 years	207.8	5.76	100	223.0	3.56	133	223.4	5.06	129	220.0	3.82	150	224.3	4.55	145
45-54 years	205.1	5.86	114	218.5	3.95	165	234.6	4.41	148	237.8	4.54	152	237.4	4.80	181
55-64 years	211.7	4.97	92	227.4	3.10	131	235.2	5.77	124	229.6	4.08	123	236.7	6.94	114
65-74 years	212.6	3.07	317	224.1	2.87	357	228.3	3.64	345	229.0	3.68	324	233.7	4.85	293

[1] Excludes "other" racial groups.

Table 4. Serum cholesterol levels of adult females ages 18–74 years within total skinfold (triceps and subscapular) thickness strata showing means and standard errors of means by race and age: United States, 1971–74

Race and age	Total skinfold thickness (millimeters)														
	Less than 26.5			26.5–34.9			35.0–44.4			44.5–56.9			57.0 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	196.1	2.00	1,652	208.1	2.05	1,720	216.7	1.76	1,617	227.0	1.81	1,674	225.9	1.83	1,637
Race															
White	196.5	2.21	1,364	207.8	2.04	1,496	217.7	1.75	1,404	227.4	1.92	1,337	226.3	2.21	1,149
Black	192.9	3.00	288	213.0	5.93	224	203.8	4.09	213	223.6	4.08	337	224.2	3.33	488
Age															
18–24 years	174.1	2.42	508	183.7	3.02	379	184.4	2.57	262	189.1	4.33	197	202.2	4.20	150
25–34 years	187.6	2.08	464	192.0	2.37	434	196.1	2.07	336	199.4	2.81	319	201.2	2.88	320
35–44 years	197.9	3.21	268	202.5	3.41	307	208.8	2.72	316	213.0	2.14	342	210.0	2.53	401
45–54 years	217.5	4.68	100	224.6	4.38	128	230.8	4.95	169	239.7	4.52	204	236.9	5.02	226
55–64 years	238.6	6.15	83	243.2	5.16	113	245.6	5.08	107	252.0	4.34	173	243.4	4.17	191
65–74 years	236.2	4.68	229	246.0	2.90	359	250.9	3.03	427	254.9	2.98	439	256.5	3.45	349

[1] Excludes "other" racial groups.

Table 5. Serum cholesterol levels of adult males ages 18–74 years within systolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	*Systolic blood pressure (millimeters of mercury)*											
	Less than 114			*114–129*			*130–153*			*154 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	197.5	2.48	686	208.2	1.47	1,842	216.9	1.52	1,458	222.9	2.14	682
Race												
White	198.4	2.55	584	207.9	1.36	1,601	217.9	1.84	1,249	224.1	2.56	513
Black	187.6	5.73	102	211.0	5.20	241	206.9	5.62	209	216.0	5.48	169
Age												
18–24 years	170.8	4.57	178	180.3	1.98	374	180.4	3.66	181	198.1	5.14	15
25–34 years	195.4	3.10	154	201.8	2.78	421	201.5	3.45	181	220.0	5.78	21
35–44 years	216.7	4.79	109	217.9	4.22	305	227.0	4.23	188	214.8	9.73	31
45–54 years	220.4	8.29	85	225.6	3.61	275	233.7	3.87	227	228.1	4.17	104
55–64 years	213.4	5.36	51	235.4	4.70	155	229.9	4.23	190	221.9	4.48	104
65–74 years	207.8	6.08	109	231.4	3.04	312	226.9	4.40	491	225.4	2.38	407
Body mass index												
1st quartile	181.1	5.11	174	187.1	1.94	290	190.6	3.68	150	211.4	8.29	80
2d quartile	192.6	4.73	288	203.0	2.48	697	208.7	2.15	465	222.3	3.95	178
3d quartile	215.3	4.29	187	218.0	2.25	661	222.6	2.17	553	227.9	3.52	241
4th quartile	210.2	6.69	37	221.3	5.41	194	229.0	3.79	290	220.9	4.98	183

[1] Excludes "other" racial groups.

Table 6. Serum cholesterol levels of adult females ages 18–74 years within systolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Systolic blood pressure (millimeters of mercury)											
	Less than 106			106–119			120–149			150 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	192.2	1.83	1,070	203.6	1.31	2,650	219.3	1.73	2,678	237.7	2.80	924
Race												
White	192.4	1.95	883	203.7	1.37	2,211	219.4	1.86	2,251	239.7	3.11	692
Black	189.9	5.41	187	202.9	3.31	439	217.6	3.40	427	226.9	3.59	232
Age												
18–24 years	175.0	2.16	363	185.4	2.04	741	185.0	3.31	367	177.9	9.02	14
25–34 years	188.3	2.08	381	194.8	1.90	860	195.6	1.49	556	213.4	6.82	42
35–44 years	201.5	2.74	209	202.5	1.88	619	209.5	2.39	589	218.2	4.38	106
45–54 years	226.0	8.22	62	231.1	3.70	222	227.5	3.47	328	237.1	5.99	118
55–64 years	228.2	9.04	26	242.4	5.96	85	248.7	3.93	259	241.9	6.24	143
65–74 years	255.3	16.97	29	246.3	5.61	123	252.3	2.83	579	248.2	3.08	501
Body mass index												
1st quartile	178.9	3.15	303	191.7	2.43	480	202.5	4.13	262	241.5	15.18	55
2d quartile	193.9	2.69	491	197.9	1.84	1,063	210.5	2.38	811	234.3	4.59	179
3d quartile	205.8	2.73	248	213.7	2.53	862	227.7	2.73	1,070	240.2	3.62	392
4th quartile	197.4	12.86	28	221.2	6.49	245	225.0	3.04	535	236.1	4.90	298

[1] Excludes "other" racial groups.

Table 7. Serum cholesterol levels of adult males ages 18–74 years within diastolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Diastolic blood pressure (millimeters of mercury)											
	Less than 70			70–82			83–94			95 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	194.4	2.68	401	205.5	1.66	2,069	215.8	1.92	1,514	225.4	2.01	684
Race												
White	194.4	2.85	344	206.1	1.54	1,798	215.8	2.05	1,288	226.8	1.98	517
Black	194.4	6.27	57	198.2	5.95	271	215.5	8.09	226	217.8	6.24	167
Age												
18–24 years	170.6	3.55	131	178.8	2.58	448	181.6	3.58	143	194.3	7.00	26
25–34 years	199.1	4.95	77	199.9	2.21	396	201.6	3.93	249	209.9	4.84	55
35–44 years	208.3	7.13	34	218.8	3.79	259	217.7	3.93	240	232.9	4.75	100
45–54 years	223.8	13.2	27	225.5	3.43	238	230.3	3.80	275	229.0	3.66	151
55–64 years	231.9	9.72	24	227.3	4.07	196	229.5	4.20	173	228.9	6.17	107
65–74 years	219.7	5.34	108	221.4	3.41	532	233.6	3.87	434	227.2	4.30	245
Body mass index												
1st quartile	178.1	4.83	113	186.8	2.49	384	190.4	3.80	143	211.2	8.99	54
2d quartile	191.3	4.48	180	201.4	2.62	823	208.8	2.90	460	221.3	4.61	165
3d quartile	222.7	6.02	89	215.2	1.95	684	221.7	2.71	608	230.2	3.00	261
4th quartile	195.4	5.92	19	221.7	5.21	178	225.4	3.43	303	225.2	3.86	204

[1] Excludes "other" racial groups.

Table 8. Serum cholesterol levels of adult females ages 18–74 years within diastolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Diastolic blood pressure (millimeters of mercury)											
	Less than 68			68–77			78–89			90 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	192.0	1.46	1,101	205.5	1.79	2,576	218.9	1.57	2,718	231.4	2.86	927
Race												
White	191.9	1.58	930	205.7	1.86	2,204	219.4	1.69	2,238	233.2	2.97	665
Black	192.4	4.69	171	203.3	4.16	372	213.8	4.41	480	223.0	4.97	262
Age												
18–24 years	177.1	2.45	440	183.9	2.24	639	185.4	2.68	365	209.5	16.84	41
25–34 years	188.7	2.31	355	193.8	1.68	764	196.7	1.75	621	200.5	3.90	99
35–44 years	195.3	2.16	161	201.8	1.88	527	210.9	2.48	649	212.3	2.98	186
45–54 years	228.1	7.13	54	226.2	3.17	219	231.4	3.60	305	233.6	5.99	152
55–64 years	248.5	12.90	22	243.3	5.04	129	245.8	4.31	221	244.5	4.96	141
65–74 years	253.7	6.17	69	250.1	4.09	298	251.5	2.98	557	246.9	4.30	308
Body mass index												
1st quartile	177.1	2.78	314	189.1	2.42	447	208.7	5.35	286	239.4	10.27	53
2d quartile	192.4	2.56	489	200.9	2.30	1,071	208.0	2.09	820	230.5	5.32	164
3d quartile	208.9	3.29	260	217.0	2.77	874	226.9	2.34	1,086	233.0	4.14	352
4th quartile	209.7	8.92	38	223.0	6.77	184	227.0	3.31	526	229.2	3.90	358

[1] Excludes "other" racial groups.

Table 9. Serum cholesterol levels of adults ages 18–74 years within frequency of fatty food consumption strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Frequency of fatty food consumption (times/week): Less than 17.0			17.0–27.9			28.0–42.4			42.5 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	216.4	1.76	1,603	210.2	1.11	3,631	210.0	1.24	3,611	204.9	1.43	1,531
Sex												
Male	219.2	3.78	556	210.1	1.55	1,264	209.7	1.81	1,525	205.3	1.91	781
Female	214.7	2.06	1,047	210.3	1.59	2,367	210.3	1.47	2,086	204.3	2.63	750
Race												
White	217.0	1.78	1,132	210.2	1.14	2,954	210.5	1.33	3,144	205.0	1.54	1,395
Black	213.6	4.76	471	210.8	3.06	677	202.7	3.57	467	203.9	6.81	136
Age												
Total												
18–24 years	182.7	3.60	287	178.6	1.97	631	181.4	1.86	716	180.3	2.21	425
25–34 years	201.3	4.80	303	196.2	1.70	830	197.5	1.81	886	198.4	2.59	337
35–44 years	217.9	4.20	280	208.3	2.08	739	214.5	2.70	633	213.4	3.21	238
45–54 years	232.1	4.62	192	229.5	2.93	444	228.6	2.51	436	222.7	3.23	170
55–64 years	236.0	4.40	153	235.8	3.69	288	240.6	4.01	263	238.7	5.15	115
65–74 years	240.8	3.48	388	242.0	2.44	699	239.1	3.87	677	235.7	3.91	246
Male												
18–24 years	173.8	4.16	65	177.7	3.51	168	179.2	2.67	279	177.6	2.84	199
25–34 years	212.9	10.28	62	202.5	3.08	226	200.5	2.87	307	199.1	3.72	137
35–44 years	222.5	7.63	66	215.6	3.59	189	220.6	5.32	195	217.4	4.33	114
45–54 years	235.0	6.71	83	224.2	3.45	198	233.3	3.73	221	224.9	4.19	109
55–64 years	233.3	7.63	62	220.9	5.92	140	234.8	4.50	139	234.2	5.63	72
65–74 years	227.1	4.01	218	226.9	2.38	343	225.8	4.82	384	231.0	5.99	150
Female												
18–24 years	185.9	4.25	222	179.2	2.31	463	184.2	2.66	437	184.4	3.34	226
25–34 years	194.0	3.31	241	191.6	2.02	604	194.0	1.42	579	197.2	3.06	200
35–44 years	215.0	4.28	214	202.8	1.88	550	208.1	2.34	438	204.8	3.25	124
45–54 years	230.3	6.47	109	234.2	4.49	246	224.2	3.68	215	218.1	6.25	61
55–64 years	237.8	6.55	91	248.7	4.51	148	247.4	5.15	124	246.5	9.54	43
65–74 years	253.6	6.09	170	253.5	3.72	356	253.7	4.06	293	242.6	6.28	96
Body mass index												
Male												
1st quartile	197.1	5.55	145	190.4	2.64	314	189.8	2.48	412	190.0	2.83	233
2d quartile	216.4	5.20	136	205.4	4.02	301	209.3	3.39	407	202.3	5.11	216
3d quartile	227.1	4.92	121	220.7	3.50	318	216.9	3.16	371	218.8	3.22	193
4th quartile	228.4	7.92	154	224.2	3.45	331	224.5	4.15	335	214.8	3.16	139
Female												
1st quartile	197.8	3.80	231	192.2	2.84	594	193.5	2.21	679	193.7	3.92	312
2d quartile	207.1	3.62	239	204.8	2.11	636	208.4	3.28	574	204.8	4.65	201
3d quartile	222.7	5.49	274	221.7	2.24	589	224.5	2.39	489	218.1	6.02	135
4th quartile	228.1	4.90	303	227.1	3.73	548	227.9	3.49	343	222.3	5.21	102

[1] Excludes "other" racial groups.

Table 10. Serum cholesterol levels of adult males ages 18–74 years within total dietary calories strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	*Average total caloric intake per day (calories)*											
	Less than 1,425.6			*1,425.6–2,201.5*			*2,201.6–3,402.3*			*3,402.4 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	219.1	2.35	517	216.8	1.60	1,205	209.8	2.35	1,205	197.5	1.87	516
Race												
White	221.4	2.58	387	218.0	1.86	1,021	210.3	2.36	1,058	198.1	2.11	461
Black	206.0	5.72	130	207.5	4.56	184	204.3	6.52	147	189.0	8.46	55
Age												
18–24 years	190.1	6.71	28	183.3	4.36	93	181.4	2.77	234	174.5	3.18	171
25–34 years	193.4	6.27	34	199.9	4.35	140	206.2	2.92	258	196.9	4.27	133
35–44 years	216.3	8.61	38	220.5	3.61	131	218.5	4.16	207	219.9	7.60	75
45–54 years	230.3	6.27	69	227.8	3.79	208	227.1	3.75	188	219.4	4.79	62
55–64 years	229.3	5.71	68	226.8	3.74	154	225.4	5.62	107	223.5	10.14	38
65–74 years	223.9	3.77	280	230.6	4.17	479	220.7	3.04	211	237.0	10.43	37
Body mass index												
1st quartile	205.8	5.63	127	200.3	3.71	277	193.1	3.82	298	178.6	2.83	158
2d quartile	217.5	4.94	117	215.5	4.55	263	207.6	3.12	336	192.4	3.79	145
3d quartile	225.8	5.28	113	223.4	2.67	332	219.0	3.36	305	209.7	3.68	111
4th quartile	224.6	4.73	159	222.3	2.70	333	220.6	4.03	266	219.8	4.68	102

[1] Excludes "other" racial groups.

Table 11. Serum cholesterol levels of adult females ages 18–74 years within total dietary calories strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	*Average total caloric intake per day (calories)*											
	Less than 989.68			*989.68–1,509.5*			*1,509.6–2,232.9*			*2,233.0 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	224.1	2.51	760	216.8	1.54	1,771	208.8	1.65	1,772	199.2	1.78	759
Race												
White	224.9	2.64	577	216.7	1.69	1,495	208.9	1.80	1,521	199.8	1.97	625
Black	219.6	5.66	183	217.0	4.85	276	207.8	4.33	251	193.7	3.74	134
Age												
18–24 years	205.9	6.38	90	178.3	2.99	306	182.5	3.00	383	179.9	3.04	227
25–34 years	198.1	3.25	155	194.1	2.05	406	192.5	2.11	471	191.2	2.87	231
35–44 years	212.7	3.43	155	211.0	1.97	371	206.1	2.31	413	203.7	2.97	147
45–54 years	240.2	4.95	100	239.5	4.81	182	223.7	4.14	170	217.2	6.22	79
55–64 years	241.2	7.41	63	244.1	3.93	149	251.4	5.83	107	235.9	6.93	29
65–74 years	250.5	6.82	197	257.1	2.95	357	247.9	5.35	228	247.8	5.92	46
Body mass index												
1st quartile	218.1	8.87	113	195.5	3.33	366	191.2	2.89	510	185.2	2.99	277
2d quartile	213.4	5.03	145	209.3	2.30	457	203.7	3.16	475	200.8	3.52	190
3d quartile	224.3	5.07	208	223.7	2.29	494	222.1	3.51	399	210.2	4.30	163
4th quartile	233.3	2.88	294	234.6	3.78	454	227.6	2.66	388	212.0	4.32	129

[1] Excludes "other" racial groups.

Table 12. Serum cholesterol levels of adult males ages 18–74 years within total dietary fat strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Total fat intake per day (grams)											
	Less than 51.12			51.12–90.04			90.05–150.01			150.02 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	218.1	1.92	517	213.9	1.71	1,205	211.0	2.19	1,205	199.8	1.77	516
Race												
White	220.2	2.15	389	215.6	1.92	1,032	210.5	2.21	1,050	200.8	1.95	456
Black	204.4	5.05	128	198.6	4.22	173	216.7	6.31	155	186.8	8.41	60
Age												
18–24 years	183.8	5.13	30	180.0	3.49	126	181.2	3.05	211	177.1	3.64	159
25–34 years	197.8	5.56	37	200.2	3.90	148	203.7	3.75	255	200.3	4.37	125
35–44 years	217.3	6.62	46	219.5	3.91	133	219.9	3.62	199	217.5	7.94	73
45–54 years	232.2	5.64	71	227.4	4.00	195	227.7	4.74	196	217.1	5.35	65
55–64 years	231.8	6.88	65	224.1	4.17	145	226.9	4.56	110	226.2	6.57	47
65–74 years	221.3	3.97	268	228.2	2.02	458	230.4	8.02	234	226.4	9.83	47
Body mass index												
1st quartile	200.5	5.40	125	196.6	3.10	292	192.6	3.25	285	185.1	2.93	158
2d quartile	215.5	5.26	115	212.8	2.95	283	208.0	3.65	327	194.2	4.59	136
3d quartile	233.0	3.73	116	221.9	3.63	321	217.9	3.39	313	210.5	3.07	111
4th quartile	219.2	3.69	161	220.8	3.09	308	224.6	4.05	280	218.7	4.98	111

[1] Excludes "other" racial groups.

