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Caloric and Selected Nutrient Values for Persons 1-74 Years of Age:

First Health and Nutrition Examination Survey

United States, 1971-1974

Presents findings of the Health and Nutrition Examination Survey on the dietary intake of various nutrients in a probability sample of the U.S. population, 1-74 years of age, by age, sex, race, and income level, 1971-74.

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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.

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CALORIC AND SELECTED NUTRIENT VALUES FOR PERSONS 1-74 YEARS OF AGE

Sidney Abraham, Margaret D. Carroll, M.S.P.H., Clifford L. Johnson, M.S.P.H., and Connie M. Villa Dresser, R.D., Nutrition Statistics Branch, Division of Health Examination Statistics

INTRODUCTION

This report presents data on dietary intake obtained to assess the nutritional status of the U.S. population, aged 1-74 years. It is the second in a series of *Vital and Health Statistics* reports presenting data on dietary intake obtained in the first Health and Nutrition Examination Survey (HANES I). By means of text, charts, and selected tables, analysis and discussion are offered on data on calories and selected nutrients by age, sex, race, and income groups. The first report[1] presented most of the tabular material on which this report is based.

The third report will examine dietary data for several special groups of the U.S. population: Spanish-American persons, pregnant and lactating women, and persons indicating that they are taking vitamins and minerals to supplement their diets. The fourth report will analyze and discuss data from the dietary frequency questionnaire, in which quantitative data are presented regarding the frequency of consumption of selected foods and food groups during the 3 months preceding the dietary interview.

The first four reports are to be published in Series 11 of the *Vital and Health Statistics* series. A fifth report, consisting of several hundred pages, will be published outside the Series 11 reports in *Vital and Health Statistics* as a separate source document. It will present tables of cumulative percent distributions of nutrient intake by age, sex, race, and income groups. Other tables will present for each nutrient the mean intake, standard deviation, standard error of the mean, and values for selected percentiles of intake from the 5th through the 95th by similar variables. The percentile levels compared with the recommended dietary allowances of calories and selected nutrients will be shown graphically by age for sex, race, and income levels.

For the convenience of readers, subsequent reports on other components of nutritional status, such as biochemical measurements of nutrients in body fluids and tissues; body measurements in growth, development, and obesity; and clinical signs of possible nutritional deficiency, interpreting HANES data will contain some of the discussion presented in this report. These reports on components of nutritional status from HANES should not be regarded as independent studies, but as parts of the analysis and discussion of data on the nutritional status of the U.S. population aged 1-74 years.

Health and Nutrition Examination Survey Program

The HANES program was undertaken by the National Center for Health Statistics in response to a directive from the Secretary, Department of Health, Education, and Welfare, to establish a continuing national nutrition surveillance system under the authority of the National Health Survey Act of 1956. The purpose of this system is to measure the nutritional status of the U.S. population and to monitor changes in this status over time.

The HANES is the first program to collect measures of nutritional status from a scientifically designed sample representative of the U.S. civilian noninstitutionalized population in a broad range of ages, 1-74 years. Earlier nutrition surveys, such as the Ten-State Nutrition Survey,[2] have had more limited objectives. The probability sample design permits estimates to be made for the total population, and it permits more detailed analysis of data for certain groups at high risk of malnutrition—the poor, preschool children, women of childbearing ages, and the elderly.[3]

This is made possible through use of differential sampling of these high-risk groups and appropriate weighting of the data.

Data collection for the first HANES program began in April 1971 and was completed in June 1974.

A detailed description of the specific content and plan of operation, including the sample design, has been published,[4] and only the general characteristics are mentioned here. The U.S. Bureau of the Census cooperated in the sample design and in the initial visits to, and interviewing at, selected eligible households in the 65 primary sampling units (PSU's) throughout the United States. Additional household visiting, interviewing, history taking, and explaining the examination portion of the program were performed by members of the field teams of the Center. The teams that traveled to the various survey locations included professional and paraprofessional medical and dental examiners along with technicians, interviewers, and other staff. The selected sample persons for whom appointments were made were brought into specially constructed Mobile Examination Centers moved into a central location in each PSU area.

The findings in this report are based on the examination of 20,749 persons, aged 1-74 years in a total of 65 PSU's. A sample of 28,043 persons was selected to be examined at the 65 locations visited between April 1971 and June 1974. These sample persons constituted a probability sample of the total U.S. population. In the course of the program, 98 percent of the total sample were interviewed and 20,749 of them, or 94.0 percent of the total sample, were examined. This corresponds to an effective response rate of 75 percent when adjustment is made for the effect of oversampling among the poor, preschool children, women of childbearing age, and the elderly. 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 total population by using the appropriate weights to account for both sampling fractions and response results. The question of any possible bias in the estimates resulting from assuming the nonexamined are like their examined counterparts is discussed in more detail in the statistical appendix; we have concluded that one may treat the weighted examined group as a probability sample of the population, so that the estimates may be regarded as representative of the civilian noninstitutionalized population of the United States.

Measures of Nutritional Status

Nutrition is a major factor in the environment affecting life and health. Adequate intake of essential nutrients is a basic requirement for good health. Utilization of these nutrients under physiological conditions of work and rest through ingestion, digestion, and metabolism is another requirement. Undernutrition and overnutrition are both parts of malnutrition because both adversely affect good health. Primary malnutrition is defined as the lack (or excess) of food, and secondary malnutrition as the faulty utilization of food. A combination of primary and secondary malnutrition may occur. The HANES is designed to provide data for population groups on their relative average dietary intake and the utilization of food under ordinary living conditions in relation to the health status of the people.

The measurements used to assess nutritional status in HANES were intended not only to detect overt signs and symptoms of malnutrition, but also to measure levels of indicators of nutritional status which are considered outside of a desirable range. The approach taken was the usual one of obtaining four different kinds of data, each of which measures a different aspect of nutritional status. These are: (1) information on the person's dietary intake (kind and quantity of food consumed and its nutritional value), (2) results of a variety of biochemical tests made on samples of blood and urine to determine the levels of various nutrients, (3) findings of clinical examinations by doctors and dentists alerted to detect stigmata of malnutrition and signs or conditions indicative of nutritional problems, and (4) various body measurements that would permit detection of abnormal growth patterns including obesity.

The four components of nutrition reflect the conventional approach to assessment of nutritional status. Nutrition, like health, is a multifaceted concept, which still requires examining a number of separate indicators for its measurement. (The interrelationships of these various measurements will be considered in a future *Vital and Health Statistics* report.) The HANES program has, as yet, no new measures, nor do we have any way of synthesizing these separate indicators into a single index of nutritional status.