Table 13. Serum cholesterol levels of adult females ages 18–74 years within total dietary fat strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	*Total fat intake per day (grams)*											
	Less than 35.00			*35.00–60.01*			*60.02–96.25*			*96.26 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	220.5	2.49	761	215.5	1.63	1,770	209.9	1.52	1,772	201.8	2.17	759
Race												
White	220.3	2.58	567	215.8	1.71	1,499	210.0	1.58	1,521	202.2	2.36	631
Black	221.1	6.25	194	212.1	4.28	271	208.8	3.91	251	196.8	3.35	128
Age												
18–24 years	193.6	5.43	110	180.8	2.81	311	182.3	2.50	380	181.1	3.88	205
25–34 years	197.2	3.07	155	192.6	2.34	411	192.8	1.95	463	193.6	2.71	234
35–44 years	213.1	4.02	144	207.5	2.40	380	206.9	2.21	399	209.4	3.14	163
45–54 years	232.4	3.54	89	238.8	2.80	191	226.8	5.27	177	217.5	5.88	74
55–64 years	241.8	7.59	67	244.0	4.12	148	250.4	5.09	104	240.3	7.10	29
65–74 years	248.9	5.45	196	258.3	4.52	329	249.5	5.29	249	243.6	5.62	54
Body mass index												
1st quartile	206.5	5.54	128	194.6	2.70	383	191.5	3.05	482	188.9	3.28	273
2d quartile	214.0	5.54	155	207.0	2.83	438	203.8	3.08	475	204.1	3.70	199
3d quartile	222.6	4.11	207	225.7	2.81	478	218.7	2.72	420	213.9	3.64	159
4th quartile	230.4	2.88	271	232.0	2.70	471	231.3	4.50	395	212.3	5.17	128

[1] Excludes "other" racial groups.

Table 14. Serum cholesterol levels of adults ages 18–74 years within percent of caloric intake from fat strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Calories from fat per day (percent)											
	Less than 28.15			28.15–36.73			36.74–45.26			45.27 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	214.2	1.50	1,276	209.8	1.54	2,978	211.3	1.36	2,976	212.5	1.87	1,275
Sex												
Male	212.6	2.30	489	208.9	2.26	1,137	211.2	1.75	1,231	211.2	2.34	586
Female	215.6	2.19	787	210.5	1.58	1,841	211.3	1.93	1,745	214.0	2.19	689
Race												
White	214.6	1.62	1,018	210.3	1.60	2,533	211.7	1.42	2,551	212.4	2.00	1,043
Black	211.1	4.49	258	203.8	3.52	445	206.7	4.16	425	212.7	5.20	232
Age												
Total												
18–24 years	179.0	2.60	224	180.7	1.96	551	182.3	2.43	554	182.9	2.05	203
25–34 years	195.5	3.43	236	198.0	2.69	662	197.0	1.71	645	198.7	3.22	285
35–44 years	216.3	3.38	210	209.7	2.64	551	215.5	2.22	538	214.8	3.41	238
45–54 years	236.0	2.83	160	226.2	3.10	345	226.9	3.68	386	230.8	3.86	167
55–64 years	238.9	6.01	116	234.0	3.28	244	237.3	4.33	249	233.0	5.33	106
65–74 years	239.6	3.61	330	241.0	2.83	625	236.0	2.01	604	246.7	7.06	276
Male												
18–24 years	175.4	4.44	62	178.0	2.43	191	183.3	3.79	192	179.3	4.27	81
25–34 years	197.2	5.17	72	204.2	4.08	195	201.0	3.29	194	201.5	4.98	104
35–44 years	224.8	6.39	60	216.3	5.19	155	220.4	3.48	165	217.1	5.92	71
45–54 years	234.5	3.91	71	223.3	4.79	171	227.4	4.55	186	226.5	4.51	99
55–64 years	231.3	8.13	55	226.2	4.55	106	223.1	4.58	140	229.8	6.20	66
65–74 years	220.5	3.69	169	227.7	2.70	319	224.9	2.43	354	238.2	11.52	165
Female												
18–24 years	181.4	3.77	162	183.2	3.31	360	181.3	2.54	362	187.5	4.01	122
25–34 years	193.7	3.55	164	192.6	2.42	467	193.3	2.02	451	195.2	2.88	181
35–44 years	208.2	3.95	150	204.0	2.06	396	210.7	2.80	373	212.7	3.36	167
45–54 years	237.2	4.43	89	229.0	3.86	174	226.4	5.18	200	236.2	6.09	68
55–64 years	245.5	7.82	61	239.9	4.50	138	254.8	5.07	109	239.0	7.15	40
65–74 years	255.0	5.63	161	252.5	4.45	306	249.2	3.30	250	256.5	5.14	111
Body mass index												
Male												
1st quartile	182.2	5.01	103	193.9	3.20	294	194.2	2.40	316	192.3	4.60	147
2d quartile	208.9	5.39	124	206.0	3.02	273	208.9	3.67	326	204.4	4.26	138
3d quartile	223.4	3.98	133	220.4	3.94	287	218.0	3.14	299	218.3	4.40	142
4th quartile	222.5	3.68	129	214.7	3.87	283	224.8	2.92	289	227.7	5.42	159
Female												
1st quartile	192.0	5.13	163	192.1	3.33	468	193.3	2.47	460	197.2	3.46	175
2d quartile	207.2	4.52	197	207.0	2.53	453	203.3	2.99	443	210.5	4.65	174
3d quartile	227.5	3.42	204	219.4	2.72	472	220.8	3.26	418	221.4	4.52	170
4th quartile	232.2	2.90	223	226.6	3.34	448	230.9	4.03	424	229.4	4.03	170

[1] Excludes "other" racial groups.

Table 15. Serum cholesterol levels of adults ages 18–74 years within linoleic to saturated fatty acid intake ratio strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Linoleic/saturated fatty acid ratio (daily intake)											
	Less than 0.1163			0.1163–0.2693			0.2694–0.5511			0.5512 or more		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	212.6	2.11	1,270	210.9	1.16	2,963	211.3	1.04	2,962	211.0	2.02	1,269
Sex												
Male	210.8	2.31	564	210.6	1.45	1,279	211.0	1.82	1,142	209.6	2.62	428
Female	214.5	2.75	706	211.3	1.63	1,684	211.7	1.46	1,820	212.2	2.52	841
Race												
White	212.7	2.32	1,123	211.4	1.27	2,447	211.4	1.13	2,483	212.0	2.18	1,060
Black	210.1	4.10	147	206.5	2.75	516	210.4	3.96	479	203.1	3.85	209
Age												
Total												
18–24 years	184.0	3.13	230	177.5	1.80	483	181.2	2.21	567	186.8	4.17	243
25–34 years	193.8	2.31	232	197.9	2.01	607	197.7	2.14	658	196.5	2.88	320
35–44 years	213.2	3.18	220	214.5	2.28	550	214.1	2.80	540	210.0	3.56	217
45–54 years	228.0	5.72	141	226.7	2.91	389	232.0	2.45	362	226.9	4.79	161
55–64 years	245.9	6.32	115	232.1	3.93	251	233.9	3.67	249	238.0	5.56	97
65–74 years	239.2	5.92	332	237.5	1.69	683	240.9	3.98	586	245.4	3.60	231
Male												
18–24 years	183.9	4.77	80	174.3	2.17	166	180.8	3.26	196	184.9	5.01	76
25–34 years	196.4	3.39	79	198.6	3.34	197	203.0	3.24	201	205.0	5.81	81
35–44 years	216.0	4.81	68	222.5	3.63	184	220.2	5.41	144	210.7	6.95	50
45–54 years	226.0	7.77	80	226.9	3.02	195	230.9	4.02	180	218.9	6.47	67
55–64 years	232.1	8.67	60	223.2	4.66	139	226.2	3.74	118	230.1	7.74	48
65–74 years	230.6	7.97	197	226.1	2.43	398	222.5	3.48	303	236.2	4.86	106
Female												
18–24 years	184.2	4.47	150	180.4	2.78	317	181.6	2.64	371	188.4	4.64	167
25–34 years	191.1	3.95	153	197.3	1.87	410	192.8	2.11	457	190.1	2.44	239
35–44 years	210.6	2.95	152	205.4	2.23	366	209.4	2.28	396	209.6	3.37	167
45–54 years	230.5	6.26	61	226.4	4.75	194	233.0	4.52	182	233.0	6.20	94
55–64 years	260.1	7.50	55	244.2	4.88	112	240.0	5.08	131	245.7	7.48	49
65–74 years	249.3	7.50	135	250.8	3.78	285	256.2	5.03	283	251.4	5.11	125
Body mass index												
Male												
1st quartile	190.2	5.38	145	193.4	2.18	330	191.9	3.12	287	197.9	5.72	89
2d quartile	203.8	3.79	133	207.2	3.56	306	209.3	2.95	310	203.6	6.23	101
3d quartile	222.0	4.42	132	222.2	3.22	334	216.5	3.63	276	216.7	4.86	113
4th quartile	225.8	5.23	154	220.3	2.61	308	224.2	2.95	269	215.5	4.44	125
Female												
1st quartile	192.9	3.63	170	192.0	2.74	434	193.7	3.33	463	195.3	5.02	195
2d quartile	211.5	4.38	178	208.1	2.10	414	203.4	2.98	449	203.9	5.31	222
3d quartile	219.7	4.91	179	221.3	3.00	395	221.2	2.95	466	223.0	5.06	223
4th quartile	234.9	6.39	179	227.2	3.80	441	230.8	2.75	442	226.2	4.12	201

[1] Excludes "other" racial groups.

Table 16. Serum cholesterol levels of adult males ages 18–74 years within dietary cholesterol strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Average daily cholesterol intake (milligrams)											
	Less than 177.945			177.945–412.874			412.875–835.584			835.585 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	212.3	2.34	512	211.4	1.75	1,195	211.8	1.70	1,195	205.4	2.81	541
Race												
White	213.7	2.42	425	211.7	1.81	1,036	212.4	1.87	1,017	206.5	2.90	449
Black	199.5	8.79	87	207.5	4.62	159	206.5	4.79	178	197.3	5.51	92
Age												
18–24 years	177.5	4.42	65	183.0	3.14	191	178.3	2.84	163	177.7	4.35	107
25–34 years	198.1	5.56	62	204.0	3.03	200	202.8	4.18	190	197.6	5.19	113
35–44 years	223.0	8.14	34	219.5	4.29	145	220.5	4.53	166	215.1	6.16	106
45–54 years	235.1	5.03	70	224.5	3.98	191	227.0	4.76	182	225.0	5.18	84
55–64 years	227.2	7.39	56	224.4	5.11	113	225.2	3.53	147	235.5	9.59	51
65–74 years	220.0	3.30	225	231.4	4.37	355	227.9	2.91	347	222.7	5.80	80
Body mass index												
1st quartile	192.7	5.05	136	190.0	3.15	266	197.7	3.08	301	188.2	4.84	157
2d quartile	214.9	5.62	110	208.7	2.80	326	207.6	3.49	301	199.1	4.83	124
3d quartile	227.9	5.28	126	220.3	2.60	305	217.1	4.05	297	218.0	4.20	133
4th quartile	213.1	3.70	140	222.4	3.73	298	225.2	2.34	295	220.4	5.49	127

[1] Excludes "other" racial groups.

Table 17. Serum cholesterol levels of adult females ages 18–74 years within dietary cholesterol strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Average daily cholesterol intake (milligrams)											
	Less than 106.52			106.52–244.78			244.79–570.78			570.79 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	213.6	2.18	758	212.5	2.12	1,768	211.0	1.20	1,768	212.2	2.79	768
Race												
White	212.7	2.25	619	212.8	2.22	1,500	211.1	1.24	1,492	212.5	3.03	607
Black	219.4	6.97	139	208.1	4.23	268	209.4	4.11	276	210.3	3.65	161
Age												
18–24 years	185.6	4.22	154	181.9	2.71	371	183.8	3.06	325	180.1	3.45	156
25–34 years	192.8	3.33	165	193.6	2.34	451	193.4	1.99	426	193.2	3.18	221
35–44 years	209.0	3.87	146	205.6	2.06	374	207.1	2.08	397	217.6	3.41	169
45–54 years	231.8	4.21	74	236.3	3.60	167	225.5	3.61	191	229.0	7.80	99
55–64 years	237.9	6.53	63	251.5	5.69	118	240.4	5.08	115	252.6	6.30	52
65–74 years	255.5	7.66	156	256.1	4.17	287	246.1	3.84	314	261.3	7.73	71
Body mass index												
1st quartile	199.6	4.81	156	189.3	2.83	432	194.0	3.16	490	195.5	3.99	188
2d quartile	204.5	4.86	182	206.5	2.92	468	206.5	2.28	431	206.9	3.55	186
3d quartile	217.7	4.09	202	228.9	2.95	459	217.2	3.64	416	215.6	4.76	187
4th quartile	229.0	2.69	218	228.4	3.63	409	228.9	3.23	431	233.3	7.06	207

[1] Excludes "other" racial groups.

Table 18. Serum cholesterol levels of adults ages 18–74 years within dietary sodium/potassium ratio strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	*Dietary sodium/potassium ratio*											
	Less than 0.5335			*0.5335–0.9526*			*0.9527–1.6360*			*1.6361 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	216.7	1.37	1,276	211.9	1.22	2,977	210.1	1.33	2,977	207.4	2.37	1,275
Sex												
Male	215.3	2.75	408	211.2	1.49	1,212	210.2	1.70	1,275	207.1	3.46	548
Female	217.6	1.92	868	212.7	1.64	1,765	210.0	1.60	1,702	207.8	3.02	727
Race												
White	216.9	1.45	1,097	212.3	1.36	2,584	210.1	1.40	2,507	208.6	2.40	957
Black	214.2	4.60	179	208.0	3.10	393	209.7	4.19	470	200.7	3.85	318
Age												
Total												
18–24 years	184.2	3.03	208	180.5	2.04	492	180.7	1.83	532	181.8	4.03	300
25–34 years	198.2	3.28	256	196.1	2.01	666	199.2	2.41	625	196.2	3.66	281
35–44 years	214.5	3.63	235	212.6	2.02	525	213.5	2.85	572	214.7	4.12	205
45–54 years	236.0	3.03	169	232.8	2.43	382	221.8	2.41	353	223.9	5.69	154
55–64 years	239.9	5.35	120	233.8	3.84	238	234.4	3.59	270	240.4	8.39	87
65–74 years	245.6	3.52	288	243.6	3.91	674	234.8	2.99	625	233.3	5.19	248
Male												
18–24 years	181.4	5.48	58	180.6	2.91	178	179.8	2.02	193	177.3	6.03	97
25–34 years	203.1	5.76	64	200.3	3.15	227	205.4	3.51	189	196.7	5.50	85
35–44 years	228.0	6.60	53	216.6	3.34	150	217.4	4.40	179	222.3	6.42	69
45–54 years	235.6	5.02	55	234.4	3.23	190	219.8	3.60	196	218.2	8.47	86
55–64 years	228.5	6.89	50	220.4	3.88	113	229.0	3.99	146	230.2	10.20	58
65–74 years	227.9	4.77	128	230.8	4.94	354	222.6	2.55	372	226.8	5.45	153
Female												
18–24 years	186.0	3.75	150	180.4	2.47	314	181.6	3.03	339	185.9	4.72	203
25–34 years	195.2	2.54	192	191.0	2.37	439	193.8	2.55	436	195.6	3.77	196
35–44 years	207.3	4.12	182	209.1	1.86	375	209.6	2.59	393	203.4	3.25	136
45–54 years	236.2	3.29	114	231.1	3.85	192	224.5	3.77	157	230.9	5.12	68
55–64 years	248.8	7.58	70	245.6	4.27	125	240.4	5.01	124	259.4	12.49	29
65–74 years	257.5	5.28	160	256.0	4.75	320	248.3	4.95	253	242.1	8.15	95
Body mass index												
Male												
1st quartile	204.2	6.59	85	192.9	3.15	293	192.5	2.38	343	186.2	5.45	139
2d quartile	204.5	5.79	105	210.7	2.58	314	207.0	3.18	301	203.1	5.14	141
3d quartile	222.8	4.45	105	219.6	3.31	304	219.5	3.46	314	217.6	4.34	138
4th quartile	227.1	4.68	113	220.7	2.93	300	220.6	2.64	317	221.8	5.87	130
Female												
1st quartile	193.9	3.19	198	194.6	2.70	425	192.8	2.32	448	189.7	6.99	195
2d quartile	214.8	3.44	219	207.8	2.63	480	202.0	3.12	401	198.1	3.71	167
3d quartile	226.4	5.07	222	219.4	2.87	447	220.2	2.75	434	221.8	4.09	161
4th quartile	234.3	3.64	229	233.2	3.80	413	225.5	3.09	419	224.3	4.53	204

[1] Excludes "other" racial groups.

Table 19. Serum cholesterol levels of adult females ages 18–74 years by extent of use of oral contraceptive agents showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race,[1] age, and body mass index quartile strata	*Oral contraceptive use*								
	Not used in past 6 months			*Used in past 6 months but not now*			*Use now*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
White									
All ages: 18–44 years	191.8	0.98	2,829	194.6	3.33	213	198.0	1.87	884
18–24 years	175.6	2.18	714	186.8	4.53	76	195.3	3.20	373
25–34 years	192.3	1.74	1,038	195.8	5.24	107	197.0	2.04	379
35–44 years	205.1	1.42	1,077	209.7	7.68	30	210.1	4.18	132
Black									
All ages: 18–44 years	197.7	1.91	669	192.0	6.64	55	191.8	4.03	194
18–24 years	181.5	3.32	182	188.5	12.53	27	194.3	5.73	112
25–34 years	199.3	4.29	231	194.2	6.05	24	189.9	7.72	60
35–44 years	211.1	3.15	256	208.0	18.79	4	185.7	8.55	22
Body mass index									
All ages: 18–44 years									
1st quartile	178.3	1.50	788	183.8	4.45	86	196.3	3.31	355
2d quartile	189.3	1.97	869	192.4	5.31	69	193.1	2.34	300
3d quartile	198.2	1.33	910	196.8	5.09	68	197.9	2.04	254
4th quartile	204.7	1.85	988	215.1	7.01	50	208.4	4.24	184
18–24 years									
1st tertile	164.8	2.38	272	171.8	4.96	36	194.1	6.59	146
2d tertile	177.2	2.64	337	192.2	6.34	37	191.4	2.71	185
3d tertile	188.3	3.38	309	203.6	8.47	31	201.8	3.79	160
24–34 years									
1st tertile	182.0	2.33	330	190.1	6.26	42	194.5	3.43	188
2d tertile	194.7	3.01	478	188.7	4.97	58	193.2	3.47	149
3d tertile	200.1	2.32	474	212.2	9.06	35	204.6	4.59	107
35–44 years									
1st tertile	197.0	1.70	388	202.5	10.51	16	212.4	7.58	60
2d tertile	205.6	1.86	505	235.2	21.39	6	207.3	5.64	59
3d tertile	214.8	2.43	461	207.8	9.45	12	200.1	8.12	39

[1] Excludes "other" racial groups.

Table 20. Serum cholesterol levels of adults ages 18–74 years within socioeconomic class strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Socioeconomic status														
	Low			Low middle			Middle			Upper middle			Upper		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	222.5	1.73	1,861	213.5	1.43	3,026	205.4	1.27	2,667	210.1	1.16	3,440	208.0	2.45	500
Sex															
Male	215.8	2.53	818	209.5	2.35	1,091	204.8	1.70	1,039	212.0	1.50	1,306	214.3	4.08	199
Female	228.1	2.10	1,043	216.7	1.66	1,935	205.9	1.79	1,628	208.2	1.51	2,134	201.2	2.53	301
Race															
White	224.1	2.25	1,278	214.8	1.72	2,286	206.0	1.29	2,343	210.3	1.22	3,206	207.4	2.47	488
Black	217.3	2.86	583	207.1	3.13	740	198.2	3.56	324	205.7	5.26	234	237.5	13.38	12
Age															
Total															
18–24 years	181.1	3.62	169	180.6	2.54	557	179.8	2.06	752	182.0	2.14	635	173.1	7.05	42
25–34 years	198.6	3.17	157	199.6	2.78	583	195.4	2.25	573	197.6	1.68	1,042	197.6	4.03	185
35–44 years	206.9	5.75	176	212.9	3.37	483	214.3	2.57	489	212.6	2.05	799	207.6	3.49	126
45–54 years	221.0	5.57	191	225.7	2.51	333	228.6	3.08	336	234.3	3.19	435	231.7	4.14	67
55–64 years	239.5	4.08	217	236.7	4.56	287	235.3	3.37	198	239.7	4.05	216	217.8	7.00	36
65–74 years	240.7	2.19	951	239.8	3.44	783	234.0	3.93	319	238.0	3.14	313	231.9	7.89	44
Male															
18–24 years	180.6	6.48	60	179.1	3.65	170	176.5	2.97	278	179.6	3.18	206	182.0	10.27	12
25–34 years	189.8	7.49	29	203.7	5.71	134	199.4	3.72	192	202.4	2.47	336	198.3	6.41	61
35–44 years	203.0	8.00	49	218.2	6.24	125	223.2	4.97	127	220.6	3.34	258	216.9	5.76	44
45–54 years	217.1	9.65	84	220.1	4.18	143	227.6	4.43	176	232.0	3.44	224	243.2	6.29	34
55–64 years	230.7	5.51	105	220.6	6.46	128	224.8	4.72	102	237.3	4.78	117	221.6	8.83	19
65–74 years	230.3	3.32	491	228.4	4.78	391	216.2	3.81	164	219.8	3.54	165	225.4	10.01	29
Female															
18–24 years	181.6	8.71	109	181.9	3.60	387	182.7	2.84	474	184.2	2.34	429	165.5	5.67	30
25–34 years	203.0	3.37	128	197.1	1.76	449	191.3	2.47	381	192.6	1.83	706	196.9	4.51	124
35–44 years	210.6	6.89	127	208.4	2.04	358	207.7	2.17	362	204.5	2.25	541	196.4	3.91	82
45–54 years	223.8	6.73	107	229.7	4.13	190	229.6	4.14	160	236.9	4.74	211	218.3	6.73	33
55–64 years	247.7	5.08	112	248.1	4.83	159	246.9	6.10	96	242.6	5.77	99	214.7	9.00	17
65–74 years	249.6	3.71	460	250.3	3.83	392	248.4	5.65	155	254.9	4.46	148	241.9	9.84	15
Body mass index															
Male															
1st quartile	206.3	2.03	496	198.2	1.98	945	190.7	1.98	893	195.2	1.68	1,322	192.4	3.21	206
2d quartile	222.8	3.75	394	211.1	2.94	660	204.5	2.75	640	206.8	2.07	797	210.0	4.68	143
3d quartile	231.0	3.16	335	224.5	2.79	561	214.7	3.23	507	221.2	2.24	643	222.9	5.23	82
4th quartile	230.9	3.15	636	225.7	2.16	860	219.2	1.98	627	226.5	2.26	678	219.6	5.45	69
Female															
1st quartile	204.8	4.72	304	195.6	2.61	608	185.2	2.54	526	191.5	2.15	782	189.7	4.62	126
2d quartile	214.7	4.31	368	202.6	3.24	661	200.4	2.09	667	200.6	1.97	927	199.2	3.24	152
3d quartile	228.3	2.50	542	211.5	2.40	878	211.2	2.18	840	217.4	1.76	1,039	219.5	4.51	150
4th quartile	230.6	3.10	647	225.8	2.04	879	218.7	2.12	634	226.5	2.31	692	221.5	4.30	72

[1] Excludes "other" racial groups.

Table 21. Serum cholesterol levels of adults ages 18–74 years within geographic region showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Geographic region											
	Northeast			Midwest			South			West		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	216.4	1.26	2,901	212.1	1.18	3,215	212.1	1.99	3,759	212.2	1.74	3,604
Sex												
Male	215.8	2.35	1,111	209.2	1.67	1,245	209.6	2.31	1,420	212.2	1.62	1,403
Female	216.9	1.68	1,790	214.9	1.53	1,970	214.2	2.34	2,339	212.2	2.26	2,201
Race												
White	216.9	1.42	2,480	211.9	1.31	2,728	212.2	2.12	2,706	212.3	1.65	3,170
Black	210.3	1.97	421	214.4	4.17	487	211.7	2.94	1,053	210.8	5.65	434
Age												
Total												
18–24 years	180.2	1.36	453	179.8	3.28	532	181.1	3.15	658	181.2	2.46	609
25–34 years	200.1	2.08	607	195.8	1.74	698	199.4	3.89	657	195.3	2.47	697
35–44 years	216.8	2.65	519	213.4	2.23	574	209.7	3.69	570	213.3	3.62	628
45–54 years	235.0	4.25	359	231.3	2.19	396	227.5	2.97	412	228.1	2.11	420
55–64 years	239.0	3.64	272	236.2	4.99	283	237.6	5.58	350	238.1	4.37	346
65–74 years	240.4	2.64	691	235.7	2.39	732	237.0	1.49	1,112	245.1	3.36	904
Male												
18–24 years	180.2	2.23	156	176.5	4.44	187	177.6	4.60	218	179.0	2.56	195
25–34 years	205.4	3.88	180	196.4	2.09	213	202.5	6.29	196	200.9	3.39	197
35–44 years	228.5	5.44	156	217.7	3.92	167	215.2	8.12	143	220.4	5.35	191
45–54 years	234.5	6.89	163	226.7	3.43	199	226.7	5.41	191	228.1	2.52	207
55–64 years	230.7	4.92	124	229.6	6.10	133	228.5	6.03	161	227.5	7.03	166
65–74 years	221.7	3.80	332	221.3	1.61	346	223.1	2.27	511	237.0	4.88	447
Female												
18–24 years	180.2	2.87	297	183.2	3.74	345	184.1	3.70	440	183.0	3.35	414
25–34 years	195.0	2.34	427	195.2	2.48	485	196.7	2.61	461	190.5	1.97	500
35–44 years	205.4	2.31	363	209.5	2.30	407	205.2	2.00	427	206.3	3.20	437
45–54 years	235.4	5.16	196	236.5	2.88	197	228.1	4.96	221	228.1	4.23	213
55–64 years	245.8	3.69	148	243.0	4.60	150	246.0	5.89	189	246.8	4.28	180
65–74 years	254.8	2.64	359	246.2	2.78	386	247.1	3.26	601	252.0	4.45	457
Body mass index												
Male												
1st quartile	194.9	3.46	273	191.2	2.92	317	198.3	2.50	498	192.6	1.94	308
2d quartile	210.3	3.32	309	209.8	4.31	279	213.6	4.99	351	209.1	3.20	355
3d quartile	228.7	4.24	239	215.1	2.80	319	213.6	3.89	271	223.9	3.53	356
4th quartile	230.2	3.49	290	219.4	3.73	330	219.3	3.56	300	227.2	3.01	312
Female												
1st quartile	198.2	2.22	476	196.7	3.23	546	199.2	3.42	678	195.1	1.98	651
2d quartile	207.1	3.24	432	209.0	2.08	490	213.4	2.28	534	214.0	3.39	583
3d quartile	228.7	3.56	460	227.4	1.96	448	223.5	3.92	555	225.7	5.09	488
4th quartile	238.1	4.51	422	230.7	3.25	486	227.6	3.64	572	225.4	3.52	479

[1] Excludes "other" racial groups.

Table 22. Serum cholesterol levels of adult males ages 25–74 years within total general well-being strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Total general well-being score*											
	Less than 67			*67–86*			*87–99*			*100 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	217.9	2.56	437	218.3	1.89	1,114	217.9	1.83	1,105	221.7	3.30	421
Race												
White	215.4	2.76	350	217.5	1.71	984	217.8	1.93	1,000	222.3	3.60	361
Black	233.1	9.40	87	226.0	9.89	130	219.4	4.63	105	215.7	6.57	60
Age												
25–34 years	194.9	5.02	77	204.7	4.40	264	200.0	3.04	237	206.5	4.71	79
35–44 years	219.5	5.17	67	215.3	3.00	189	217.6	2.96	195	222.3	8.03	59
45–54 years	221.5	5.86	119	227.5	3.50	260	234.5	3.53	265	233.6	6.32	89
55–64 years	233.6	4.89	101	229.1	3.44	211	225.5	3.34	202	220.5	5.37	81
65–74 years	224.6	7.29	73	226.6	4.13	190	218.1	3.23	206	228.7	4.48	113
Body mass index												
1st quartile	203.1	3.93	133	207.6	3.45	274	202.1	4.08	253	203.4	4.09	104
2d quartile	219.7	5.16	84	216.6	3.58	285	219.7	2.98	299	228.1	5.39	103
3d quartile	225.3	5.64	102	221.6	3.16	275	219.0	2.54	290	229.7	6.54	99
4th quartile	228.5	8.03	117	226.9	4.32	280	230.1	3.30	262	222.5	4.59	114

[1] Excludes "other" racial groups.

Table 23. Serum cholesterol levels of adult females ages 25–74 years within total general well-being strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	Total general well-being score											
	Less than 60			60–79			80–95			96 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	220.5	2.65	541	224.1	1.43	1,275	220.2	1.74	1,263	225.8	2.62	531
Race												
White	221.8	2.92	417	225.2	1.65	1,093	220.0	1.78	1,143	225.0	2.84	484
Black	215.4	5.33	124	216.2	4.48	182	222.9	4.55	120	235.8	8.39	47
Age												
25–34 years	194.6	4.70	124	201.9	2.36	313	192.5	2.72	316	190.3	4.36	101
35–44 years	211.5	4.54	107	208.6	3.07	234	205.0	3.21	243	203.4	4.29	76
45–54 years	227.0	6.06	127	233.1	3.91	287	232.7	3.34	295	235.2	6.19	139
55–64 years	251.1	6.26	93	242.9	4.06	234	245.2	3.99	201	247.8	5.26	112
65–74 years	242.2	5.05	90	254.3	3.18	207	250.4	3.64	208	251.4	4.93	103
Body mass index												
1st quartile	213.1	4.49	112	211.7	2.71	315	205.5	3.03	331	203.6	4.04	137
2d quartile	215.1	4.33	122	222.0	3.17	298	216.5	2.88	353	222.0	4.45	141
3d quartile	226.3	4.88	125	232.1	3.56	306	227.8	4.48	318	234.9	5.16	149
4th quartile	227.0	6.31	181	231.6	2.51	353	236.4	3.58	261	246.7	6.31	104

[1] Excludes "other" racial groups.

Table 24. Serum cholesterol levels of adult males ages 18–74 years within hemoglobin strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	*Hemoglobin level (grams/deciliter)*											
	Less than 14.35			*14.35–15.54*			*15.55–16.74*			*16.75 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	208.6	2.60	729	208.2	1.29	1,647	210.9	1.80	1,443	218.4	2.76	634
Race												
White	208.4	2.57	522	209.1	1.29	1,355	210.6	1.79	1,322	217.3	2.80	589
Black	209.8	7.61	207	201.6	3.82	292	215.9	10.22	121	244.9	20.02	45
Age												
18–24 years	173.6	4.75	60	173.4	2.08	255	180.9	3.05	282	185.0	4.98	112
25–34 years	194.8	4.84	88	197.8	3.08	256	203.4	3.18	278	207.4	4.90	118
35–44 years	213.3	6.18	66	216.6	3.47	254	224.0	3.55	195	232.8	5.36	84
45–54 years	214.7	5.92	101	223.9	2.93	237	232.3	3.38	219	240.2	4.82	110
55–64 years	229.6	6.64	89	226.8	3.60	186	230.8	5.33	136	229.7	10.55	63
65–74 years	215.1	2.75	325	231.0	4.19	459	226.2	3.84	333	233.6	4.69	147
Body mass index												
1st quartile	191.1	3.45	271	186.6	2.78	396	195.8	3.73	320	193.8	4.37	113
2d quartile	208.3	5.14	179	205.7	3.20	421	206.7	3.77	359	214.3	5.22	162
3d quartile	212.0	3.00	145	219.2	2.62	440	220.3	3.04	357	226.0	5.22	173
4th quartile	232.7	6.05	134	218.5	3.08	390	219.4	3.13	407	230.7	6.09	186

[1] Excludes "other" racial groups.

Table 25. Serum cholesterol levels of adult females ages 18–74 years within hemoglobin strata showing means and standard errors of means by race, age and body mass index: United States, 1971–74

Race, age, and body mass index quartile strata	Hemoglobin level (grams/deciliter)											
	Less than 12.65			12.65–13.74			13.75–14.94			14.95 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	204.7	1.51	1,216	206.9	1.56	2,327	213.4	1.65	2,462	224.8	2.34	929
Race												
White	205.5	2.08	797	206.5	1.72	1,936	213.1	1.70	2,175	224.9	2.37	863
Black	202.3	3.75	419	209.7	2.30	391	217.3	4.44	287	223.9	7.23	66
Age												
18–24 years	180.9	2.94	282	180.3	2.46	537	186.8	2.94	463	189.4	5.94	115
25–34 years	193.8	2.95	315	190.8	1.70	604	195.1	1.67	617	201.8	2.29	203
35–44 years	206.0	3.99	271	201.1	2.15	503	207.7	1.87	493	215.7	3.44	183
45–54 years	220.0	4.56	110	229.1	4.20	205	227.7	4.64	256	236.8	6.84	116
55–64 years	247.2	10.11	55	245.7	4.23	140	242.6	3.84	191	250.6	5.10	107
65–74 years	244.6	7.49	183	248.4	4.52	338	254.5	3.46	442	254.4	3.36	205
Body mass index												
1st quartile	185.1	3.73	307	190.8	2.37	626	197.7	3.40	585	209.2	3.80	211
2d quartile	200.6	3.44	325	202.3	2.77	615	208.8	2.28	633	216.3	5.33	180
3d quartile	218.2	4.49	318	216.7	1.96	566	221.5	1.98	625	229.2	5.27	243
4th quartile	219.4	5.05	266	224.0	3.10	520	225.5	4.29	619	239.9	4.57	295

[1] Excludes "other" racial groups.

Table 26. Serum cholesterol levels of adults ages 25–74 years within SGOT strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	SGOT level (units/millimeter)											
	Less than 16.25			16.25–21.74			21.75–29.74			29.75 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	210.0	1.42	812	216.8	1.40	1,850	221.5	1.53	1,838	223.1	2.20	764
Sex												
Male	213.5	3.63	211	214.2	1.99	715	219.2	2.07	1,012	219.2	2.58	535
Female	208.8	1.78	601	218.7	1.59	1,135	224.5	1.97	826	232.4	3.70	229
Race												
White	210.5	1.55	710	217.2	1.47	1,680	220.9	1.32	1,647	223.2	2.49	655
Black	204.5	3.80	102	211.5	4.72	170	227.4	7.42	191	222.5	5.86	109
Age												
Total												
25–34 years	189.9	2.94	265	196.8	2.00	548	203.0	3.73	378	208.1	3.67	173
35–44 years	210.6	3.47	192	209.8	2.56	362	213.8	3.24	309	212.9	3.44	132
45–54 years	222.6	4.45	159	226.7	2.06	391	229.6	3.24	481	235.1	4.50	209
55–64 years	238.3	4.38	102	235.7	3.18	302	234.9	3.32	350	239.6	4.76	138
65–74 years	232.0	5.05	94	244.4	3.09	247	238.1	2.96	320	226.3	4.50	112
Male												
25–34 years	193.7	6.43	48	198.4	3.36	193	202.1	4.81	215	208.5	4.57	131
35–44 years	211.2	6.28	41	214.8	3.66	121	220.7	3.86	181	213.4	4.43	94
45–54 years	223.6	6.88	42	222.7	3.03	137	228.9	4.19	257	228.8	4.23	145
55–64 years	235.9	6.49	35	223.5	4.25	143	228.2	4.48	181	234.2	6.00	92
65–74 years	225.5	5.92	45	227.7	4.25	121	224.7	3.73	178	220.2	5.18	73
Female												
25–34 years	189.0	3.02	217	195.6	2.37	355	204.4	4.42	163	206.3	11.80	42
35–44 years	210.4	4.13	151	206.2	3.61	241	203.1	3.72	128	211.5	6.81	38
45–54 years	222.2	5.74	117	229.0	2.67	254	230.7	3.84	224	249.4	8.19	64
55–64 years	239.3	5.83	67	247.1	3.46	159	241.8	4.44	169	246.9	5.88	46
65–74 years	236.5	8.00	49	258.0	3.59	126	250.5	4.46	142	236.6	8.96	39
Body mass index												
Male												
1st quartile	205.5	5.35	65	202.6	3.40	192	199.5	2.82	245	201.3	6.11	113
2d quartile	211.0	6.36	54	217.0	3.63	199	221.2	4.01	267	220.4	8.21	105
3d quartile	215.8	7.56	49	218.9	3.34	179	223.0	2.66	236	221.7	4.10	135
4th quartile	223.6	7.52	43	220.8	4.45	144	230.2	4.12	262	227.7	4.12	182
Female												
1st quartile	197.9	3.72	154	204.8	3.34	299	216.5	3.77	193	224.1	7.51	46
2d quartile	204.2	3.04	179	216.2	3.25	272	224.6	3.41	210	217.0	8.66	46
3d quartile	218.0	4.35	142	225.7	3.08	288	226.8	4.82	204	245.1	7.42	60
4th quartile	221.6	4.57	126	229.2	3.60	275	230.0	4.49	216	235.1	6.63	77

[1] Excludes "other" racial groups.