METHODS

Dietary Intake Collection Methods

Although various methods have been developed to estimate food intakes as part of nutritional or epidemiological studies, a number of practical considerations influenced the selection of the quantitative 24-hour recall and the 3-month frequency recall for the dietary interview over other methods for HANES. The main considerations were the data collection process, the fact that data would be analyzed by groups and not by individuals, the limitations of interviewing time, the availability of staff and training facilities, and the recruitment potential for interviewers.

A dietary interview was conducted with each sample person to obtain information about his total food and drink consumption during the preceding 24 hours. This was followed by questions about the frequency of food intake for the preceding 3 months (to be reported elsewhere).[5] 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 aged 6 through 12 years.

Information on food intake was obtained for the day, midnight to midnight, preceding the interview. Food recall included foods eaten on Monday through Friday but generally excluded foods eaten on the weekend which very likely are not typical of one's usual intake.[6]

The dietary interview lasted approximately 20 minutes (maximum allowance, 30 minutes) and usually was administered in the Mobile Examination Center. A small percent of the interviews took place in the subject's home.

Home visits were made for several reasons. Some aged or ill examinees wished to spend less time at the examination center. Some mothers had several children who were examined, and it was more convenient for the mothers to have the children examined at home. Occasionally, home visits were made to collect dietary information because the mother or baby sitter did not accompany a child, or because translators were needed when the examinee did not know enough English to understand or answer the interviewer.

Food portion models were used to assist the respondent in estimating amounts of foods consumed. The models developed for another survey[2] were used with slight modifications. 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[7] and was based on a program developed originally at Tulane University. The program uses the nutritive values of food items appearing in the U.S. Department of Agriculture Handbook No. 8 (1963), table 1,[8] 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 are: calories, protein, calcium, iron, vitamins A and C; thiamine in milligrams (mg) and in milligrams per 1,000 calories (mg/1,000 cal); riboflavin in mg and in mg/1,000 cal; and preformed niacin in mg and in mg/1,000 cal. Vitamin A is measured in international units (IU).

Thiamine and riboflavin in terms of mg/1,000 cal and preformed niacin in mg/1,000 cal for each sampled person are calculated by dividing each sample person's value for the given nutrient by his caloric intake value and multiplying the result by 1,000.

Data for niacin intake are presented but not analyzed. Intake data for niacin, a B-complex vitamin, are based on amounts of consumed preformed niacin in foods. A variety of protein foods, practically devoid of nicotinic acid, can supply all the niacin equivalents by converting the amino acid, tryptophan, to the vitamin niacin necessary for optimal health. Thus it would be misleading to compare the niacin values of the diet with a dietary standard. Recognition of adequate or deficient dietary intake of, specifically, nicotinic acid or tryptophan containing proteins can be determined by urinalysis. For these reasons, no special discussion of niacin intake is included in the analysis or discussion sections. Table V in appendix III shows food sources of selected nutrients, their functions, and physiological problems associated with nutrient deficiency.

Definition of Variables

Race was observed and recorded as "white," "black," or "other." White persons constituted 78.80 percent of the total sample size of 20,749 examined persons and black persons, 20.07 percent. There were few persons whose race was recorded as other, only 1.13 percent. Other races are included only when the total subjects are used but are not used in the white-black breakdowns.

The sample design focused special attention on groups of people known to be at greater risk of malnutrition by oversampling the following groups: the poor, preschool children, women of childbearing ages, and the elderly. The oversampling was directed first of all to the poor. The design thus enabled us to obtain sufficient numbers to analyze the nutritional status of black persons and of poor white persons without resorting to separate oversampling of racial or ethnic groups. Thus although black persons represent about 11 percent of the U.S. population, they make up one-fifth of the HANES sample. Such large numbers were found because the economically poor segments of the population include disproportionate numbers of black persons. These larger numbers yield more reliable estimates for this group.

The poor have less money to spend for food than have families with higher incomes, and perhaps they are not as well informed about what constitutes adequate diets; they are thus especially vulnerable to nutritional deficiencies or imbalances. The relatively high vulnerability of children and pregnant and lactating women results from increased need for calories and essential nutrients, such as protein and calcium. In children, this is because they are growing; in pregnant and lactating women, because they have to feed an additional being, first the fetus in utero and, after birth, the newborn infant. Nutrient requirements of the elderly, on the other hand, usually are relatively low, because of their reduced basal metabolism and physical activity. Their greater vulnerability may result from such factors as the effects of increased physical infirmities and health problems on their ability to utilize nutrients. It is also influenced to a larger extent than in younger adults by socioeconomic and psychological factors, including food shopping problems, such as transportation and degree of interest in food preparation.

The income status of each examined person is expressed by the poverty income ratio (PIR) (see appendix II). Families and unrelated individuals are classified as being above or below the low income or poverty level by using the poverty index adopted by a Federal interagency committee in 1969. This index, in contrast to total family income, reflects the different consumption requirements of families based on their size and composition, on the sex and age of the family head, and on farm-nonfarm residence.

For analysis, two groups of income levels are presented: income below poverty level (a ratio of less than 1), and income at and above poverty level (a ratio of 1 or more). Of the total persons examined, there were 723, or 3.5 percent, with unknown income information. These persons were excluded from the two income classification groups, but were included in the total group.

The previously published volume of tables[1] included the estimated mean and median caloric and selected nutrient intakes ingested on a single day for various population subgroups. It also presented certain relative measures of those means (e.g., the percent they were of defined standard). The present report examines some of these same relationships graphically and in the text, and it adds a new measure, namely the proportion of the population in each of the subgroups represented by persons whose reported dietary intake on the specific day fell below the standard used for the evaluation of the particular nutrient. As a guideline to interpreting the data, the standards for the evaluation of HANES dietary data were developed with advice from an ad hoc advisory group. The group considered standards from the National Research Council (NRC), *Recommended Dietary Allowances* (1968)[9]; Interdepartmental Committee on Nutrition for National Defense, *Manual* (1963)[10]; Food and Agriculture Organization and World Health Organization (FAO/WHO), *Calcium Requirements* (1962)[11]; FAO/WHO, *Energy and Protein Requirements* (1973)[12]; FAO/WHO, *Requirements of Vitamin A, Thiamine, Riboflavin, and Niacin* (1967)[13]; and FAO/WHO *Requirements of Ascorbic Acid, Vitamin D, B_{12}, Folate, and Iron* (1970)[14]; and those used in the Ten-State Nutrition Survey.