Table 27. Serum cholesterol levels of adults ages 25–74 years within serum calcium strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	Serum calcium level (milligrams/deciliter)											
	Less than 9.25			9.25–9.74			9.75–10.14			10.15 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	204.4	1.34	812	214.9	1.04	2,277	223.3	1.42	1,553	233.2	2.63	613
Sex												
Male	205.0	1.88	323	213.2	1.63	1,052	221.7	1.94	773	232.1	3.38	341
Female	204.0	1.69	489	216.4	1.84	1,225	225.0	1.68	780	234.8	3.68	272
Race												
White	204.9	1.44	730	215.4	1.17	2,042	223.3	1.65	1,353	232.7	2.83	526
Black	199.3	5.99	82	208.6	3.06	235	223.2	4.69	200	236.9	6.31	87
Age												
Total												
25–34 years	186.9	4.14	180	192.3	2.11	551	202.6	2.25	434	216.1	4.44	185
35–44 years	195.6	2.32	162	209.7	2.70	416	214.6	3.42	301	228.1	4.97	119
45–54 years	214.0	3.12	183	224.3	1.97	555	239.0	2.72	376	244.9	5.25	139
55–64 years	212.1	4.15	137	234.9	2.59	404	242.6	3.85	244	256.3	3.72	109
65–74 years	225.8	3.99	150	232.3	3.15	351	251.0	3.82	198	244.3	9.95	61
Male												
25–34 years	185.2	4.07	37	193.1	2.83	205	203.3	3.52	220	214.4	4.88	127
35–44 years	205.4	4.71	43	212.2	3.49	176	218.2	4.53	161	236.4	6.77	63
45–54 years	212.2	4.01	86	221.3	3.01	257	243.1	3.01	181	250.3	6.66	67
55–64 years	204.6	5.12	75	226.2	2.68	217	239.7	5.44	117	251.1	4.88	48
65–74 years	211.2	5.98	82	221.6	4.52	197	231.4	4.78	94	251.0	12.17	36
Female												
25–34 years	187.4	5.15	143	191.7	2.98	346	201.6	2.37	214	220.4	8.02	58
35–44 years	192.0	2.75	119	207.3	3.60	240	209.9	3.79	140	219.1	6.59	56
45–54 years	215.6	3.85	97	227.1	3.59	298	235.3	3.76	195	238.8	7.46	72
55–64 years	221.1	5.77	62	243.3	3.83	187	245.1	6.20	127	260.0	5.25	61
65–74 years	239.5	4.95	68	243.7	4.37	154	265.4	4.68	104	237.9	12.35	25
Body mass index												
Male												
1st quartile	190.9	4.19	86	201.3	3.46	270	204.8	4.48	165	217.8	5.13	95
2d quartile	208.6	4.86	72	212.3	3.33	248	222.5	4.14	221	235.9	5.99	91
3d quartile	210.3	2.40	91	219.0	3.32	265	222.9	3.01	189	235.1	6.68	72
4th quartile	212.5	6.55	74	219.4	2.74	268	233.3	4.01	196	239.9	6.90	83
Female												
1st quartile	192.2	4.22	112	205.0	3.36	303	210.8	2.93	204	223.0	5.59	74
2d quartile	203.2	3.83	153	211.9	3.08	288	219.3	4.42	194	224.8	6.38	64
3d quartile	214.4	4.84	106	222.2	3.28	322	235.5	4.11	187	242.4	8.72	61
4th quartile	207.6	3.80	118	226.9	3.96	311	239.1	4.19	192	250.3	7.32	73

[1] Excludes "other" racial groups.

Table 28. Serum cholesterol levels of adults ages 25–74 years within serum magnesium strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	Serum magnesium level (milligrams/deciliter)											
	Less than 1.555			1.555–1.684			1.685–1.824			1.825 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	209.5	1.54	891	215.6	1.54	1,997	220.5	1.10	2,066	228.1	2.17	815
Sex												
Male	209.3	3.00	340	215.9	2.09	889	218.3	1.79	1,053	226.3	2.42	449
Female	209.5	2.30	551	215.4	1.70	1,108	223.1	1.92	1,013	230.4	3.59	366
Race												
White	209.2	1.66	713	215.0	1.29	1,771	220.7	1.18	1,854	227.9	2.22	762
Black	210.5	4.63	178	221.6	7.22	226	217.9	3.94	212	232.7	10.62	53
Age												
Total												
25–34 years	194.1	2.77	280	199.2	3.36	553	199.5	2.09	480	204.4	3.46	161
35–44 years	199.5	3.13	168	209.8	2.12	416	213.8	2.87	366	222.8	4.62	141
45–54 years	226.4	4.26	207	225.7	2.58	446	230.3	2.36	535	237.3	3.99	188
55–64 years	228.9	6.23	122	233.5	3.95	322	238.6	2.89	362	242.0	3.53	166
65–74 years	226.1	4.27	114	236.1	3.56	260	235.2	3.09	323	245.6	4.06	159
Male												
25–34 years	192.8	4.25	81	204.2	5.10	231	201.7	3.16	237	205.8	3.48	91
35–44 years	203.8	6.12	54	214.0	2.69	165	217.5	3.94	183	230.4	6.05	82
45–54 years	221.6	5.55	81	225.9	4.43	183	230.8	3.40	286	234.5	3.87	104
55–64 years	221.4	7.63	61	225.6	4.84	160	232.0	3.58	176	229.6	4.83	92
65–74 years	214.7	7.18	63	223.4	4.44	150	217.7	3.66	171	241.2	6.73	80
Female												
25–34 years	194.6	3.56	199	194.7	2.76	322	196.4	2.80	243	202.5	6.46	70
35–44 years	197.3	3.59	114	206.7	3.04	251	208.8	3.63	183	210.7	5.50	59
45–54 years	229.6	6.92	126	225.5	2.65	263	229.8	3.68	249	241.2	7.59	84
55–64 years	235.7	7.41	61	240.6	4.83	162	244.2	3.66	186	256.3	5.41	74
65–74 years	238.5	5.50	51	248.8	5.54	110	251.3	3.52	152	249.3	5.91	79
Body mass index												
Male												
1st quartile	196.1	4.62	98	200.2	2.94	220	203.3	3.71	260	209.1	3.43	102
2d quartile	214.1	5.26	83	214.3	3.43	228	224.6	3.87	251	222.5	4.44	120
3d quartile	210.0	6.10	75	219.8	3.36	216	219.6	2.72	274	237.1	4.38	117
4th quartile	218.0	5.81	84	227.7	5.37	224	226.5	3.38	267	233.5	4.19	109
Female												
1st quartile	200.8	5.48	142	204.5	3.12	266	210.1	3.10	249	214.9	7.70	94
2d quartile	203.2	3.11	136	212.3	2.89	296	221.9	2.92	252	218.8	5.62	78
3d quartile	215.1	4.50	128	220.5	4.43	271	228.7	3.31	269	247.1	7.83	91
4th quartile	220.7	5.37	144	225.1	3.34	273	232.0	4.80	243	242.1	4.20	102

[1] Excludes "other" racial groups.

Table 29. Serum cholesterol levels of adult males ages 25–74 years within serum urate strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Serum urate level (milligrams/deciliter)*											
	Less than 4.95			*4.95–6.14*			*6.15–7.54*			*7.55 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	212.4	2.19	403	216.2	1.76	955	216.5	1.93	935	228.8	3.49	438
Race												
White	212.6	2.35	360	216.7	1.86	856	216.5	1.99	837	224.7	3.23	367
Black	209.3	7.90	43	210.6	4.30	99	216.2	6.07	98	254.3	14.51	71
Age												
25–34 years	188.2	4.12	71	202.6	3.91	243	202.0	2.87	234	212.2	10.03	92
35–44 years	210.2	3.98	65	213.9	3.70	177	218.5	4.01	166	228.0	5.54	76
45–54 years	223.6	6.84	102	228.7	3.19	212	228.8	3.88	221	234.3	5.72	119
55–64 years	221.6	4.40	81	228.9	3.50	172	223.2	4.13	167	243.8	6.29	69
65–74 years	224.4	6.32	84	222.5	3.52	151	216.6	4.08	147	234.9	6.80	82
Body mass index												
1st quartile	203.0	2.86	167	203.4	3.27	269	197.0	4.09	175	209.0	6.26	69
2d quartile	219.6	5.71	111	217.8	3.35	276	218.5	4.65	220	231.9	7.24	75
3d quartile	211.8	4.80	87	219.6	2.82	220	223.5	2.56	258	230.4	5.50	117
4th quartile	232.2	7.63	38	227.4	5.28	188	220.7	2.55	281	234.2	6.31	177

[1] Excludes "other" racial groups.

Table 30. Serum cholesterol levels of adult females ages 25–74 years within serum urate strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Serum urate level (milligrams/deciliter)*											
	Less than 3.65			*3.65–4.64*			*4.65-5.94*			*5.95 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	207.2	2.44	478	214.1	1.74	1,054	224.1	1.83	999	228.9	2.48	507
Race												
White	207.2	2.56	432	214.6	1.73	952	225.2	2.07	889	228.8	2.47	407
Black	206.7	6.43	46	208.2	5.19	102	211.9	4.98	110	229.1	7.92	100
Age												
25–34 years	190.7	3.88	166	194.1	2.54	321	198.9	2.80	259	204.5	5.51	88
35–44 years	199.6	4.97	105	204.4	2.60	235	211.7	2.90	192	204.1	6.51	75
45–54 years	215.1	4.78	111	224.5	3.32	268	239.8	4.68	229	236.5	5.80	114
55–64 years	246.9	6.48	54	243.7	4.53	134	241.1	3.78	176	245.9	5.91	119
65–74 years	233.7	6.06	42	249.5	4.23	96	251.2	4.47	143	250.1	5.07	111
Body mass index												
1st quartile	198.4	3.26	189	208.3	3.19	320	210.8	3.27	205	221.7	10.48	37
2d quartile	206.0	4.64	135	214.3	2.72	319	220.1	2.72	225	211.1	7.27	83
3d quartile	218.7	4.99	109	216.4	3.26	245	231.1	3.17	264	234.2	6.61	141
4th quartile	220.6	9.09	45	221.7	3.88	168	231.1	3.86	304	232.7	3.30	245

[1] Excludes "other" racial groups.

Table 31. Serum urate levels of adults ages 25–74 years showing means, standard erros of means and selected percentiles by sex and race: United States, 1971–75

Sex, race, and age	Mean	Standard error of the mean	Percentile 5th	10th	25th	50th	75th	90th	95th	Number of examinees	Estimated population in thousands
			Milligrams/deciliter								
Male											
Total[1]	6.3	0.02	4.3	4.7	5.5	6.2	7.2	8.1	8.7	3,171	48,857
White	6.2	0.02	4.3	4.7	5.4	6.2	7.1	8.1	8.5	2,744	43,903
Age											
25–34 years	6.2	0.05	4.6	4.9	5.5	6.2	7.0	7.8	8.4	592	11,846
35–44 years	6.2	0.06	4.5	4.7	5.4	6.2	7.0	7.9	8.5	466	9,219
45–54 years	6.3	0.05	4.1	4.6	5.4	6.3	7.3	8.2	8.7	647	9,886
55–64 years	6.2	0.06	3.7.	4.4	5.4	6.2	7.2	8.1	8.6	538	8,006
65–74 years	6.3	0.06	4.5	4.7	5.4	6.3	7.2	8.2	8.9	501	4,946
Black	6.6	0.07	4.5	4.8	5.6	6.5	7.7	8.7	9.5	390	44,114
Age											
25–34 years	6.3	0.15	4.5	4.9	5.7	6.3	7.2	8.2	8.6	72	1,220
35–44 years	6.7	0.21	4.6	4.8	5.6	6.5	7.6	9.5	10.0	53	1,005
45–54 years	6.8	0.15	4.7	4.9	5.6	6.5	7.8	9.1	9.8	99	994
55–64 years	6.9	0.17	4.4	4.9	5.8	7.0	8.0	8.6	9.2	76	724
65–74 years	6.6	0.17	3.7	4.1	5.6	6.7	7.8	8.5	9.6	90	471
Female											
Total[1]	4.8	0.02	2.9	3.5	4.0	4.7	5.6	6.6	7.2	3,742	53,927
White	4.8	0.02	2.9	3.5	4.0	4.7	5.5	6.5	7.2	3,224	47,705
Age											
25–34 years	4.5	0.04	2.8	3.1	3.8	4.4	5.2	5.8	6.3	778	12,324
35–44 years	4.6	0.04	2.9	3.3	3.8	4.5	5.3	6.2	6.7	580	9,518
45–54 years	4.8	0.04	3.0	3.5	3.9	4.7	5.5	6.4	7.1	756	10,588
55–64 years	5.2	0.06	3.4	3.7	4.2	5.1	6.1	7.1	7.6	572	8,876
65–74 years	5.3	0.06	3.3	3.7	4.4	5.3	6.3	7.2	7.6	538	6,399
Black	5.1	0.06	2.9	3.5	4.0	4.9	6.1	7.2	7.9	483	5,733
Age											
25–34 years	4.6	0.12	2.8	3.1	3.8	4.5	5.5	6.3	6.9	104	1,658
35–44 years	4.7	0.13	2.9	3.5	3.9	4.5	5.4	6.6	7.2	97	1,348
45–54 years	5.3	0.13	3.5	3.7	4.3	5.2	6.3	7.3	7.9	107	1,253
55–64 years	5.8	0.17	2.9	3.5	4.5	5.6	7.3	8.1	8.4	85	845
65–74 years	5.6	0.18	3.3	3.7	4.3	5.6	6.9	7.8	8.4	90	629

[1] Excludes "other" racial groups.

Table 32. Serum urate levels of adult males ages 25–74 years within body mass index strata showing means and standard errors of means by race and age: United States, 1971–75

Race and age	*Body mass index (kilograms/meters²)*														
	Less than 22.270			*22.270–24.449*			*24.450–26.353*			*26.354–28.482*			*28.483 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.7	0.05	523	5.9	0.07	530	6.2	0.06	534	6.3	0.06	532	6.9	0.08	534
Race															
White	5.7	0.06	454	5.9	0.07	479	6.2	0.06	476	6.3	0.07	489	6.8	0.08	466
Black	5.7	0.23	69	6.1	0.17	51	6.6	0.19	58	6.3	0.23	43	7.4	0.22	68
Age															
25–34 years	5.9	0.11	143	5.9	0.10	141	6.2	0.11	116	6.3	0.13	110	7.0	0.18	114
35–44 years	5.5	0.15	83	5.9	0.16	96	6.2	0.15	99	6.3	0.13	102	6.7	0.16	89
45–54 years	5.6	0.17	105	6.0	0.11	118	6.2	0.12	132	6.4	0.12	138	6.9	0.14	139
55–64 years	5.8	0.20	94	5.5	0.24	79	6.3	0.16	108	6.1	0.14	95	6.9	0.12	105
65–74 years	5.7	0.16	98	6.0	0.14	96	6.3	0.16	79	6.3	0.19	87	6.7	0.18	87

[1] Excludes "other" racial groups.

Table 33. Serum urate levels of adult females ages 25–74 years within body mass index strata showing means and standard errors of means by race and age: United States, 1971–75

Race and age	Body mass index (kilograms/meters²)														
	Less than 20.706			20.706–22.843			22.844–25.203			25.204–28.907			28.908 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	4.2	0.04	592	4.4	0.05	598	4.6	0.05	589	4.9	0.06	590	5.5	0.06	596
Race															
White	4.2	0.05	549	4.4	0.06	565	4.6	0.05	536	4.9	0.07	501	5.5	0.07	472
Black	4.3	0.15	43	4.5	0.17	33	4.5	0.22	53	4.9	0.11	89	5.4	0.14	124
Age															
25–34 years	4.2	0.08	258	4.4	0.07	205	4.4	0.11	136	4.5	0.14	101	5.3	0.13	116
35–44 years	4.1	0.08	131	4.3	0.13	137	4.6	0.09	111	4.7	0.10	115	5.5	0.12	95
45–54 years	4.2	0.08	108	4.3	0.10	142	4.6	0.10	145	5.0	0.11	166	5.3	0.11	151
55–64 years	4.3	0.17	53	4.7	0.18	70	4.8	0.13	109	5.0	0.10	111	5.5	0.14	128
65–74 years	4.5	0.15	42	4.7	0.18	44	5.0	0.14	88	5.4	0.15	97	5.7	0.15	106

[1] Excludes "other" racial groups.

Table 34. Serum urate levels of adult males ages 25–74 years within total skinfold (triceps and subscapular) thickness strata showing means and standard errors of means by race and age: United States, 1971–75

Race and age	*Total skinfold thickness (millimeters)*														
	Less than 17.0			*17.0–22.9*			*23.0–28.9*			*29.0–36.5*			*36.6 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.7	0.07	470	6.0	0.07	556	6.2	0.07	509	6.4	0.07	535	6.6	0.06	580
Race															
White	5.6	0.08	385	6.0	0.07	497	6.2	0.07	481	6.4	0.08	474	6.6	0.06	523
Black	5.9	0.18	85	6.1	0.22	59	6.8	0.26	28	6.7	0.26	61	7.0	0.28	57
Age															
25–34 years	5.9	0.10	115	6.0	0.10	143	6.2	0.10	118	6.4	0.19	109	6.7	0.13	138
35–44 years	5.6	0.15	75	6.1	0.17	93	6.2	0.14	89	6.3	0.15	106	6.5	0.15	106
45–54 years	5.6	0.15	105	6.1	0.12	123	6.4	0.14	120	6.4	0.13	117	6.6	0.10	165
55–64 years	5.7	0.25	78	5.8	0.14	110	6.3	0.15	93	6.5	0.15	105	6.6	0.14	96
65–74 years	5.6	0.13	97	6.3	0.12	87	6.1	0.18	89	6.5	0.13	98	6.4	0.21	75

[1] Excludes "other" racial groups.

Table 35. Serum urate levels of adult females ages 25–74 years within total skinfold (triceps and subscapular) thickness strata showing means and standard errors of means by race and age: United States, 1971–75

Race and age	*Total skinfold thickness (millimeters)*														
	Less than 28.0			*28.0–36.4*			*36.5–45.9*			*46.0–58.0*			*58.1 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	4.2	0.06	608	4.4	0.05	605	4.7	0.07	601	5.0	0.06	580	5.3	0.07	553
Race															
White	4.2	0.06	551	4.4	0.05	566	4.6	0.07	561	5.0	0.06	489	5.4	0.07	440
Black	4.5	0.14	57	4.6	0.26	39	5.2	0.30	40	4.8	0.18	91	5.0	0.13	113
Age															
25–34 years	4.2	0.07	238	4.3	0.09	190	4.4	0.14	143	4.7	0.12	109	5.1	0.13	125
35–44 years	4.1	0.08	129	4.3	0.10	124	4.5	0.14	111	4.9	0.09	116	5.3	0.10	107
45–54 years	4.2	0.09	113	4.4	0.09	125	4.6	0.09	158	4.9	0.12	150	5.2	0.11	164
55–64 years	4.4	0.27	63	4.7	0.12	95	4.8	0.13	99	5.2	0.11	113	5.5	0.16	99
65–74 years	4.6	0.14	65	4.7	0.14	71	5.3	0.15	90	5.4	0.19	92	5.8	0.18	58

[1] Excludes "other" racial groups.