The recommended dietary allowances (RDA) established by the Food and Nutrition Board of the National Research Council in 1974 were not used[15] in the analyses of the HANES I dietary data because the processing and analysis of HANES I data were started before the release of the 1974 *Recommended Dietary Allowances.*[15]

Calcium and vitamin A standards for HANES are nearer the FAO/WHO standards,[11,13] but are lower than those levels based on the RDA established by the Food and Nutrition Board of the National Research Council (1968, 1974).[9,15] The HANES standards for vitamin A intake in older children and adults are considerably lower than the 1968 RDA, NRC standards and they are slightly less than the 1974 RDA, NRC standards for adult females. The HANES standards for iron, thiamine, and riboflavin are the same as the 1968 RDA, NRC standards.[9] HANES standards for thiamine and riboflavin are approximately the same as the FAO/WHO requirements[13] and are based on caloric intake, as contrasted with the 1968 and 1974 RDA, NRC standards, which are independent of calories; however, their values are very similar. HANES standards for vitamin C are higher than those of the FAO/WHO and similar to the 1968 RDA, NRC standards. The 1974 RDA, NRC standards for vitamin C for adults were reduced by 25 percent from the 1968 RDA, NRC standards. The HANES caloric and protein standards in terms of calories per kilogram of body weight per day, and grams of protein per kilogram of body weight per day, respectively, are approximately the same as the values presented in the 1968 and 1974 RDA, NRC tables.

Elsewhere[16] are presented basic data on the distribution of the total U.S. population with respect to various nutrient intakes. These should aid in identifying areas in which reexamination of standards may be necessary. Using the standards of other investigators, these cumulative distributions can be used to estimate proportions of persons below the standards.

The mean caloric and nutrient intakes in relation to the standard are a crude estimate of desirable or expected nutrient intakes and prove useful for comparisons of dietary intake data between population subgroups. Percents of standard below 100 do not, however, necessarily indicate inadequate nutrient intakes. The standards are designed to guide dietitians in formulating diets for the maintenance of good nutrition in healthy persons. They allow for some margin above what is really needed by most individuals, with the objective of maintaining good health in all.

Data are presented by nutrient intake per kilogram of body weight, permitting comparisons between males and females and between different age groups. This statistic accounts for differences in total food consumption due to differences in body weight, age, sex, and variations in growth rates. Data are also presented by mean nutrient intake per 1,000 calories. The statistic indicates the extent to which the adequacy of the diet is either a function of total caloric intake or dependent upon specific choice of foods with high nutrient content (high density).

Standards for assessing caloric and protein allowances for adults are based on expected median body weight for sex and height at ages 20-29 years. More specifically, an expected body weight at ages 20-29 years was computed for each individual adult based on height and sex. The median of the distribution of expected weight for each height and sex group was determined. Then for each individual 20 years and over that median expected weight for height and sex was multiplied by the nutrient allowance per kilogram of body weight (table VI). The resultant product was then taken as that individual's sex-height-adjusted standard. The reported caloric or protein intake for each individual was then divided by this standard to arrive at the "percent of standard." Height-sex-specific weight at ages 20-29 years was used because at these ages it is thought to most closely approximate the body's cell mass. Cell mass, the metabolically active part of the body, is the major determinant of adult nutrient needs. Weight gain after 20-29 years is usually fat, with no increase of the body's cell mass. Cell mass, rather, tends to decrease with age even as weight increases,[17] which indicates that these standardized allowances tend to overstate the nutrient needs of older people as compared with younger. This bias is much less, however, than the presentation of nutrient intake per kilogram of body weight.

Note that the foregoing procedure differs from the use of an average weight for all members of each of the adult age groups, along with the NRC recommended dietary allowance expressed in calories per kilogram. It also differs from the procedure followed in the Ten-State Nutrition Survey[2] where the weight used was the actual weight of the individual.

A similar method was used to obtain height-adjusted standards for assessing caloric and protein dietary intakes of children and of youth. The expected median body weight for age, sex, and height in those age groups was derived from anthropometric data collected in HANES.

In testing for significance of caloric and nutrient intakes between sex, race-sex, and race-sex-income subgroups within age an α level of 0.05 is assumed. Verification of the results cited can be obtained from the authors.

DIETARY FINDINGS

Mean Caloric and Nutrient Intakes

Sex and Age.—Figures 1-8 show the mean caloric and seven nutrient intakes (protein, calcium, thiamine, riboflavin, iron, and vitamins A and C) by age and sex. Mean protein, calcium, thiamine, and riboflavin intakes of males and females by age generally follow the same pattern shown by mean caloric intake for sex and comparable age groups (figure 1). A similar pattern is not evident for average iron and vitamins A and C intakes of males and females by age (figures 6-8).

Mean caloric, protein, calcium, thiamine, and riboflavin intakes of males increased rapidly from age 1 to age group 6-7 years and then increased less rapidly to age group 15-17 years (figures 1-5). The mean values for calories and related nutrients peaked at age group 15-17 years and then declined thereafter. The mean calcium and riboflavin intakes were exceptions to this nutrient intake trend by age; mean calcium intake declined at age group 2-3 years from age 1 and mean riboflavin intake remained fairly constant at similar ages. The mean calcium intake of children at age 1 was higher than that at age group 2-3 years, possibly because of decreased milk consumption.

Males had significantly higher mean caloric and thiamine intakes than females of comparable age groups 1-74 years had. Although differences in mean intakes were large enough to be statistically significant, they were too small to be of nutritional importance. Mean protein intake of males ages 2-74 was significantly higher than that of females of comparable age groups; mean riboflavin intake of males ages 4 years and over was significantly higher than intake of females of the same age group. The differences in mean calcium intake between sexes for comparable age groups showed a less consist-

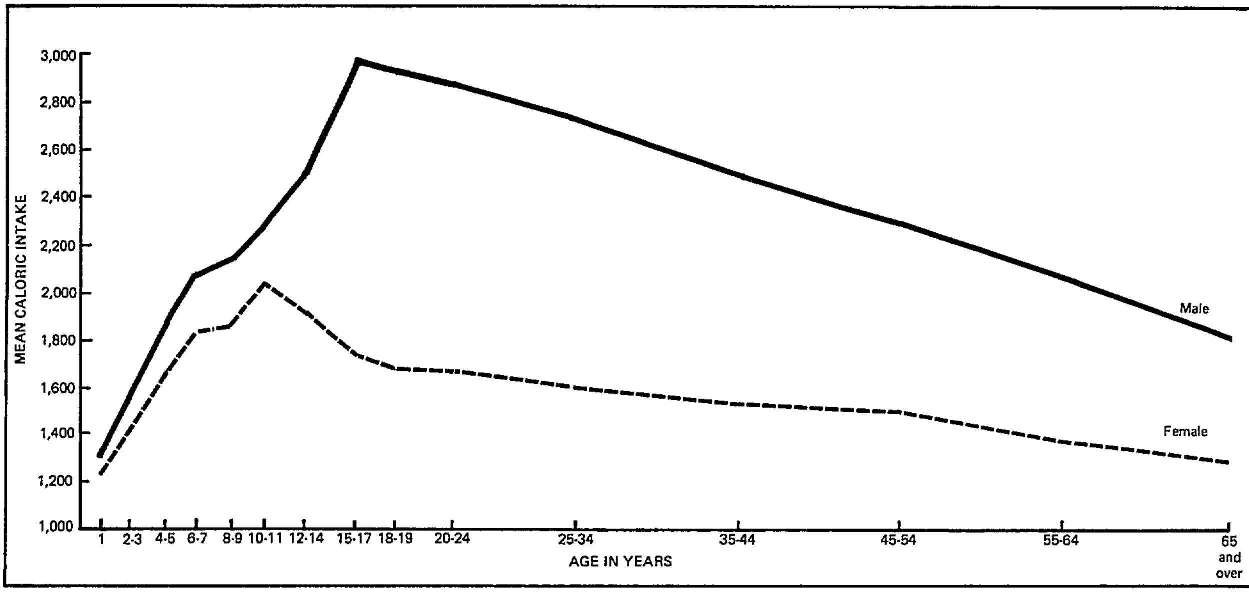

Figure 1. Mean caloric intake of persons aged 1-74 years, by age and sex: United States, 1971-74

ent pattern. Here, results were significant for all age groups except 1-3, 6-7, and 10-11. The mean caloric and nutrient values for females also climbed rapidly from age 1 to age group 6-7 years and then increased less rapidly to age group 10-11 years. The trend of mean nutrient intakes with age for calcium and even more so, for riboflavin, observed among males in the youngest ages were also observed among females. The mean values for calories and related nutrients peaked earlier for females than those observed for males and then declined thereafter.

Figure 6 shows the mean and median vitamin A intake by age and sex. The median values were consistently lower than those for mean values. Because of the skewness of the data, the

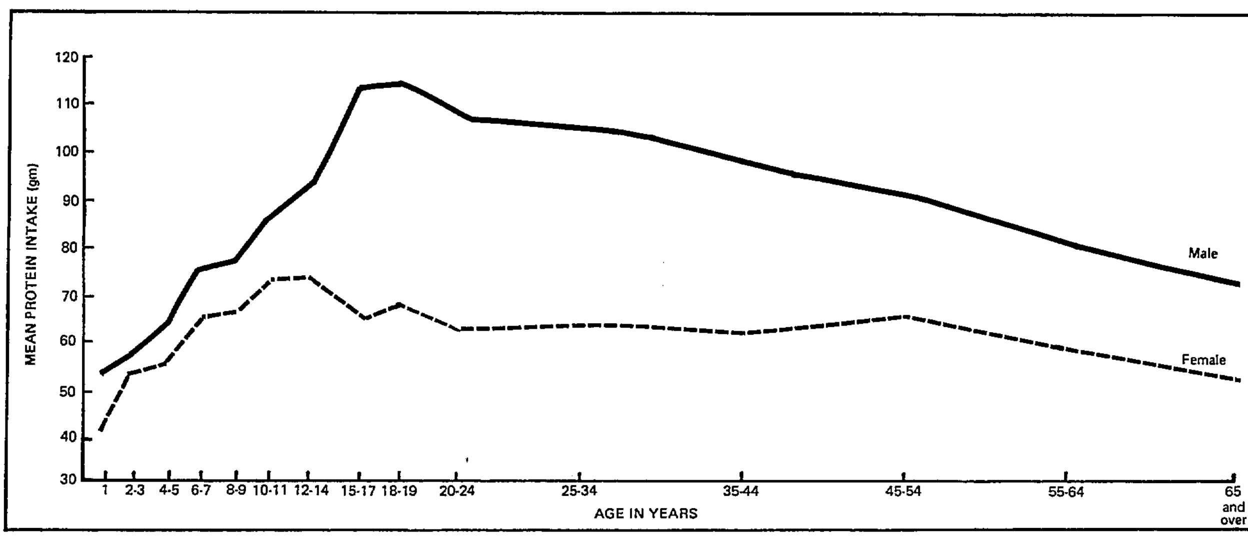

Figure 2. Mean protein intake of persons aged 1-74 years, by age and sex: United States, 1971-74

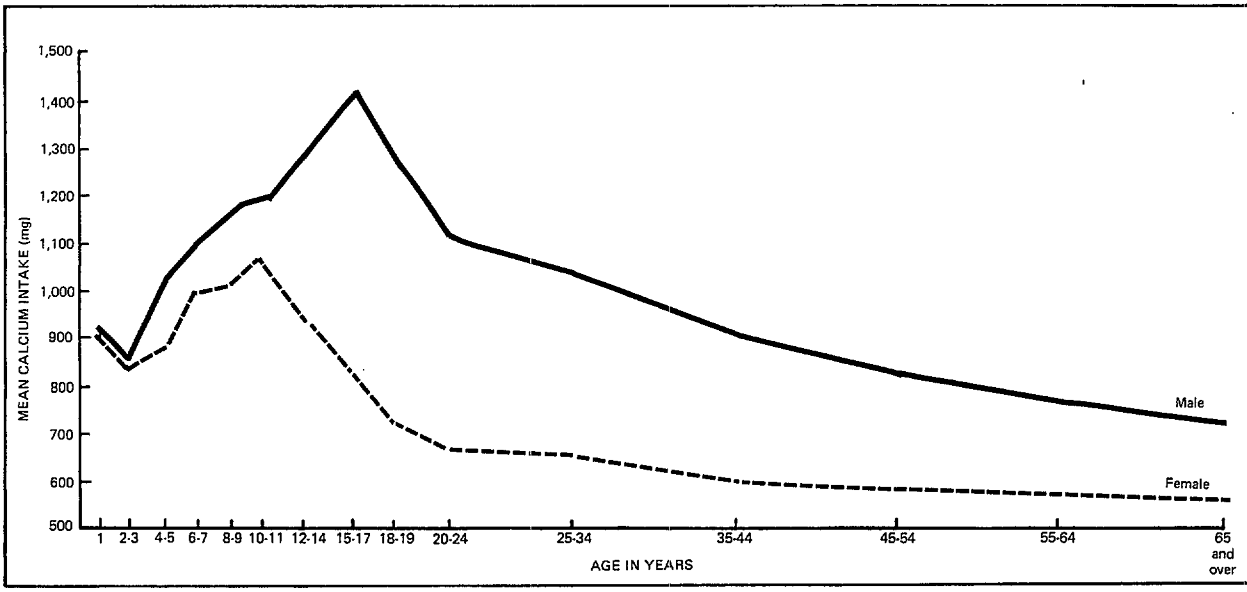

Figure 3. Mean calcium intake of persons aged 1-74 years, by age and sex: United States, 1971-74