Table 36. Serum urate levels of adults ages 25–74 years within geographic region strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	Northeast Mean	Northeast Standard error of mean	Northeast Number of examinees	Midwest Mean	Midwest Standard error of mean	Midwest Number of examinees	South Mean	South Standard error of mean	South Number of examinees	West Mean	West Standard error of mean	West Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.5	0.05	1,333	5.5	0.05	1,421	5.4	0.07	1,352	5.4	0.04	1,518
Sex												
Male	6.3	0.06	630	6.3	0.06	647	6.2	0.09	648	6.2	0.08	731
Female	4.7	0.06	703	4.7	0.06	774	4.7	0.07	704	4.7	0.06	787
Race												
White	5.5	0.07	1,213	5.4	0.05	1,269	5.3	0.07	1,104	5.4	0.04	1,406
Black	5.4	0.26	120	5.9	0.12	152	5.6	0.15	248	5.5	0.18	112
Age												
25–34 years	5.4	0.12	330	5.4	0.09	379	5.2	0.10	345	5.3	0.08	388
35–44 years	5.4	0.10	258	5.3	0.10	285	5.3	0.11	226	5.4	0.08	290
45–54 years	5.5	0.11	337	5.6	0.08	329	5.3	0.08	331	5.5	0.10	347
55–64 years	5.6	0.14	231	5.6	0.15	236	5.6	0.16	226	5.4	0.09	261
65–74 years	5.8	0.11	177	5.6	0.09	192	5.7	0.16	224	5.6	0.09	232
Body mass index												
Male												
1st quartile	5.9	0.13	155	5.9	0.12	130	5.7	0.11	197	5.5	0.08	173
2d quartile	6.2	0.10	148	6.0	0.10	152	6.0	0.12	165	6.0	0.12	204
3d quartile	6.2	0.09	157	6.2	0.13	197	6.5	0.21	137	6.3	0.10	171
4th quartile	6.9	0.11	168	6.9	0.16	168	6.6	0.10	148	6.7	0.16	183
Female												
1st quartile	4.2	0.05	160	4.2	0.08	198	4.2	0.12	174	4.3	0.09	212
2d quartile	4.5	0.11	155	4.5	0.11	195	4.4	0.11	171	4.6	0.09	225
3d quartile	4.6	0.13	180	4.8	0.13	188	4.9	0.12	183	4.8	0.12	183
4th quartile	5.3	0.07	207	5.6	0.10	193	5.2	0.10	174	5.3	0.16	167

[1] Excludes "other" racial groups.

Table 37. Serum urate levels of adults ages 25–74 years within strata of weekly ethanol consumption showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	*Ethanol consumption (ounces/week)*											
	Abstainers (0)			*Light (0.001–0.999)*			*Moderate (1.000–6.999)*			*Heavy (7,000 or more)*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.01	0.070	668	5.18	0.048	786	5.71	0.057	750	6.35	0.088	228
Sex												
Male	5.73	0.085	238	6.04	0.057	363	6.28	0.077	488	6.49	0.104	194
Female	4.64	0.077	430	4.49	0.056	423	4.75	0.094	262	5.44	0.201	34
Race												
White	5.01	0.081	557	5.15	0.054	691	5.69	0.060	635	6.35	0.094	195
Black	4.98	0.181	111	5.49	0.124	95	5.88	0.263	115	6.31	0.255	33
Age												
Total												
25–34 years	4.93	0.174	83	5.01	0.097	227	5.75	0.137	186	6.05	0.128	49
35–44 years	5.03	0.197	85	4.99	0.101	135	5.33	0.120	150	6.39	0.169	53
45–54 years	4.89	0.119	165	5.28	0.105	187	5.88	0.114	211	6.26	0.138	62
55–64 years	5.08	0.118	155	5.50	0.182	124	5.81	0.178	112	6.88	0.295	35
65–74 years	5.15	0.090	180	5.77	0.165	113	6.09	0.164	91	6.83	0.284	29
Male												
25–34 years	6.03	0.273	20	5.90	0.112	97	6.44	0.153	122	6.18	0.157	40
35–44 years	6.08	0.253	27	5.94	0.144	49	5.85	0.150	84	6.51	0.180	44
45–54 years	5.54	0.172	63	6.16	0.124	78	6.45	0.127	138	6.50	0.171	52
55–64 years	5.69	0.186	53	6.21	0.162	69	6.26	0.235	75	6.93	0.324	31
65–74 years	5.42	0.135	75	6.25	0.176	70	6.33	0.188	69	6.85	0.265	27
Female												
25–34 years	4.47	0.109	63	4.34	0.081	130	4.46	0.185	64	5.11	0.432	9
35–44 years	4.48	0.229	58	4.33	0.083	86	4.72	0.185	66	5.47	0.421	9
45–54 years	4.54	0.142	102	4.67	0.116	109	4.71	0.114	73	5.19	0.284	10
55–64 years	4.76	0.127	102	4.66	0.181	55	5.17	0.220	37	6.49	0.484	4
65–74 years	5.00	0.102	105	5.14	0.176	43	5.49	0.194	22	6.62	0.865	2
Body mass index												
Male												
1st quartile	4.54	0.118	190	4.57	0.084	267	5.01	0.108	235	5.80	0.117	75
2d quartile	4.82	0.088	153	5.19	0.097	187	5.67	0.095	187	6.37	0.189	50
3d quartile	5.13	0.105	122	5.70	0.169	139	6.03	0.096	147	6.53	0.187	51
4th quartile	5.60	0.108	203	5.76	0.090	193	6.53	0.149	181	6.77	0.227	52
Female												
1st quartile	4.38	0.123	122	4.35	0.067	178	4.85	0.163	147	5.73	0.182	44
2d quartile	4.78	0.114	157	4.99	0.130	190	5.39	0.118	204	6.16	0.157	62
3d quartile	5.05	0.081	208	5.53	0.102	252	5.98	0.076	245	6.41	0.143	85
4th quartile	5.63	0.120	181	5.82	0.105	166	6.68	0.166	154	7.07	0.215	37

[1] Excludes "other" racial groups.

Table 38. Serum urate levels of adults ages 25–74 years within strata of dietary purine showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–74

Sex, race, age, and body mass index quartile strata	Purine-rich food intake (times/week)											
	Less than 8.00			*8.00–11.99*			*12.00–16.99*			*17.00 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.3	0.08	377	5.3	0.04	915	5.4	0.06	1,023	5.6	0.09	415
Sex												
Male	6.1	0.11	153	6.2	0.09	392	6.2	0.05	552	6.1	0.09	272
Female	4.8	0.10	224	4.6	0.06	523	4.6	0.07	471	4.6	0.11	143
Race												
White	5.3	0.08	310	5.2	0.05	781	5.4	0.06	915	5.6	0.10	345
Black	5.4	0.23	67	5.7	0.26	134	5.3	0.16	108	5.8	0.21	70
Age												
Total												
25–34 years	5.7	0.17	64	5.2	0.13	181	5.3	0.11	259	5.5	0.12	117
35–44 years	4.7	0.14	34	5.1	0.13	150	5.2	0.10	208	5.8	0.21	85
45–54 years	5.3	0.15	79	5.4	0.11	230	5.4	0.08	271	5.6	0.21	121
55–64 years	5.5	0.17	87	5.4	0.13	171	5.7	0.17	166	5.4	0.34	49
65–74 years	5.6	0.10	113	5.7	0.15	183	5.6	0.13	119	5.9	0.21	43
Male												
25–34 years	6.0	0.19	22	6.5	0.26	65	6.1	0.10	137	6.0	0.10	75
35–44 years	5.5	0.34	9	5.8	0.20	58	6.1	0.11	99	6.4	0.23	54
45–54 years	6.2	0.21	31	6.3	0.15	89	6.2	0.10	147	6.3	0.17	77
55–64 years	6.3	0.22	35	6.1	0.20	78	6.4	0.16	96	5.7	0.38	34
65–74 years	6.0	0.21	56	6.3	0.18	102	6.1	0.18	73	5.9	0.26	32
Female												
25–34 years	4.6	0.16	42	4.3	0.10	116	4.5	0.13	122	4.4	0.16	42
35–44 years	4.4	0.16	25	4.5	0.14	92	4.5	0.09	109	4.6	0.29	31
45–54 years	4.8	0.13	48	4.7	0.09	141	4.6	0.10	124	4.6	0.26	44
55–64 years	5.1	0.21	52	4.8	0.11	93	4.9	0.16	70	4.9	0.43	15
65–74 years	5.3	0.17	57	5.1	0.20	81	5.1	0.19	46	5.8	0.37	11
Body mass index												
Male												
1st quartile	5.4	0.33	50	5.8	0.14	116	5.7	0.10	130	5.6	0.13	86
2d quartile	6.0	0.17	50	5.9	0.15	106	6.1	0.09	163	6.2	0.16	75
3d quartile	5.8	0.16	44	6.3	0.12	131	6.1	0.10	148	6.2	0.18	61
4th quartile	6.6	0.16	45	6.6	0.22	105	6.7	0.09	173	6.9	0.15	67
Female												
1st quartile	4.5	0.21	57	4.3	0.11	146	4.1	0.08	161	4.2	0.14	42
2d quartile	4.5	0.11	72	4.5	0.09	147	4.3	0.09	141	4.3	0.22	40
3d quartile	4.8	0.10	76	4.6	0.13	157	5.0	0.11	131	4.7	0.20	38
4th quartile	5.6	0.14	84	5.1	0.12	156	5.2	0.13	116	5.3	0.28	39

[1] Excludes "other" racial groups.

Table 39. Serum urate levels of adult males ages 25–74 years within systolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	Systolic blood pressure (millimeters of mercury)											
	Less than 114			114–129			130–150			151 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	6.0	0.07	351	6.0	0.04	1,042	6.4	0.06	894	6.7	0.08	369
Race												
White	6.0	0.07	322	6.0	0.05	965	6.3	0.07	787	6.6	0.08	292
Black	6.0	0.26	29	6.1	0.17	77	6.6	0.19	107	6.9	0.18	77
Age												
25–34 years	6.1	0.11	109	6.1	0.07	294	6.5	0.15	178	6.6	0.24	43
35–44 years	5.9	0.13	62	6.0	0.10	171	6.4	0.12	170	6.7	0.19	67
45–54 years	5.8	0.23	52	6.2	0.08	223	6.3	0.11	238	6.7	0.14	119
55–64 years	6.2	0.24	50	5.8	0.16	178	6.3	0.10	171	6.7	0.22	84
65–74 years	6.0	0.16	78	6.1	0.11	176	6.2	0.14	137	6.8	0.22	56
Body mass index												
1st quartile	5.8	0.09	151	5.7	0.09	280	5.8	0.10	174	5.8	0.20	50
2d quartile	6.0	0.12	100	6.0	0.07	297	6.1	0.10	201	6.4	0.21	71
3d quartile	6.2	0.17	66	6.1	0.08	273	6.3	0.12	238	6.6	0.16	86
4th quartile	6.3	0.19	34	6.5	0.10	191	6.9	0.11	280	7.1	0.11	161

[1] Excludes "other" racial groups.

Table 40. Serum urate levels of adult female ages 25–74 years within systolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Systolic blood pressure (millimeters of mercury)*											
	Less than 108			*109–121*			*122–150*			*151 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	4.3	0.05	382	4.6	0.04	1,356	4.9	0.05	848	5.2	0.09	382
Race												
White	4.3	0.06	358	4.6	0.05	1,221	4.9	0.06	757	5.2	0.09	290
Black	4.4	0.22	24	4.7	0.12	135	5.1	0.15	91	5.1	0.19	92
Age												
25–34 years	4.2	0.08	189	4.4	0.06	425	4.8	0.11	169	4.9	0.29	35
35–44 years	4.1	0.10	79	4.5	0.07	284	4.9	0.11	170	5.0	0.21	56
45–54 years	4.2	0.15	53	4.7	0.08	316	4.7	0.06	229	5.2	0.19	114
55–64 years	4.9	0.25	27	4.8	0.08	200	5.2	0.15	156	5.2	0.17	88
65–74 years	4.8	0.34	34	5.1	0.15	131	5.2	0.12	124	5.5	0.18	89
Body mass index												
1st quartile	4.2	0.07	161	4.2	0.05	386	4.3	0.10	158	4.8	0.18	39
2d quartile	4.3	0.11	116	4.5	0.08	400	4.5	0.09	190	4.7	0.21	40
3d quartile	4.3	0.13	77	4.7	0.08	333	4.9	0.08	230	5.1	0.22	95
4th quartile	4.9	0.31	27	5.2	0.08	236	5.5	0.08	270	5.4	0.10	207

[1] Excludes "other" racial groups.

Table 41. Serum urate levels of adult males ages 25–74 years within diastolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Diastolic blood pressure (millimeters of mercury)*											
	Less than 72			*72–83*			*84–96*			*97 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	6.0	0.08	402	6.2	0.05	1,073	6.4	0.06	805	6.4	0.08	376
Race												
White	6.0	0.08	373	6.1	0.06	976	6.3	0.06	712	6.4	0.08	305
Black	6.0	0.23	29	6.4	0.22	97	6.5	0.17	93	6.9	0.30	71
Age												
25–34 years	6.2	0.13	137	6.1	0.08	324	6.4	0.14	150	6.8	0.40	13
35–44 years	5.8	0.13	92	6.2	0.09	219	6.4	0.15	132	6.3	0.39	27
45–54 years	6.0	0.16	80	6.2	0.10	264	6.4	0.10	205	6.7	0.17	83
55–64 years	5.5	0.27	50	6.0	0.16	155	6.4	0.11	171	6.3	0.18	107
65–74 years	5.9	0.17	43	6.3	0.15	111	6.1	0.11	147	6.3	0.15	146
Body mass index												
1st quartile	5.8	0.16	151	5.7	0.08	284	5.7	0.14	148	5.8	0.22	72
2d quartile	6.0	0.08	119	6.0	0.07	279	6.3	0.10	192	6.0	0.14	79
3d quartile	6.0	0.13	82	6.2	0.09	275	6.3	0.09	212	6.6	0.18	94
4th quartile	6.3	0.23	50	6.8	0.12	235	6.8	0.10	251	6.9	0.14	130

[1] Excludes "other" racial groups.

Table 42. Serum urate levels of adult females ages 25–74 years within diastolic blood pressure level strata showing means and standard errors of means by race, age and body mass index: United States, 1971–75

Race, age, and body mass index quartile strata	*Diastolic blood pressure (millimeters of mercury)*											
	Less than 70			*70–79*			*80–91*			*92 or more*		
	Mean	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*	*Mean*	*Standard error of mean*	*Number of examinees*
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	4.4	0.05	447	4.6	0.04	1,064	4.8	0.05	1,078	5.1	0.07	379
Race												
White	4.4	0.05	407	4.6	0.04	962	4.9	0.05	969	5.1	0.07	288
Black	4.7	0.26	40	4.7	0.12	102	4.7	0.14	109	5.5	0.18	91
Age												
25–34 years	4.3	0.08	219	4.5	0.06	415	4.5	0.10	173	5.2	0.38	11
35–44 years	4.3	0.07	116	4.5	0.08	269	4.7	0.11	178	5.2	0.36	26
45–54 years	4.5	0.11	78	4.5	0.08	240	4.9	0.07	298	5.0	0.14	96
55–64 years	4.8	0.20	24	4.9	0.13	95	5.0	0.11	249	5.1	0.12	103
65–74 years	5.6	0.66	10	5.0	0.17	45	5.1	0.12	180	5.3	0.16	143
Body mass index												
1st quartile	4.1	0.06	194	4.3	0.06	315	4.3	0.10	193	4.5	0.19	42
2d quartile	4.4	0.09	135	4.4	0.09	319	4.5	0.08	241	4.6	0.16	51
3d quartile	4.6	0.14	82	4.6	0.11	232	4.9	0.08	316	5.0	0.15	105
4th quartile	5.4	0.31	34	5.2	0.09	198	5.4	0.09	328	5.5	0.10	180

[1] Excludes "other" racial groups.

Table 43. Serum urate levels of adults ages 25–74 years within SGOT strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	SGOT level (units/milliliter)											
	Less than 16.2			16.2–21.7			21.8–29.6			29.7 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	4.8	0.05	778	5.3	0.04	1,863	5.7	0.04	1,823	6.2	0.07	792
Sex												
Male	5.8	0.10	199	6.1	0.06	719	6.3	0.05	997	6.6	0.08	557
Female	4.4	0.04	579	4.7	0.04	1,144	4.9	0.06	826	5.3	0.09	235
Race												
White	4.8	0.05	680	5.3	0.04	1,693	5.6	0.04	1,634	6.2	0.08	675
Black	4.8	0.17	98	5.2	0.16	170	5.9	0.15	189	6.5	0.22	117
Age												
Total												
25–34 years	4.6	0.09	252	5.1	0.06	553	5.7	0.08	379	6.4	0.17	174
35–44 years	4.7	0.10	183	5.2	0.08	364	5.6	0.10	304	6.1	0.13	143
45–54 years	4.7	0.11	153	5.2	0.07	396	5.7	0.07	475	6.3	0.12	216
55–64 years	4.9	0.14	99	5.5	0.10	301	5.7	0.10	348	6.2	0.17	145
65–74 years	5.7	0.21	91	5.7	0.10	249	5.6	0.09	317	6.1	0.17	114
Male												
25–34 years	5.9	0.15	46	6.0	0.08	191	6.3	0.09	214	6.7	0.17	133
35–44 years	4.3	0.06	206	4.5	0.05	362	4.6	0.12	165	4.9	0.29	41
45–54 years	5.8	0.25	37	6.2	0.15	124	6.2	0.11	174	6.4	0.14	102
55–64 years	4.4	0.08	146	4.5	0.09	240	4.7	0.13	130	5.2	0.15	41
65–74 years	5.9	0.15	39	6.0	0.11	137	6.3	0.09	254	6.7	0.12	151
Female												
25–34 years	4.3	0.11	114	4.7	0.08	259	4.9	0.09	221	5.4	0.18	65
35–44 years	5.4	0.25	34	6.1	0.15	143	6.3	0.14	179	6.6	0.18	98
45–54 years	4.6	0.17	65	4.9	0.11	158	5.1	0.09	169	5.7	0.25	47
55–64 years	6.4	0.22	43	6.2	0.12	124	6.1	0.11	176	6.4	0.23	73
65–74 years	5.3	0.27	48	5.3	0.12	125	5.0	0.13	141	5.5	0.20	41
Body mass index												
Male												
1st quartile	5.5	0.15	58	5.6	0.12	197	5.8	0.07	244	6.1	0.15	119
2d quartile	6.0	0.16	53	6.0	0.08	199	6.2	0.08	262	6.1	0.14	110
3d quartile	5.7	0.22	46	6.3	0.13	179	6.2	0.10	233	6.7	0.10	140
4th quartile	6.1	0.18	42	6.5	0.10	143	6.8	0.09	256	7.1	0.16	188
Female												
1st quartile	4.1	0.08	146	4.2	0.06	306	4.3	0.08	197	4.9	0.27	48
2d quartile	4.4	0.07	175	4.5	0.08	275	4.6	0.11	209	4.7	0.21	48
3d quartile	4.5	0.12	136	4.8	0.07	292	4.9	0.13	203	5.6	0.18	60
4th quartile	5.0	0.15	122	5.3	0.09	271	5.6	0.10	214	5.7	0.16	79

[1] Excludes "other" racial groups.

Table 44. Serum urate levels of adults ages 25–74 years within serum calcium strata showing means and standard errors of means by sex, race, age and body mass index: United States, 1971–75

Sex, race, age, and body mass index quartile strata	Serum calcium level (milligrams/deciliter)											
	Less than 9.30			9.30–9.60			9.61–10.099			10.100 or more		
	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees	Mean	Standard error of mean	Number of examinees
	Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter			Milligrams/deciliter		
Total[1]	5.1	0.06	809	5.3	0.04	1,779	5.5	0.05	1,775	5.8	0.06	864
Sex												
Male	6.1	0.09	323	6.2	0.06	797	6.2	0.06	869	6.4	0.07	482
Female	4.5	0.07	486	4.6	0.05	982	4.8	0.05	906	5.0	0.07	382
Race												
White	5.1	0.06	729	5.3	0.05	1,593	5.5	0.05	1,576	5.8	0.06	736
Black	5.4	0.18	80	5.2	0.14	186	5.7	0.16	199	6.1	0.19	128
Age												
Total												
25–34 years	4.6	0.15	178	5.2	0.09	428	5.4	0.09	474	5.9	0.09	261
35–44 years	4.8	0.11	160	5.3	0.09	333	5.5	0.09	332	5.7	0.12	165
45–54 years	5.2	0.12	182	5.3	0.08	417	5.6	0.10	451	5.9	0.10	196
55–64 years	5.7	0.14	139	5.4	0.08	326	5.6	0.12	281	5.6	0.16	145
65–74 years	5.4	0.15	150	5.7	0.10	275	5.7	0.10	237	6.0	0.16	97
Male												
25–34 years	6.0	0.18	37	6.2	0.11	152	6.2	0.12	222	6.4	0.10	172
35–44 years	4.2	0.13	141	4.5	0.08	276	4.5	0.07	252	4.7	0.11	89
45–54 years	6.1	0.19	43	6.1	0.13	130	6.1	0.11	174	6.5	0.14	92
55–64 years	4.4	0.12	117	4.6	0.10	203	4.6	0.10	158	4.8	0.18	73
65–74 years	6.0	0.17	85	6.1	0.10	188	6.5	0.09	218	6.5	0.15	94
Female												
25–34 years	4.5	0.13	97	4.6	0.08	229	4.7	0.09	233	5.2	0.15	102
35–44 years	6.2	0.21	76	6.1	0.10	169	6.0	0.17	144	6.4	0.27	67
45–54 years	5.1	0.15	63	4.8	0.12	157	5.1	0.13	137	5.1	0.15	78
55–64 years	5.9	0.18	82	6.3	0.12	158	6.3	0.17	111	6.3	0.17	57
65–74 years	5.0	0.18	68	5.1	0.11	117	5.2	0.12	126	5.7	0.27	40
Body mass index												
Male												
1st quartile	5.8	0.20	86	5.7	0.08	201	5.7	0.11	195	5.9	0.17	127
2d quartile	5.9	0.15	71	6.1	0.08	183	6.1	0.11	248	6.1	0.09	126
3d quartile	6.0	0.18	92	6.2	0.10	206	6.2	0.10	204	6.7	0.15	112
4th quartile	6.5	0.18	74	6.6	0.11	206	6.9	0.12	221	7.0	0.15	116
Female												
1st quartile	4.0	0.09	111	4.2	0.09	244	4.3	0.07	230	4.4	0.10	109
2d quartile	4.3	0.11	151	4.5	0.08	237	4.5	0.09	225	4.6	0.11	87
3d quartile	4.5	0.13	106	4.6	0.09	255	4.9	0.10	225	5.4	0.20	85
4th quartile	5.2	0.14	118	5.2	0.10	246	5.5	0.11	223	5.7	0.11	101

[1] Excludes "other" racial groups.

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Appendix I. Statistical notes

Survey design

The sample design for the first National Health and Nutrition Examination Survey (NHANES I) is basically a three-stage, stratified probability sample of loose clusters of persons in land-based segments. The sample was designed to be representative of the civilian noninstitutionalized population within designated age ranges in the coterminous United States, excluding persons residing on lands set aside for the use of American Indians. Successive elements dealt with in the process of sampling were the primary sampling unit (PSU), census enumeration district (ED), segment (a cluster of households), household, eligible person, and finally sample person.

For the period April 1971–June 1974, the design provided for selection of a representative sample of the target population 1–74 years of age to be given the nutrition-related health interview and examination. A subsample of adults 25–74 years of age would also receive a more detailed examination focused on other aspects of health and health care needs. To increase the size for this subsampling and consequently the usefulness of the data obtained, the design further provided for the selection of an additional nationally representative sample of adults 25–74 years of age between July 1974 and September 1975, to be given the more detailed examination. This extension of NHANES I is referred to as the "augmentation survey."

The estimated civilian noninstitutionalized U.S. population ages 1–74 years is shown in table I by sex, race, and age at the time of examination. The estimates closely approximate the U.S. population as estimated by the U. S. Bureau of the Census as of the midpoint of the survey sample design. The figures in table I may differ slightly from the census estimates because the latter are based on the ages of sample persons at the time they were examined, whereas the poststratification was based on the ages at interview. Because certain analyses must be done on the basis of age at examination, the population estimates have also been based on age at examination for the sake of consistency.

The starting points in the first stage of this design were the 1960 decennial census lists of addresses and

Table I. NHANES I population estimates for examination locations 1–65, by sex, race, and age at examination

Age at examination	Estimated population						
	Total	Male			Female		
		All races	White	Black	All races	White	Black
Total	193,976,381	94,239,866	82,740,899	10,413,986	99,736,515	86,867,546	11,999,935
1 year	3,313,458	1,693,074	1,401,508	280,212	1,620,384	1,327,657	257,289
2–3 years	6,963,162	3,553,765	2,997,107	479,362	3,409,397	2,872,581	505,442
4–5 years	6,672,346	3,378,503	2,866,374	485,872	3,293,843	2,755,016	511,134
6–7 years	7,193,663	3,652,322	3,060,883	573,867	3,541,341	2,951,927	576,578
8–9 years	7,696,597	3,880,396	3,279,649	586,419	3,816,201	3,257,936	539,855
10–11 years	8,465,793	4,381,730	3,732,593	563,823	4,084,063	3,424,070	617,793
12–14 years	12,335,321	6,312,591	5,397,061	879,377	6,022,802	5,122,189	836,252
15–17 years	12,318,434	6,312,519	5,311,596	812,321	6,111,265	5,233,091	853,294
18–19 years	7,352,200	3,673,321	3,206,467	404,045	3,678,879	3,158,930	504,417
20–24 years	17,325,038	8,109,775	7,094,036	866,201	9,215,263	7,972,486	1,073,358
25–34 years	26,936,001	13,002,514	11,594,115	1,231,793	13,933,487	12,160,578	1,646,337
35–44 years	22,268,477	10,675,731	9,515,530	1,004,953	11,592,746	10,111,458	1,318,050
45–54 years	23,313,316	11,150,110	10,039,124	1,056,837	12,163,206	10,879,167	1,237,459
55–64 years	19,049,001	9,072,586	8,274,948	702,647	9,976,415	9,037,157	871,098
65–74 years	12,773,574	5,496,351	4,969,903	486,257	7,277,223	6,603,303	651,579

the nearly 1,900 primary sampling units (PSU's) into which the entire United States was divided. Each PSU is either a standard metropolitan statistical area (SMSA), a county, or two or three contiguous counties. The PSU's were grouped into 357 strata, as they were for use in the National Health Interview Survey during 1963–72, and subsequently collapsed into 40 superstrata for use in NHANES I.

During the April 1971–June 1974 period, 15 of the 40 superstrata that contained a single large metropolitan area of more than 2 million population were chosen in the sample with certainty. The remaining 25 noncertainty strata were classified into 4 broad geographic regions of approximately equal population (when the large metropolitan areas selected with certainty were included) and cross-classified into 4 broad population density groups in each region. Then a modified Goodman-Kish controlled-selection technique was used to select 2 PSU's from each of the 25 noncertainty superstrata, with the probability of selection of a PSU proportionate to its 1960 population, and so that proportionate representation of specified State groups and rate of population change classes were maintained in the sample. In this manner a total first-stage sample of 65 PSU's was selected. These 65 sample PSU's are the areas within which a cluster sample of persons was selected for examination at the particular examination location designated within each area. The mobile examination units were moved from one location to the next during this 39-month period (1971–74) to permit administering those single-time examinations to the cross-sectional sample of the target population.

Although the 1970 census data were used as the frame for selecting the sample within the PSU when they became available, the calendar of operations required that the 1960 census data be used for the first 44 locations in the sample. The 1970 census data were then used for the final 21 stands of the sample and for the augmentation survey.

Beginning with the use of the 1970 census data, the segment size was changed from an expected 6 housing units selected from compact clusters of 18 housing units to an expected compact cluster of 8 housing units. This change was implemented because of operational advantages and results of research by the U.S. Bureau of the Census indicating that precision of estimates would not be appreciably affected by such a modification. For large enumeration districts the segments were clusters of addresses from the 1960 Census Listing Books (later the corresponding books for 1970). For other ED's area sampling was employed and consequently some variation in the segment size occurred. To make the sample representative of the then current population of the United States, the address or list segments were supplemented by a sample of housing units that had been constructed since 1960.

Within each PSU a systematic sample of segments was selected. The enumeration districts selected for the sample were coded into one of two economic classes. The first class, identified as the "poverty stratum," was composed of "current poverty areas" that had been identified by the Bureau of the Census in 1970 (pre-1970 Census), plus other ED's in the PSU with a mean income of less than $3,000 in 1959 (based on 1960 Census). The second economic class, the "nonpoverty stratum," included all ED's not designated as belonging to the "poverty stratum." All sample segments classified as being in the poverty stratum were retained in the sample. For those sample segments in nonpoverty stratum ED's, the selected segments were divided into eight random subgroups and one of the subgroups was chosen to remain in the NHANES I sample. Continuing research indicated that efficiency of estimates could be increased (sampling variance decreased) by changing the ratio of poverty to nonpoverty segments from 8:1 to 2:1. Therefore, in the later stands (44–65) the selected segments in the nonpoverty-stratum ED's were divided into two random subgroups, and one of the subgroups was chosen to remain in the sample. This procedure permits separate analyses, with adequate reliability of those classified as being below the poverty level and those classified as being above the poverty level.

After identifying the sample segments, a list of all current addresses within the segment boundaries was made, and the households were interviewed to determine the age and sex of each household member, as well as other demographic and socioeconomic information required for the survey. If no one was at home after repeated calls or if the household members refused to be interviewed, the interviewer tried to determine the household composition from questioning neighbors.

To select the persons in the sample segments to be examined in NHANES I, all household members ages 1–74 years in each segment were listed on a sample selection worksheet, with each household in the segment listed serially. The number of household members in each of the six age-sex groups shown in table II were listed on the worksheet under the appropriate age-sex group column. The sample selection worksheets were then put in segment number order, and a systematic random sample of persons in each age-sex group was selected to be examined using the sampling rates displayed in table II. This sampling strategy in the 65 stands of the general sample of NHANES I resulted in the selection of 28,043 sample persons 1–74 years of age, a sample that can be regarded as representative of the target population displayed in table I.

A subsample of those adults 25–74 years of age in the total or "nutrition" sample was then selected to also receive the detailed health examination at the first 65 stands of NHANES I. This "detailed" sample was chosen systematically after a random start, using the sampling rates shown in table III. Consequently, adults 45–74 years of age in the first 65 PSU's were subsampled for the detailed examination at a somewhat higher rate than those 25–44 years of age.

During the augmentation period, July 1974 to September 1975, the sample of adults 25–74 years of age selected for examination in locations 66–100 constituted a national probability sample of the target population. Also, when considered jointly with those selected for the NHANES I detailed examination in locations 1–65, the entire 100-PSU sample is also nationally representative of the target population at that time.

The starting point for the selection of the augmentation sample was the 1970 decennial census list of adddresses and PSU's. The sampling methods for establishing the sample frame were generally similar to those used in the first 65 PSU's. However, only 5 of the 15 superstrata composed of only one very large metropolitan area of more than 2 million population were drawn into the sample for locations 66–100 with certainty. The remaining 10 of these superstrata were collapsed into 5 groups of 2 each, only one of which was chosen for the augmentation survey with a probability of selection of 0.5. When these latter 5 locations are considered a part of the 100-PSU design, they are selected with certainty.

In this augmentation survey there was no economic axis of stratification and no oversampling among special groups. One of every two eligible persons within sample households (using a random start among those 25–74 years of age) was selected for participation in the survey.

Nonresponse

In any health examination survey, after the sample is identified and the sample persons are requested to participate in the examination, the survey meets one of its more severe problems. Usually a sizable number of sample persons who are willing to complete the household questionnaire and possibly some of the medical history will not participate in the examination. Individual participation is determined by many factors, some of them uncontrollable. Therefore, participation may be treated as a random event with a particular probability of occurrence.

In this situation, the effect of nonparticipation would only reduce the sample size, thereby increasing the sampling variability of the examination findings. In practice, however, a potential for bias due to nonresponse exists if nonparticipation is not a random event and if nonparticipants differ from participants. Because of the possibility of bias, intensive efforts were made in NHANES I to develop and implement procedures and inducements that would reduce the number of nonrespondents and thereby reduce the potential of bias due to nonresponse. These procedures are discussed elsewhere.[8]

Also during the early stages of NHANES I, when it became apparent that the response rate for the examinations was lower than in the preceding health examination surveys, a study of the effect of remuneration on response in NHANES I was undertaken. The findings[63] were considered sufficient to include remuneration as a routine procedure in NHANES I starting with the 21st and 22d examination locations.

Despite response rates at the household interview stage of over 98 percent and these intensive efforts of persuasion, only 20,749 (74 percent) of the sample persons from the first 65 stands were examined. When adjustments are made for differential sampling for high-risk groups, the response rate becomes 75.2 percent. Consequently, the potential for a sizable bias does exist in the estimates in this publication. However, from what is known about the nonrespondents and the nature of nonresponse, the likelihood of sizable bias is believed to be small. For instance, only a small proportion of sample persons from the first 65 examination locations gave reasons for nonparticipation that would lead to the belief that they would never agree to participate in examination surveys and that they may differ from examined persons with respect to the characteristics under examination. Only 15 percent of nonrespondents gave the following reasons for nonparticipation: personal illness, physical inability, pregnancy, antidoctor feelings, or a fear of finding something wrong. Typical among the reasons given by the other nonrespondents were the following: inability to take time off from work, school, or household duties; suspicion or skepticism about the program; uninterested in participating; and considered their private medical care sufficient, or they had just visited a doctor.

An analysis of the medical history data obtained for most nonexaminees as well as examinees also

Table II. Sampling rates by age-sex groups for the NHANES I general sample

Age and sex	Sampling rate
1–5 years	1/2
6–19 years	1/4
20–44 years (men)	1/4
20–44 years (women)	1/2
45–64 years	1/4
65–74 years	1

Table III. Subsampling rates by age-sex groups for the NHANES I detailed sample

Age and sex	Subsampling rate
25–44 years (men)	2/5
25–44 years (women)	1/5
45–64 years	3/5
65–74 years	1/4

supports the belief that the likelihood of sizable bias due to nonresponse is small. No large differences were found between the examined group and the nonexamined group for the statistics compared. For example, the percent of persons examined who reported ever being told by a doctor that they had arthritis was 20 percent; the percent for high blood pressure was 18 percent; and for diabetes, 4 percent. The corresponding percents for nonexamined persons were arthritis, 17 percent; high blood pressure, 21 percent; and diabetes, 4 percent.

A procedure (similar to that used in previous National Health Examination Surveys) was used in which the reciprocal of the probability of selection of the sample persons is multiplied by a factor that brings estimates based on examined persons up to a level that would have been attained if all sample persons had been examined. This factor is the ratio of the sum of sample weights for all sample persons with a relatively homogeneous class defined by age, sex, and five income groups (under $3,000; $3,000–$6,999; $7,000–$9,999; $10,000–$14,999 and $15,000 or more) within each stand, to the sum of sampling weights for all responding sample persons within the same homogeneous class for the same stand. The poststratified ratio adjustment makes the final sample estimates of the population agree approximately with independent controls prepared by the U.S. Bureau of the Census for the noninstitutionalized population of the United States as of November 1, 1972 (approximately midsurvey point), by race, sex, and age as shown in table I.

To the degree that homogeneous groups can be defined that are also homogeneous with respect to the characteristics under study, this weighting procedure can be effective in reducing the potential bias from nonresponse. For the 65-stand sample of NHANES I, the percent distribution of the nonresponse adjustment factors used for the 325 cells (determined by the cross-classification of the 5 income groups by the 65 stands) is shown in table IV. Overall, the extent of the adjustment for nonresponse among the detailed examinees was 1.45 during the 1971–74 period and 1.40 in the augmentation survey of 1974–75.

Table IV. Percent distribution of nonresponse adjustment factors: National Health and Nutrition Examination Survey, 1971–74

Size of nonresponse adjustment factor	*Number of cells*	*Percent distribution*
Total (1.00–3.03)	325	100.0
1.00–1.24	106	32.6
1.25–1.49	125	38.4
1.50–1.74	59	18.2
1.75–1.99	24	7.4
2.00–2.49	9	2.8
2.50–2.99	1	0.3
3.00–3.03	1	0.3

Missing data and imputation

Examination surveys are subject to the loss of information not only through failure to examine all sample persons but also from the failure to obtain and record all items of information for examined persons. When data are found to be missing for some of the examinees, imputation for these values becomes necessary in order to minimize the effect on population estimates.

Among the 13,671 examinees ages 18–74 years of age in the total or nutrition sample of 1971–74, there were 76 examinees (0.6 percent) missing the single measurement of systolic or diastolic blood pressure or both. Of the 6,913 examinees ages 25–74 years in the detailed and augmentation samples, only 28 (0.4 percent) were missing measurements of either systolic or diastolic blood pressure or both in the first sitting position. For the recumbent position, 59 (0.9 percent) were missing measurements of either systolic or diastolic blood pressure or both, while for the second sitting position, 64 (0.9 percent) were missing measurements of either or both blood pressures. In no case was a diastolic measurement present without an accompanying systolic measurement.

In the statistical analysis of the blood pressure variables reported in other *Vital and Health Statistics* publications,[64,65] replacement values for the less than 2 percent with missing systolic and diastolic blood pressure were assigned on the basis of matched examinees of the same age, sex, and race, with similar arm girth, weight, and height. However, to simplify the analysis discussed in this report, examinees with such missing data were excluded since such exclusion was found not to seriously alter the findings with respect to the hypotheses being tested.

Design considerations for examined persons

Although the sample design for this survey is described in extensive detail in the previous sections and in other documents,[8,9] the aspects of the design pertaining to data analysis considerations are discussed further in this section. All 20,749 examined persons ages 1–74 years received a specifically designed nutrition-related examination. In addition, approximately a 20-percent subsample (3,854 persons) of those ages 25–74 years received a more detailed examination focused on other aspects of health and health care needs. An additional 3,059 persons ages 25–74 years from the augmentation survey were examined to increase the size of the sample and, hence, the reliability of the estimates from the data collected during this detailed survey (including the augmentation portion). The data collection forms for the entire (nutrition) sample, together with the additional forms for the detailed and augmentation sample, are contained elsewhere.[8,10]

NOTE: A list of references follows the text.