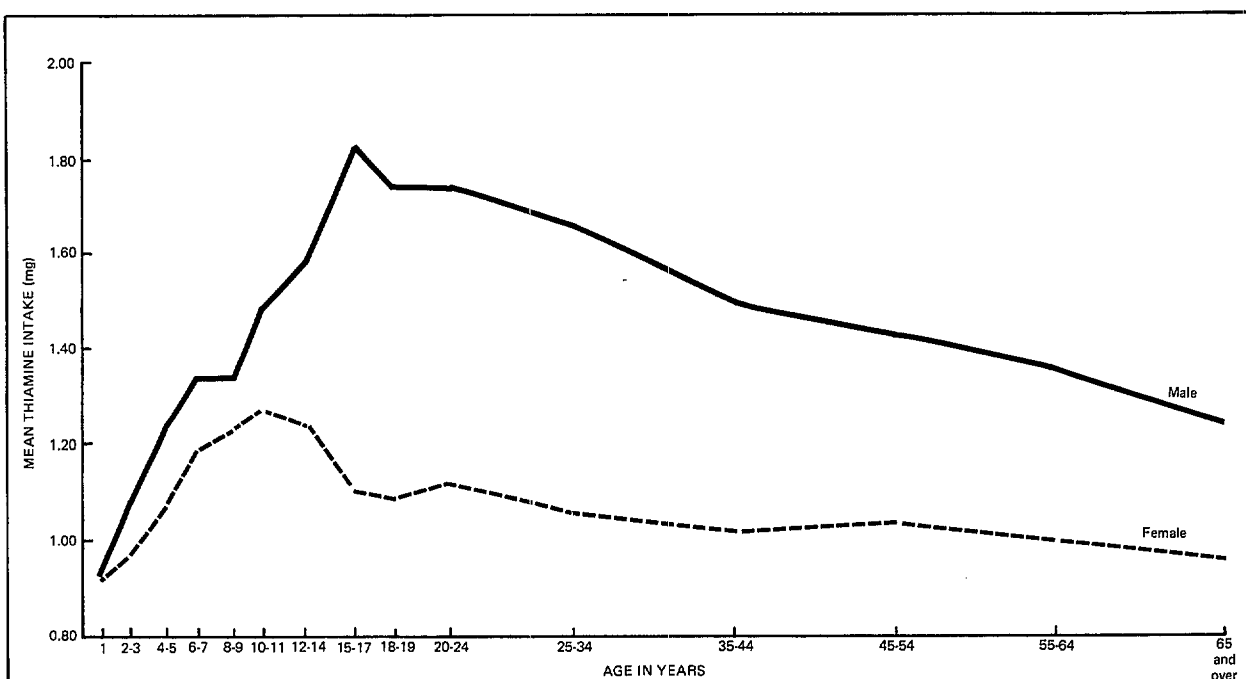

Figure 4. Mean thiamine intake of persons aged 1-74 years, by age and sex: United States, 1971-74

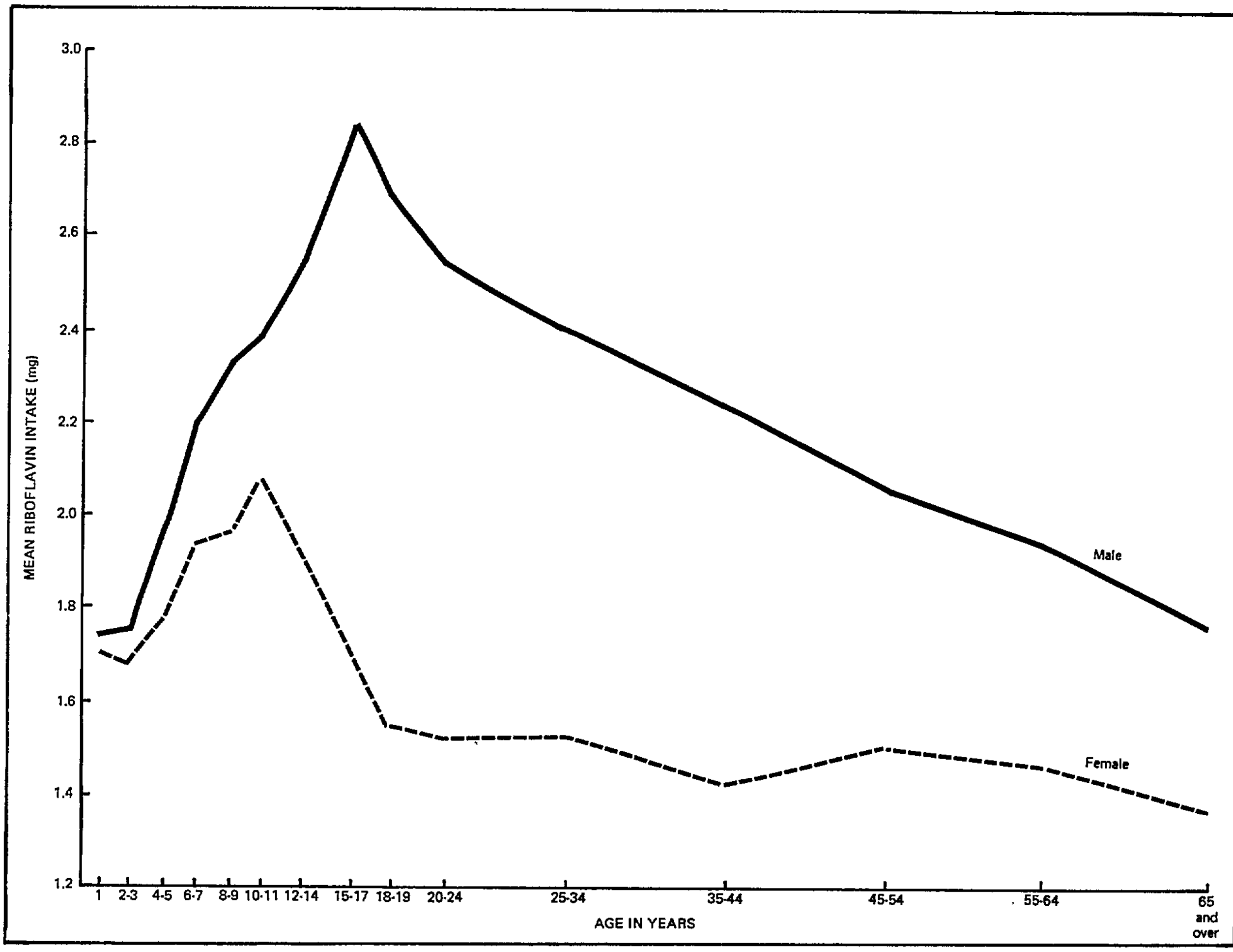

Figure 5. Mean riboflavin intake of persons aged 1-74 years, by age and sex: United States, 1971-74

median values were used for analysis. The logs of the mean values were used for tests of significance.

Median vitamin A intake was higher among males than among females at all ages (figure 6). The mean values were significantly higher for males from ages 10 through 44 years. The median intake of males remained fairly constant from age 1 to age group 4-5 years. The peak median intake of vitamin A occurred in the age group 18-19 years and declined irregularly thereafter. Females showed a pattern similar to that for males; there was a constant level in the youngest ages and, subsequently, a less rapid rate of increase with age than that for males. The peak median intake of vitamin A occurred at age group 10-11 years and declined to age group 15-17 years. From here, there was a gradual increase in value to age group 35-44 years, and the intake remained within a narrow range of values, 2,918-2,983 IU at ages 45-54 years to 65 years and older.

Figure 7 shows the mean vitamin C intake by age and sex. The mean values of males tended to rise over the age range 1-18 years, after which there was a general decline.

Mean vitamin C intake among females increased rapidly from age 1 to age group 4-5 years and then remained constant until age group 6-7 years, following which an increase in intake with age was noted. Among females this increase with age was more than that among

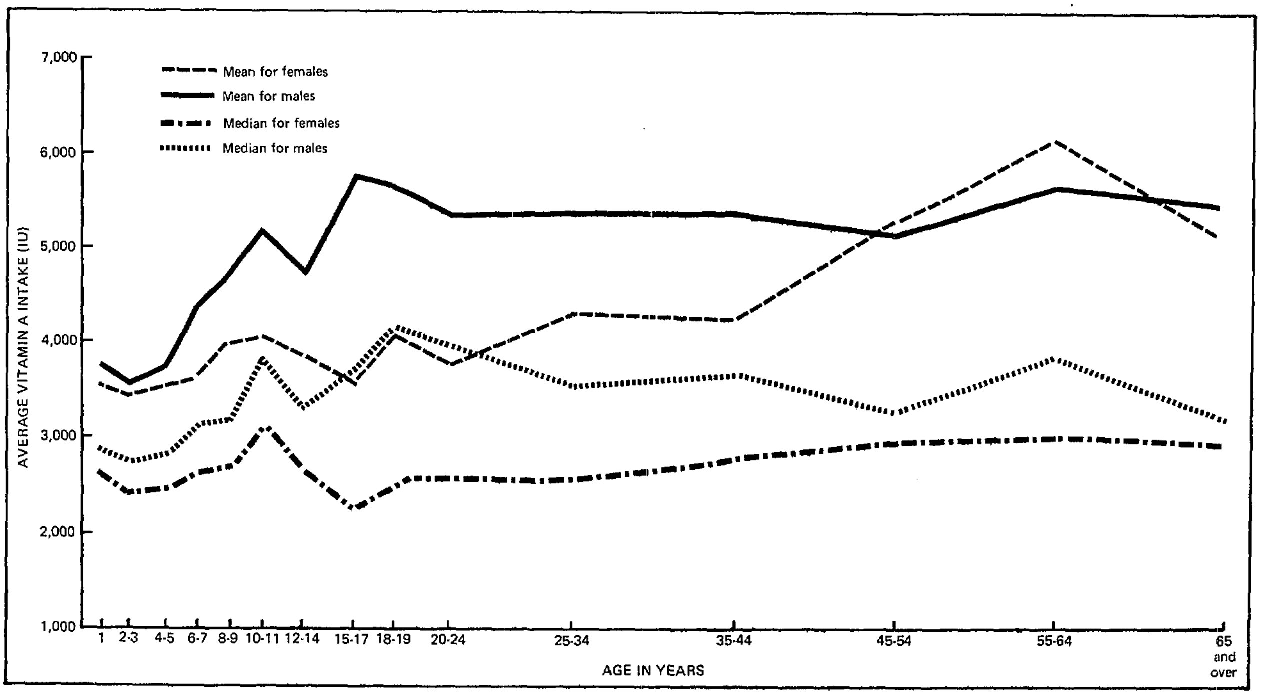

Figure 6. Average vitamin A intake of persons aged 1-74 years, by age and sex: United States, 1971-74

males, so that at age group 8-9 years the mean vitamin C value exceeded that for males. From ages 1 through 17 years, the peak value of vitamin C occurred at age group 8-9 years, declined to a low at age group 15-17 years, and then increased at age group 18-19 years. Females showed a pattern similar to that of males: there was a decrease in mean value until age group 25-34 years and, subsequently, a more rapid increase with age than that for males, so that the mean vitamin C value for females exceeded that for males at the older ages. Because of the skewness of the distribution of vitamin C intake, the logs of the mean vitamin C intake were used for tests of significance. The mean intake of vitamin C among males was significantly higher than that

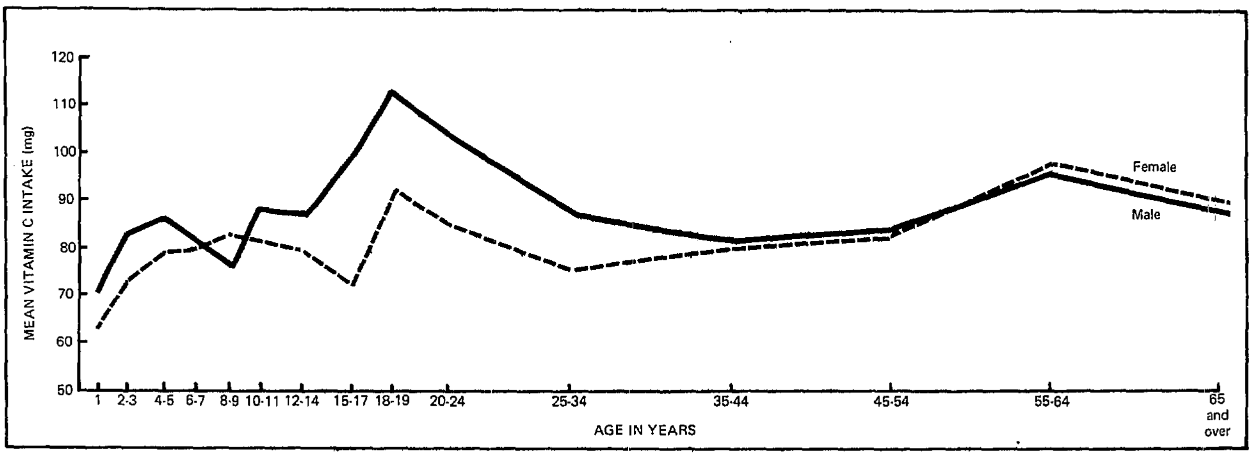

Figure 7. Mean vitamin C intake of persons aged 1-74 years, by age and sex: United States, 1971-74

among females aged 2-3, 15-17, and 20-34 years.