Although the sample design for this survey was fairly complex, the essential feature is the selection of primary sampling units (PSU's) consisting of counties or groups of counties from each of the defined strata. In particular, the NHANES I design for the 1971–74 period involved the selection with certainty of the PSU's in the 15 large standard metropolitan statistical areas with more than 2 million population, referred to as "certainty strata" (each PSU consists of a large number of enumeration districts), and the selection of exactly 2 PSU's from each of the remaining 25 strata. The design was modified for the 1974–75 period by collapsing 10 of the certainty PSU's into 5 strata of 2 PSU's each, retaining the remaining strata, and then sampling one PSU per strata. The augmentation sample thus included 10 of the certainty PSU's from the original design and one additional PSU from each of the 25 noncertainty PSU's. The data tapes from the National Center for Health Statistics reflect the indexing of the certainty strata used in the augmentation sample. The number of PSU's and the corresponding number of examined persons in each of these strata are summarized in table V. Thus, for analytic purposes, this design can be characterized as having the following characteristics:

1. 10 (redefined) strata with multiple selection of PSU's.
2. 25 strata with paired selection of PSU's for the general and detailed samples and with a single PSU for the augmentation sample.

Another important aspect of the NHANES I design is the need to adjust for the oversampling of the following subgroups thought to be at high risk of malnutrition, as outlined in table II:

1. Persons with low income.
2. Preschool children.
3. Women of childbearing age.
4. Elderly persons.

Adjusted sampling weights that reflect the selection probabilities and poststratification adjustments were computed.

An additional design complication arises because at the first 65 sites of the nutrition survey a subset of the sample persons ages 25–74 years received a more detailed health examination. No particular oversampling of subgroups of the population remained in this subsample; for example, women of childbearing age were not oversampled as they were for the major nutrition component of NHANES I. However, some slight oversampling remained among the elderly. The total number of persons given this detailed examination is 3,854 persons ages 25–74 years, for which separate adjusted sampling weights were available.

Moreover, the augmentation survey (fully discussed elsewhere[10]) poses additional complications for analysis. The 3,059 examined persons selected for this survey represent a national probability sample of the target population when used as a separate 35-stand as well as when combined with the 65-stand detailed sample to form a 100-stand (PSU) national probability sample, in which the combined number of examined persons is 6,913. Ten of the PSU's were included in both the augmentation and initial surveys. There was no oversampling of specific groups in either the initial detailed sample group or the augmentation sample group.

Consequently, when computing estimates of analytic statistics and their estimated variance-covariance structure, the appropriate sampling weights need to be utilized in the weighted analyses. Thus, hypotheses involving variables from the initial detailed sample of persons ages 25–74 years, in stands 1–65 were investigated using the adjusted sampling weights associated with the detailed sample persons (sampling weight on

Table V. Number of primary sampling units (PSU's) and number of examined persons for the general, detailed, and augmentation surveys, by stratum number for the NHANES I design

Stratum number	Number of PSU's		Number of examined persons		
	General and detailed	Augmentation	General and detailed	Detailed only	Augmentation
Total	1,263	236	20,749	3,854	3,059
1–10	1,213	211	4,514	853	701
1	169	21	621	112	55
2	106	17	367	80	63
3	125	18	482	87	59
4	156	21	737	129	60
5	197	24	741	143	97
6	83	22	250	48	82
7	108	23	395	71	72
8	61	21	188	42	80
9	89	21	304	57	64
10	119	23	429	84	69
11–35	50	25	16,235	3,001	2,358

tape location 170–175). Analyses involving the augmentation detailed sample (stands 66–100) used the adjusted sampling weights for this group (tape location 182–187). When hypotheses were investigated across the combined detailed sample groups (stands 1–100), adjusted sampling weights were used for the combined groups (tape location 188–193). Otherwise, hypotheses involving variables from the entire initial sample (stands 1–65) utilized the adjusted sampling weights for the entire initial sample (tape location 176–181).

Analytical strategies

Because of the complexities of the sample design, each analysis could be performed one of three different ways depending on whether the sampling weights were included and/or whether the design structure was incorporated in the calculations. For simplicity, these options are as follows:

Option	Inclusion of sampling	
	Weights	Design
1	No	No
2	Yes	No
3	Yes	Yes

Most hypotheses initially were investigated under option 1 to minimize cost and time. Relationships found to be statistically significant at this stage were then subjected to more definitive analyses under option 3 utilizing the sample weights and the survey design effects. Consequently, the estimated covariance structure for the sample estimators based on the complexities of the survey design was utilized in all final models and inferential conclusions.

In survey research, the design effect is commonly defined to be the ratio of the actual variance for a statistic from a complex sample to the corresponding variance from a simple random sample. Increasingly, design effects are being used to adjust estimates and statistics computed under simple random sampling assumptions for the effects of the complexities in the sample design on measures of precision. Given the importance of these effects to those who design and analyze surveys, simple but useful models have been sought for design effects. An extensive literature review of these design effect considerations and analytical strategies for survey data from complex sample designs is presented by Lepkowski.[66] A comprehensive evaluation of the design effects and analytic strategies specifically for the NHANES I survey has been published.[9]

All analyses under option 1 were performed quite simply and inexpensively using standard statistical software. In this option sampling weights and design effects were totally ignored. Thus, the data were regarded as coming from a simple random sample with equal representation and probability of selection. On the other hand, analyses under option 2 incorporated the adjusted sampling weights in estimating the analytic statistics, but simple random sampling computations were still utilized for the variance estimates. These calculations were performed within the OSIRIS IV software package.[67] Finally, analyses under option 3 utilized both the adjusted sampling weights and the sampling design in calculating the estimated variance-covariance structure of analytic statistics. In particular, the computer program &PSALMS was used for estimating ratio means and the program &REPERR was utilized to fit regression models. Both of these routines are available within the OSIRIS IV library, and are described in more detail by Vinter.[68] Briefly, for relatively simple statistics, such as ratio means, differences of such ratios, and totals, the &PSALMS routine approximates the complex sample variance of these estimators using a linearized Taylor Series expansion. For more complex statistics, such as regression coefficients, several replicated variance estimation procedures are available. In particular, the balanced repeated replication (BRR) option within the &REPERR routine was utilized to fit multiple regression models.

The estimation procedure to implement option 3 can be extremely time consuming and expensive, particularly in fitting regression models by the balanced half-sample approach, because of the multiple sampling error computing units within the certainty strata 1–10. To alleviate some of these difficulties, the multiple sampling error computing unit identification codes were randomly allocated into 2 "pseudoreplicates" for each of these 10 strata. Consequently, the paired selection computations then could be utilized for all 35 strata. The effects of randomly assigning the multiple sampling error computing units to two paired pseudoreplicates was investigated by the comparative analysis of standard errors and design effects for systolic blood pressure and calories within the selected age groups shown in table VI. The means and standard errors were computed both under the multiple sampling error computing unit classification as well as under the paired sampling error computing unit groupings. At least for these variables, it is apparent that the random allocation of sampling error computing units in the certainty strata to form a complete paired design has not substantially altered the estimates of variances or the corresponding design effects.

As a result of this pairing for the 10 certainty strata, all variance-covariance computations could be obtained directly as appropriate sums of squares and cross-products of differences across the 35 strata, and thus, 70 sampling error computing units. Thus, all the analyses under option 3 for the data from the general and detailed surveys were performed assuming this paired selection design. On the other hand, the analyses under option 3 for the combined data from

NOTE: A list of references follows the text.

the detailed and augmentation surveys required the multiple selection model because the design could not be paired for the 25 noncertainty strata.

Continuous variable: Means

The relative effects of the sampling weights and the sampling design are displayed in table VII for three variables of primary interest in these analyses, namely, systolic blood pressure, calories and age. Note that for the total sample, the unweighted and weighted analyses (options 1 and 2) for these variables are quite similar, both for the means and variances. However, under option 3, the complex sample design introduces a considerable increase in the estimated variance of the mean. In particular, the ratio of the standard error of the mean under option 3 to that obtained under option 1 in the last column in table VII ranges from 1,498 to 2,937. Consequently, the design effects for these three variables range from 2.24 to 8.63.

In view of the fact that age was a crucial variable in the oversampling aspects of the 1971–74 design, one might expect the design effects to be less important when stratifying by age. To investigate this possibility, means and standard deviations of these same variables were computed within age groups as shown in table VIII. Even though the design effects are somewhat reduced, they are certainly not negligible, ranging from 1.39 to 4.99.

Subgroup comparisons: Means

Most of the hypotheses tested in this report involve the comparison of two subgroup means. Because of the clustered design and the sampling weights, the difference between the mean response for each subgroup was computed as the difference between two weighted ratio means within the context of the &PSALMS routine described in Vinter[68] and other basic sampling texts.

In order to assess the effects of the sampling weights and the complex sample design on the magnitude of the t-statistics associated with the tests for these differences, a representative analysis was investigated in detail under options 1–3. In particular, the mean systolic blood pressure was compared for two subclasses determined by the lowest 15th percentile and highest 15th percentile of skinfold thickness in selected age-race subgroups. These results are displayed in table IX under each of the three analysis options. In all subgroups, the simple random sample estimates for the unweighted and weighted analyses are quite similar, both for the means and variances. However, under option 3, the complex sample design introduces a considerable increase in the estimated variance of the difference in the means between the two subclasses. Specifically, the ratio of the standard error of the

NOTE: A list of references follows the text.

Table VI. Comparative analyses of standard errors and design effects for multiple and paired sampling error computing units (SECU's) within certainty strata for systolic blood pressure and calories, by age for NHANES I data, 1971–74

Age	Number of examined persons	Mean	Multiple SECU's: Standard error of mean	Multiple SECU's: Square root of design effect[1]	Paired SECU's: Standard error of mean	Paired SECU's: Square root of design effect[1]
			Systolic blood pressure			
Total: 6–74 years	17,658	123.95	0.424	2.292	0.409	2.21
6–17 years	4,085	108.24	0.492	2.207	0.498	2.23
18–24 years	2,290	118.89	0.466	1.573	0.441	1.48
25–34 years	2,675	120.93	0.445	1.534	0.440	1.51
35–44 years	2,317	125.64	0.580	1.479	0.603	1.53
45–54 years	1,589	134.14	1.015	1.746	1.037	1.78
55–64 years	1,255	142.11	0.826	1.214	0.804	1.18
65–74 years	3,447	150.01	0.793	1.820	0.784	1.79
			Calories			
Total: 1–74 years	20,749	2,000.0	17.80	2.923	17.88	2.93
1–17 years	7,104	2,011.0	20.75	2.106	20.03	2.03
18–24 years	2,297	2,294.8	37.02	1.660	35.32	1.58
25–34 years	2,694	2,177.5	27.66	1,479	29.44	1.57
35–44 years	2,327	2,042.9	28.33	1.545	28.94	1.57
45–54 years	1,599	1,897.3	31.76	1.515	30.41	1.45
55–64 years	1,262	1,723.2	33.06	1.418	33.45	1.43
65–74 years	3,466	1,518.9	20.68	1.870	19.99	1.80

[1] Ratio of standard error of mean from SECU's to standard error of mean from simple random sampling.

Table VII. Number of examined persons, estimated means, standard deviations, standard errors of the means, and design effects for systolic blood pressure, calories, and age, under analysis options 1–3 for NHANES I data: 1971–74

Option number	Inclusion of sampling		Number of examined persons	Mean	Standard deviation	Standard error of mean	Square root of design effect
	Weights	Design					
				Systolic blood pressure			
1	No	No	17,658	126.91	24.585	0.185	---
2	Yes	No	17,658	123.95	22.262	0.168	---
3	Yes	Yes	17,658	123.95	54.347	0.409	2.211
				Calories			
1	No	No	20,749	1,827.5	877.00	6.088	---
2	Yes	No	20,749	2,000.0	944.91	6.560	---
3	Yes	Yes	20,749	2,000.0	2,575.9	17.883	2.937
				Age			
1	No	No	20,749	32.23	22.972	0.159	---
2	Yes	No	20,749	30.61	20.120	0.140	---
3	Yes	Yes	20,749	30.61	34.417	0.239	1.498

difference of the mean under option 3 to that obtained under option 1 in the last column in table IX ranges from 1.1 to 2.0. Thus, the design effects for these *t*-statistics range from 1.2 to 4.0.

Continuous variables: Multiple regression models

One of the statistical models used for the analyses in this report is the following multiple regression model:

$$Y_i = B_1 + B_2X_{2i} + B_3X_{3i} + \ldots + B_kI_{ki} + E_i$$

where Y_i denotes the *i*the observation of the dependent variable; X_i denotes the *i*th observation of each independent or explanatory variable; and E_i is the random variation of the *i*th observation of Y. The subscripts 1,2 . . . , k identify the specific explanatory variables. B_1 is the mean of Y_1 each of the explanatory variables is equal to zero; and B_k is the change in the expected value of Y_k corresponding to a unit change in the *k*th explanatory variable, holding all other explanatory variables constant. $B_2, B_3, \ldots,$ are often referred to as the regression slopes or (partial) regression coefficients.

Also presented in the regression results tables are beta coefficients. The beta coefficients are the result of linear regression in which each variable is "normalized" by subtracting its mean and dividing by its estimated standard deviation. In other words, the beta coefficient adjusts the estimated slope parameter by the ratio of the standard deviation of the independent variable to the standard deviation of the dependent variable. A beta coefficient of 0.3 may be interpreted to mean that a standard deviation change of 1.0 in the independent variable will lead to a 0.3 standard deviation change in the dependent variable. Beta coefficients are also used to make statements about the relative importance of the X variables in the model.

Assumptions of the multiple regression model

The classical assumptions associated with the regression model are:

1. The model specification is correct.
2. The X's are nonstochastic. In addition, no exact linear relationship exists among two or more of the independent variables.
3. The random variation has zero expected value and constant variance for all observations.
4. Random variations corresponding to different observations are uncorrelated.
5. The random variation term is normally distributed.

Any set of real data is unlikely to meet all these assumptions, particularly one utilizing complex sample design such as that in the NHANES I survey. However, certain violations of these assumptions may not seriously affect statistical inferences. For example, under simple random sampling theory, it is straightforward to show that the least squares estimators of the regression coefficients retain their desirable asymptotic properties (unbiased, consistent, and efficient), provided that the explanatory variables are each distributed independently of the true errors in the model. See for example, Kmenta.[69] More detailed discussions of the properties of the regression model estimates from complex sample surveys can be found in Holt et al.[70]

NOTE: A list of references follows the text.

Table VIII. Number of examined persons, estimated means, standard deviations, standard errors of the means, and design effects for systolic blood pressure and calories within age groups, under analysis options 1–3 for NHANES I data: 1971–74

Age	Number of examined persons	Option 1			Option 2			Option 3			Square root of design effect
		Mean	Standard deviation	Standard error of mean	Mean	Standard deviation	Standard error of mean	Mean	Standard deviation	Standard error of mean	
					Systolic blood pressure						
Total: 6–74 years	17,658	126.91	24.585	0.1850	123.95	22.262	0.1675	123.95	54.347	0.4090	2.211
6–17 years	4,005	108.67	14.245	0.2229	108.24	14.132	0.2211	108.24	31.829	0.4980	2.234
18–24 years	2,290	117.96	14.166	0.2960	118.89	13.794	0.2883	118.89	21.089	0.4407	1.489
25–34 years	2,675	119.90	15.006	0.2901	120.93	14.710	0.2844	120.93	22.739	0.4397	1.515
35–44 years	2,317	125.76	18.885	0.3923	125.64	17.665	0.3670	125.64	29.008	0.6026	1.536
45–54 years	1,509	135.10	23.176	0.5814	134.14	22.782	0.5715	134.14	41.317	1.0365	1.783
55–64 years	1,255	143.13	24.126	0.6810	142.11	23.453	0.6620	142.11	28.482	0.8040	1.181
65–74 years	3,447	151.02	25.580	0.4357	150.01	25.056	0.4268	150.01	46.027	0.7840	1.799
					Calories						
Total: 1–74 years	20,749	1,827.5	877.00	6.088	2,000.0	944.91	6.560	2,000.0	2,575.9	17.883	2.937
1–17 years	7,104	1,880.4	830.42	9.852	2,011.0	874.24	10.372	2,011.0	1,688.5	20.033	2.033
18–24 years	2,297	2,084.6	1,068.70	22.298	2,294.0	1,136.60	23.715	2,294.8	1,692.6	35.317	1.584
25–34 years	2,694	1,954.5	971.00	18.700	2,177.5	1,050.1	20.232	2,177.5	1,527.8	29.435	1.573
35–44 years	2,327	1,829.0	884.65	18.339	2,042.9	966.51	20.036	2,042.9	1,395.8	28.935	1.578
45–54 years	1,599	1,040.4	838.33	20.965	1,897.3	816.17	20.411	1,897.3	1,216.0	30.410	1.451
55–64 years	1,262	1,679.2	828.08	23.310	1,723.2	814.02	22.914	1,723.2	1,188.5	33.454	1.435
65–74 years	3,466	1,497.2	651.06	11.059	1,518.9	649.50	11.032	1,518.9	1,176.9	19.991	1.808

Table IX. Number of examined persons in subclasses determined by lowest 15th percentile and highest 15th percentile of skinfold thickness, means, standard errors, test statistics, and design effects for systolic blood pressure: NHANES I, 1971–74

Option	Low skinfold percentile			High skinfold percentile			t-statistic	Square root of design effect
	Number of examined persons	Mean	Standard error	Number of examined persons	Mean	Standard error		
				All males				
1	1,025	130.6	0.70	1,008	141.7	0.73	11.0	...
2	1,025	126.0	0.58	1,008	138.0	0.65	13.6	...
3	1,025	126.0	0.99	1,008	138.0	0.91	9.2	1.3
				Black males				
1	280	137.5	1.60	153	148.7	2.40	4.0	...
2	280	131.8	1.32	153	140.1	2.06	3.6	...
3	280	131.8	2.33	153	140.1	3.25	1.9	1.6
				White males				
1	745	127.9	0.73	855	140.4	0.73	12.0	...
2	745	124.8	0.65	855	137.8	0.69	13.5	...
3	745	124.8	1.02	855	137.8	0.88	9.2	1.4
				All females				
1	1,644	120.7	0.55	1,621	141.9	0.66	24.7	...
2	1,644	118.9	0.50	1,621	140.9	0.65	27.1	...
3	1,644	118.9	0.63	1,621	140.9	1.05	19.7	1.3
				Black females				
1	285	121.2	1.48	482	145.3	1.35	11.5	...
2	285	120.3	1.52	482	146.3	1.41	12.1	...
3	285	120.3	2.59	482	146.3	3.08	6.2	2.0
				White females				
1	1,359	120.6	0.59	1,139	140.5	0.75	21.2	...
2	1,359	118.7	1.16	1,139	139.7	0.74	23.7	...
3	1,359	118.7	0.59	1,139	139.7	1.20	19.8	1.1

Empirical results for regression models

In order to investigate predictive relationships among continuous variables, multiple regression models also can be fitted under either option 1, 2, or 3. Specifically, the affects of the sampling weights and complex design on the precision of regression coefficients was investigated under options 1–3 for systolic blood pressure and calories on age as summarized in table X. First, it can be observed in the corresponding entries under options 1 and 2 that the results are quite similar, particularly for systolic blood pressure on age, which has a significant linear relationship in all the race-sex subclasses. However, for calories on age, which has extremely small E^2 values for all subgroups, the estimate of the slope is quite different for some subclasses; in fact, for the "other males" category there is a 12-fold increase in the slope under option 2 compared with option 1, and for the "other females" category it differs by a factor of nearly 3. Of course, in both of these subclasses the sample size is relatively small.