Figure 8 shows that the mean iron intake of males increased rapidly to ages 6-7 years. Thereafter the mean value continued to increase rapidly to ages 15-17 years. Here, the rate of increase "plateaued," and the mean value reached a peak at ages 25-34 and then declined at age 65 years and older, a decrease of 27 percent. The mean iron intake among males was consistently higher than that among females in all ages 1-74 years. The differences were statistically significant from age 2 on. The mean values among females were about the same at the youngest ages of 1 and 2-3 years. They rose steadily at ages 2-3 years to ages 6-7 years. The rate of increase then diminished, and the mean values reached a peak at ages 12-14 years and declined slightly at ages 15-17 years. The mean iron intake generally remained stationary between the ages of 18-19 years to 45-54 years within a narrow range and then declined to age 65 years and more.

The pattern of the decrease of mean caloric intake after age group 10-11 years for girls and the continuing increase in such intake for boys may be explained, in part, by differences in the growth pattern. The growth pattern of girls follows a growth pattern different from that of boys. Girls mature 1½-2 years earlier and decelerate more rapidly and completely. The rapid acceleration of growth for girls occurs just before puberty at age group 10-12 years, decreases rapidly, and then continues at a decreased rate. The average growth spurt of boys starts after age 1½, ends at about age 15, and continues at a slightly lower rate to maturity at about age 20 years. Girls, on the average, attain their peak rate of growth in height about 1½ years earlier than boys do.[18,19]

The picture of changes in body fatness from 6 through 17 years as represented by skinfold thickness shows that at every site—triceps, subscapular, midaxillary, suprailiac, and medial calf—girls display greater skinfold thickness than do boys of the same age. In both boys and girls, the skinfolds of the trunk (subscapular, midaxillary, suprailiac) increase in thickness with age from 12 through 17 years. The patterns of change in the triceps occur during the period of rapid adolescent growth.

In girls, the triceps skinfold, after leveling off at ages 10-12 years, continues to increase through age 17; in boys the triceps skinfold decreases steadily from 12 through 16 years of age.[20]

The daily average intake of girls reached its peak (average 2,023 calories) at about age group 10-11 years and then began to decline, reflecting the reduction in the velocity of growth that occurs after the onset of menarche. The caloric intake of boys tended to parallel the adolescent growth spurt increasing until age 15-17 years and then declined. Generally, boys mature later than girls do so that the peak average daily intake of 2,981 calories occurs later. Boys also

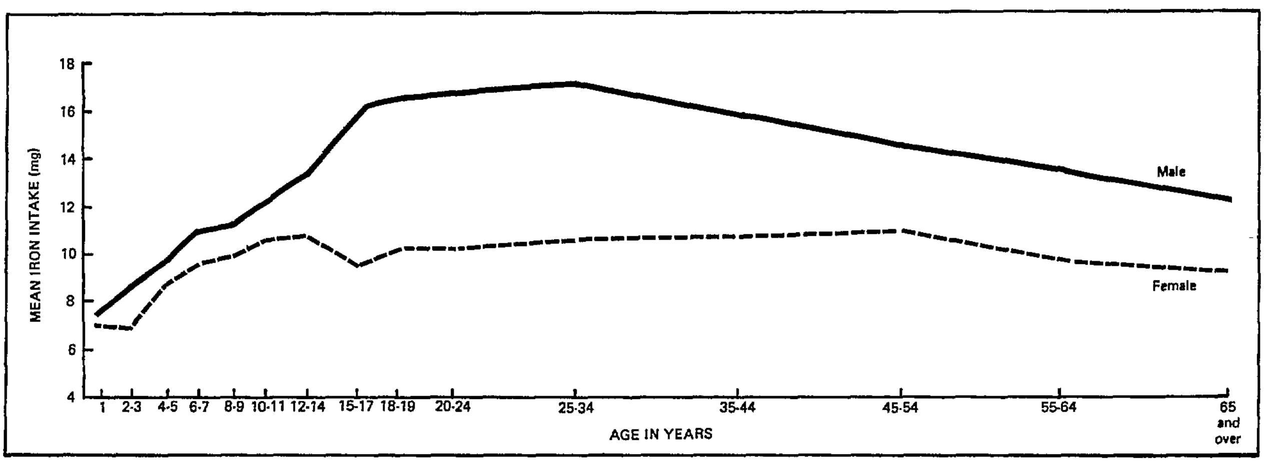

Figure 8. Mean iron intake of persons aged 1-74 years, by age and sex: United States, 1971-74

have higher caloric requirements than girls have because of their greater lean body mass; and since they are usually more active, their caloric needs are much greater for most of the adolescence.

Race, sex, and age.—The pattern of progression in average caloric and nutrient intake with age shown previously for all males occurred separately for white and black males (figures 9-17). The increase in mean caloric, calcium, thiamine, and riboflavin intakes of white males as they grew older leveled off after age group 15-17 years; among black males, the increase in the intake of these nutrients continued through age group 25-34 years, with the exception of mean calcium intake (figures 9, 11, 16, and 17). Here, the mean calcium intake peaked at age group 6-7 years and then declined thereafter. A similar examination of other nutrient values by age for white males shows that mean protein, iron, vitamin C, and median vitamin A intakes peaked at age group 18-19 years (figures 10, 12, 14, and 15). The mean iron and protein intakes of black males declined after age group 25-34 years. The increase in mean vitamin C intake of black males was quite irregular, proceeding upward to a peak at age group 20-24 years, declining, and then showing another peak at age group 55-64 years. The median vitamin A intake peaked initially at age group 6-7 years, declined irregularly to a low of 1,672 IU at age group 18-19 years, and then climbed to another peak of 3,361 IU at ages 35-44 years. From here, the median value after a decline at ages 45-54 years rose quite rapidly to exceed the median vitamin A intake of white males and then declined at the oldest age group 65 years and over.