Otherwise, note in table X that the results under option 3 are only reported for the white subgroups, even though the number of black persons examined appears to be reasonably large. This omission is due to the failure of the balanced half-sample routine in the weighted regression program in OSIRIS IV resulting from entire strata with no data for these subclasses as shown in table XI. Modification of this routine or use of another sampling error program could still be used to obtain these estimates for the other subclasses. This problem of missing sampling error computing units is even more pronounced within the more restrictive detailed examination as displayed in table XII. Consequently, due to the sparse design across strata, only the white and black race data were used in many of the analyses.

In addition to simple linear regression models, multiple regression models can also be fitted within this same framework. Table XIII summarizes the results of systolic blood pressure regressed jointly on age, race, sex and Quetelet's index for 13,573 cases ages 18–74 years. Here again, the design effects for the regression coefficients range from 2.22 to 4.41.

These empirical results, as expressed in terms of estimated design effects, demonstrate the critical importance of incorporating the sampling weights and the survey design adjustments into all definitive subgroup comparisons and multiple regression models.

Table X. Summary of simple regression models for systolic blood pressure and calories on age under analysis options 1–3, by race and sex for NHANES I data, 1971–74

Sex, race, and age	Number of examinees	*Unweighted design*				*Weighted design*						
		(Option 1)						*(Option 2)*		*(Option 3)*		*Square root of design effect*
		R^2	*Slope*	*Standard error*	*t-statistic*	R^2	*Slope*	*Standard error*	*t-statistic*	*Standard error*	*t-statistic*	
Total						Systolic blood pressure on age						
6–74 years	17,658	0.40	0.730	0.0060	107.45	0.35	0.696	0.0071	98.11	0.0131	53.14	1.93
White males	5,854	0.36	0.605	0.0106	57.24	0.33	0.610	0.0115	53.14	0.0113	54.06	1.07
Black males	1,326	0.46	0.815	0.0240	33.91	0.43	0.848	0.0269	31.53	---	---	---
Other males	89	0.35	0.762	0.1118	6.81	0.14	0.401	0.1064	3.77	---	---	---
White females	8,243	0.41	0.767	0.0102	75.57	0.38	0.734	0.0104	70.39	0.0188	39.03	1.85
Black females	2,037	0.47	0.979	0.0230	42.55	0.44	1.008	0.0252	40.05	---	---	---
Other females	109	0.40	0.920	0.1086	8.47	0.37	0.818	0.1040	7.87	---	---	---
Total						Calories on age						
1–74 years	20,749	0.02	–4.90	0.2629	–18.64	0.01	–5.50	0.3238	–16.99	0.3171	17.35	1.21
White males	7,004	0.01	–3.39	0.4873	–6.95	0.00	–3.52	0.6102	–5.70	0.6314	–5.58	1.30
Black males	1,707	0.01	–3.74	0.9217	–4.05	0.00	–1.08	1.212	–0.89	---	---	---
Other males	109	0.00	1.00	3.598	0.28	0.05	12.50	51.01	2.45	---	---	---
White females	9,347	0.04	–5.89	0.3034	–19.41	0.04	–6.44	0.3315	–19.43	0.4339	–14.05	1.43
Black females	2,456	0.06	–8.39	0.6578	–12.75	0.06	–9.45	0.7420	–12.74	---	---	---
Other females	126	0.00	–1.23	3.474	–0.35	0.01	–3.35	3.899	–0.86	---	---	---

Table XI. Number of examined persons ages 1–74 years, by race, sex, and stratum number in the NHANES I design, 1971–74

Stratum number	Total	Number of examined persons by race and sex					
		White males	Black males	Other males	White females	Black females	Other females
Total	20,749	7,004	1,707	109	9,347	2,456	126
1	621	169	88	2	220	138	4
2	367	146	24	0	157	38	2
3	482	123	85	1	171	102	0
4	737	198	102	11	255	162	9
5	741	232	65	13	328	88	15
6	580	67	35	2	85	57	4
7	395	85	90	0	93	127	0
8	188	67	16	0	79	26	0
9	304	109	13	1	149	32	0
10	429	138	32	13	190	37	19
11	481	205	4	0	267	3	2
12	517	198	14	0	286	17	2
13	531	232	2	2	290	4	1
14	701	273	15	2	396	14	1
15	486	185	20	4	226	43	8
16	563	178	68	5	211	98	3
17	594	235	6	0	346	6	1
18	505	176	39	2	224	62	2
19	585	237	12	4	317	14	1
20	446	171	13	1	246	14	1
21	790	344	0	0	446	0	0
22	551	114	107	3	141	185	1
23	619	167	85	0	249	116	2
24	449	131	73	0	170	122	3
25	728	225	73	0	311	119	0
26	887	232	156	0	305	194	0
27	684	262	23	1	379	17	2
28	1,001	259	174	0	327	241	0
29	634	222	51	1	292	68	0
30	868	284	84	1	371	124	4
31	651	221	34	5	334	52	5
32	691	250	22	3	367	32	12
33	619	222	3	21	345	10	18
34	545	236	5	5	295	1	3
35	1,059	411	74	1	479	93	1

Table XII. Number of examined persons ages 25–74 years, by race, sex, and stratum number in the NHANES I design for the detailed sample, 1971–74

Stratum number	*Total*	*Number of examined persons by race and sex*					
		White males	*Black males*	*Other males*	*White females*	*Black females*	*Other females*
Total	3,854	1,541	277	21	1,667	335	13
1	112	37	13	1	34	27	0
2	80	38	4	0	27	11	0
3	87	23	18	0	29	17	0
4	129	46	15	1	43	23	1
5	143	60	11	4	55	12	1
6	48	17	7	1	12	11	0
7	71	16	18	0	17	20	0
8	42	19	0	0	18	5	0
9	57	25	1	0	27	5	0
10	84	34	8	4	30	4	3
11	100	45	0	0	53	1	1
12	93	40	3	0	49	0	1
13	92	45	1	0	46	0	0
14	129	54	1	0	70	4	0
15	78	43	2	1	27	5	0
16	101	29	13	0	41	18	0
17	107	52	1	0	54	0	0
18	81	41	4	1	28	7	0
19	109	45	2	1	59	2	0
20	81	34	2	0	44	1	0
21	162	72	0	0	90	0	0
22	89	28	17	1	23	20	0
23	112	33	16	0	48	15	0
24	81	28	8	0	30	15	0
25	156	67	8	0	67	14	0
26	150	45	22	0	65	18	0
27	141	65	6	0	68	1	1
28	182	57	26	0	64	35	0
29	126	50	10	0	58	8	0
30	152	63	14	0	64	11	0
31	113	49	3	1	51	8	1
32	123	51	2	2	61	6	1
33	119	45	0	2	69	0	3
34	100	46	2	0	52	0	0
35	224	99	19	1	94	11	0

Table XIII. Summary of multiple regression models for systolic blood pressure on age, race, sex, and Quetelet's index for 13,573 examined persons ages 18–74 years, under analysis options 1–3: NHANES I, 1971–74

Variable	*Regression coefficient*	*Standard error of coefficient*	*t-statistic*	*Square root of design effect*
		Unweighted SRS design (option 1)		
Age	0.677	0.0096	69.44	---
Race	3.896	0.3938	9.89	---
Sex	–1.135	0.0335	33.88	---
Quetelet's index	1.135	0.0335	33.88	---
		Weighted SRS design (option 2)		
Age	0.584	0.0102	57.49	---
Race	2.908	0.4422	6.58	---
Sex	–2.871	0.3162	–9.08	---
Quetelet's index	1.177	0.0331	35.56	---
		Weighted complex sampling design (option 3)		
Age	0.584	0.0177	32.92	1.85
Race	2.908	0.8266	3.52	2.10
Sex	–2.871	0.5206	–5.52	1.49
Quetelet's index	1.177	0.0630	18.69	1.88

Appendix II. Definitions of selected terms

Demographic and socioeconomic terms

Age

Two ages were recorded for each examinee: age at last birthday at the time of the examination and age at the time of the census interview. The age criterion for inclusion in the sample used in this survey was defined as age at the time of the census interview. The adjustment and weighting procedures used to produce national estimates were based on the age at interview. Data in the detailed tables and text of the report are shown by age at the time of the examination, except that those few who became 75 years of age by the time of the examination are included in the 65–74-year age group.

Race

Race was recorded as "white," "Negro," or "other." "Other" includes Japanese, Chinese, American Indian, Korean, Eskimo, and all races other than white or black. Mexicans were included with "white" unless definitely known to be American Indian or of a race other than white. Black persons and those of mixed black and other parentage were recorded as "Negro." When a person of mixed racial background was uncertain about his or her race, the race of the father was recorded.

Geographic region

The 48 contiguous States and the District of Columbia, excluding Alaska and Hawaii, were stratified into four broad geographic regions, each of about the same population size. With a few exceptions, the compositions of the regions are as follows:

Region	States included
Northeast	Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania
Midwest	Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri
South	Delaware, Maryland, Virginia, West Virginia, Kentucky, Arkansas, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, District of Columbia
West	Washington, Oregon, Idaho, Montana, Wyoming, Colorado, Utah Nevada, California, Arizona, New Mexico, Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota

In a few instances the actual boundaries of the regions did not follow State lines. Some strata in the Midwest and South include primary sampling units that are actually located in the West. Similarly, some strata in the West contain primary sampling units located in the Midwest and South.

Family income

The income recorded was the total income received by the head of the household and all other household members related to the head during the 12 months prior to the interview. This income was the gross cash income (excluding pay in kind) except in the case of a family with its own farm or business. In that instance net income was recorded. Also included was the income of a member of the Armed Forces who lived at home with the family (even though he or she was not considered a household member). If the person was not living at home, allotments and other money received by the family from him or her were included in the family income figure.

Population density

The classification of urban-rural areas was that used in the 1960 census. According to the 1960 definition, those areas considered urban are: (1) places of 2,500 inhabitants or more that are incorporated as cities, boroughs, villages, and towns (except towns in New England, New York, and Wisconsin); (2) the densely settled urban fringe, whether incorporated or unincorporated, of urbanized areas; (3) towns in New England and townships in New Jersey and Pennsylvania that contain no incorporated municipalities as subdivisions and have either 2,500 inhabitants or more, or a population of 2,500 to 25,000 and a density of 1,500 persons per square mile; (4) counties in States other than the New England States, New Jersey, and Pennsylvania that have no incorporated municipalities within their boundaries and have a density of 1,500 persons or more per square mile; and (5) unincorporated places of 2,500 inhabitants or more that are not included in any urban fringe. The remaining population is classified as rural.

By means of the first digit of the identification code on the household questionnaire, the urban and rural population was divided into the following categories according to population size: (1) urban, 3,000,000 or more; (2) urban, 1,000,000–2,999,999; (3) urban, 250,000–999,999; (4) urban, under 250,000; (5) urban, not in urbanized area, 25,000 or more; (6) urban, not in urbanized area, 10,000–24,999; (7) urban, not in urbanized area, 2,500–9,999; and (8) rural.

Statistical terms

Regression coefficient *(B)*

The estimated additive effect on the dependent variable for each unit of change in the independent variable within the multiple regression model for which all the other independent variables are held constant.

Sigma *(B)*

The model-based estimated standard error of the regression coefficient (*B*).

Standardized coefficient (Beta)

The estimated additive effect on the dependent variable for each unit of change in the independent variable which has been standardized to have mean zero and variance unity, within the multiple regression model in which all the other independent variables have been standardized and held constant.

Sigma (Beta)

The model-based estimated standard error of the standardized coefficient (Beta).

Partial r

The estimated correlation coefficient between the dependent variable and the independent variable within the multiple regression model for which all the other independent variables are held constant.

t-statistic

The test criterion obtained as the ratio of the regression coefficient (*B*) to its estimated standard error, Sigma (*B*), to test the hypothesis that B is zero.

Dietary terms

Caloric or total energy intake

Total caloric intake computation for food items listed in the 24-hour recall.

Ethanol (alcohol) consumption

For each examinee, the average number of ethanol ounces per week was calculated in the following way:

(1) Assigning a factor approximating the average amount of ethanol in a typical serving (0.48 for beer, 0.6 for wine, and 0.45 for liquor), based on the usual type of alcohol consumed by the individual.

(2) Assigning a factor to approximate the average number of drinking occasions per week for each individual as follows:

How often do you usually drink?

Every day	7.0
Almost every day	5.5
2 to 3 times per week	2.5
1 to 4 times per month	0.625
4 to 12 times per year	0.163
Never	0.0

(3) Multiplying the alcohol content by the weekly frequency and then multiplying the result by usual number of drinks per drinking occasion.

Thus, ethanol ounces per week = average alcohol content of usual alcoholic beverage consumed × frequency of individual drinks × number of drinks individual usually consumes per drinking occasion.

This continuous variable was categorized into abstainers (less than 0.0001 ethanol ounces per week), light drinkers (0.0001 to 0.9999 ethanol ounces per week), moderate drinkers, and heavy drinkers (7.000 ethanol ounces per week or more).

The second alcohol variable, calories from alcoholic beverages, was derived from the 24-hour dietary recall by summing calories from all foods coded as "alcoholic beverages food group." This variable was categorized into: none (less than 1 calorie), light/moderate (1 to 250 calories), and heavy (250 calories or more). The two data sources agreed with respect to alcohol abstinence for 98.7 percent of the abstainers on the medical history questionnaire who reported no alcohol intake in the 24-hour recall.

Salt and salty food intake

The frequency of use of the table salt shaker and estimated sodium content in food items listed on the 24-hour recall, assuming a ratio of one gram of salt to 400 milligrams of sodium from grain products, milk and milk products, mixed protein dishes, soups, meats, fruit and vegetables, fats and oils and other foods.[15]

NOTE: A list of references follows the text.

The sodium content of food is incomplete because the values cover only naturally occuring sodium in foods and sodium added by processors. Table salt used is not included in these data.

Sodium intake, combined

A twelve-cell table was constructed from the table-salt-use responses and the dietary sodium content of food reported on the 24-hour recall as follows:

Frequency of salt shaker use	*Dietary sodium intake (24 hour recall)* Under 982.6 milligrams	982.6–1,883.9 milligrams	1,884.0–3,436.7 milligrams	3,436.8 milligrams and over
	Cell number			
Rarely	[a]1	[a]2	[b]3	[b]4
Occasionally	[a]5	[b]6	[b]7	[c]8
Frequently	[b]9	[b]10	[c]11	[c]12

[a] Low salt users.
[b] Moderate salt users.
[c] Heavy salt users.

In the analyses, individuals in cells 1, 2, and 5 were classified as having low salt intake; those in cells 3, 4, 6, 7, and 9 had moderate intake; and those in cells 8, 11, and 12 were considered to have heavy salt intake.

Fat and complex carbohydrate intake

For the combined intake of fat and complex carbohydrates, the distribution of the examinees by their frequency of intake of foods high in fats (cheese, milk, eggs, butter/margarine, and meat/poultry) and their frequency of intake of complex carbohydrate foods (cereals, grains, fruits, vegetables, beans, and peas) were each divided into three groups using as cutoff points the 33d and 66th percentiles. The three levels of each of the two variables were arrayed in a three-by-three table yielding nine cells. The two extreme cells represented low fat/high complex carbohydrate and high fat/low complex carbohydrate intake, respectively. The remaining seven cells of the three-by-three table were pooled. The first level of the combined fat/complex carbohydrate varibable is the high complex carbohydrate/low fat extreme cell, which contains approximately 5 percent of the examinees. The second level is composed of the seven intermediate cells, representing 90 percent of the total. The third level, containing the remaining 5 percent of the total, is the extreme cell, representing the low complex carbohydrate/high fat intake.

Coffee and tea consumption

Derived from the food frequency dietary history.

NOTE: A list of references follows the text.

Linoleic fatty acid

Estimated content in foods (from the 24-hour recall) including fats and oils, salty snacks, fruits and vegetables, meats, desserts and sweets, grain products, poultry and other.[15]

Oleic (unsaturated fat)

Estimated content in foods (from the 24-hour recall) including meats, milk and milk products, fats and oils, desserts and sweets, grain products, mixed protein dishes, and others.[15]

Dietary cholesterol

Estimated content in foods (from the 24-hour recall) including eggs, meats, milk and milk products, desserts and sweets, fats and oils, and others.[15]

Medical and biochemical terms

Hypertensive status

Includes the following four categories:

Normotensive.—Systolic pressure less than 140 mm Hg and diastolic pressure less than 90 mm Hg.

Borderline.—Systolic pressure less than 160 mm Hg or diastolic less than 95 mm Hg but not both systolic less than 140 mm Hg and diastolic less than 90 mm Hg.

Hypertension (definite).—Systolic pressure greater than or equal to 160 mm Hg and/or diastolic pressure greater than or equal to 95 mm Hg.

Systolic hypertension.—Systolic pressure greater than or equal to 160 mm Hg *and* diastolic pressure less than 90 mm Hg.

Hemoglobin concentration

As determined from the examinees' blood samples on the Coulter Hemoglobinometer in the mobile examination centers.[19]

Serum cholesterol

As determined from the examinees' blood samples at the Lipid Standardization Laboratory of the Centers for Disease Control (Atlanta, Ga.) using a modified ferric-chloride technique.[19]

Serum urate

As determined from the examinees' blood samples at the Centers for Disease Control, Bureau of Laboratories, using the Sobrinho-Simoes method.[19]

Serum glutamic oxalacetic transaminase (SGOT)

As determined from the examinees' blood samples at the Centers for Disease Control, Bureau of Laboratories, using the method of Henry et al.[19]

Serum calcium

As determined from the examinees' blood samples at the Centers for Disease Control, Bureau of Laboratories, using the method of Kessler and Wolfman.[19]

Serum inorganic phosphate

As determined from the examinees' blood samples at the Centers for Disease Control, Bureau of Laboratories, using an adaptation of the methods of Hurst and Kraml.[19]

Serum magnesium

As determined from the examinees' blood samples at the Centers for Disease Control, Bureau of Laboratories, using the method of Hansen and Freier.[19]

NOTE: A list of references follows the text.

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