Findings for mean protein, calcium, thiamine, and riboflavin intakes shown previously for the total female population paralleled the findings for white and black females when they were examined separately; the mean nutrient intakes leveled off after age group 10-11 years (figures 10, 11, 16, and 17). This pattern by age for both female subgroups is not evident for the average caloric, iron, and vitamins A and C intakes (figures 9, 12, 14, and 15). The mean iron intake of white and black females peaked at age group 10-11 years and then leveled off. The corresponding age group of black females for mean

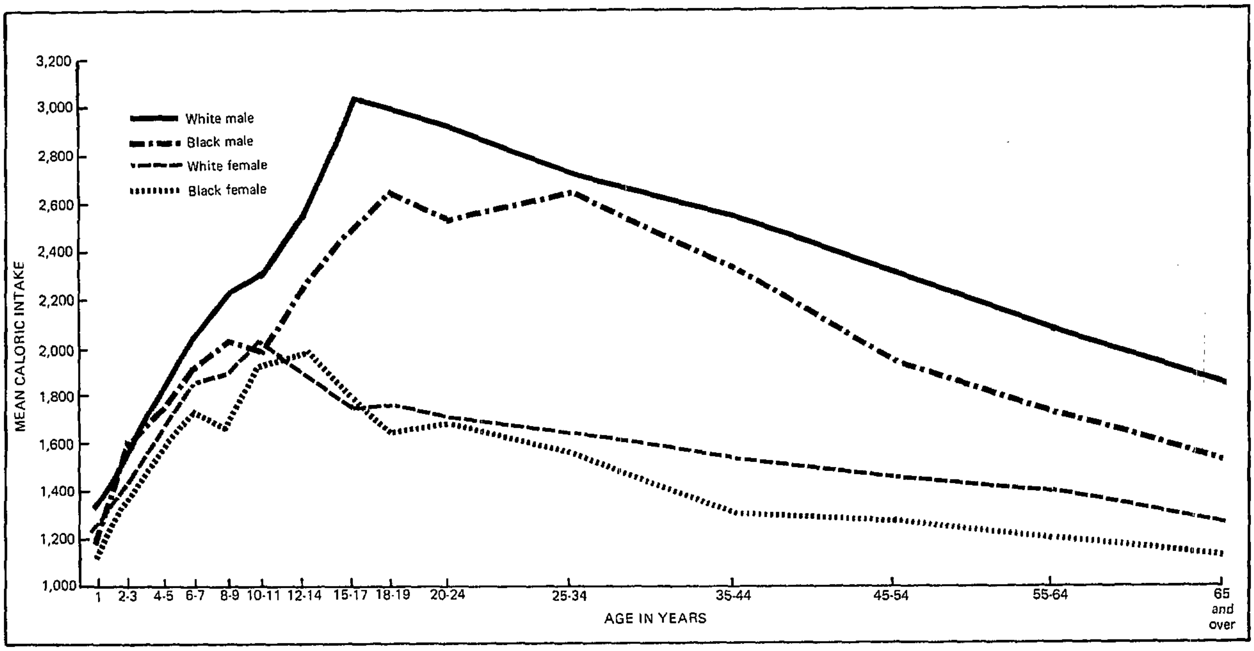

Figure 9. Mean caloric intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

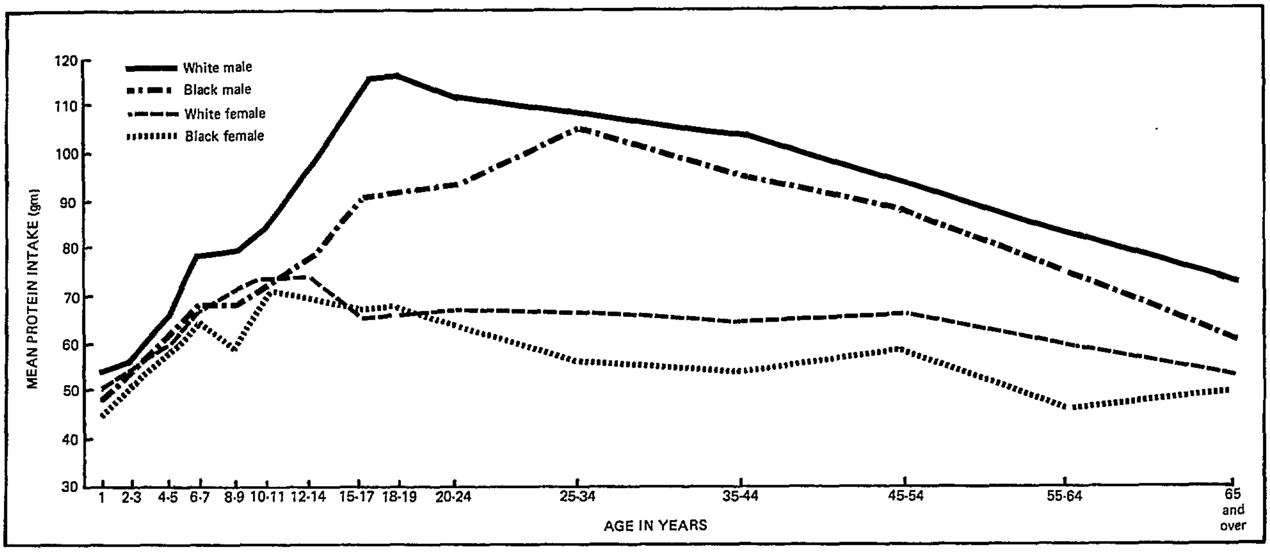

Figure 10. Mean protein intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

caloric intake was at ages 12-14 years and of white females was at ages 10-14 years.

Mean Differences in Caloric and Nutrient Intakes

The reader will not be able to note observations regarding the mean differences from this report. The figures showing the differences to substantiate the statements regarding differences in this section are too numerous to be included. Such figures are available upon request from the National Center for Health Statistics.

Race, sex, and age.—White males tended to have, on the average, higher mean caloric and nutrient intakes than their black counterparts had in ages 1-74 years. This observation held true consistently for protein, calcium, and riboflavin intakes in each of the 15 age comparisons. The differences were statistically significant for calcium intake in all age groups, except for ages 6-7 years, and for riboflavin in all age groups, except for ages 6-9 and 65-74. However, the differences were statistically significant for protein intake at ages 4-24 and 65 years and over. This direction was slightly less evident for average caloric, iron, vitamins A and C, and thiamine intakes. For iron, white males had, on the average, higher intakes in 13 of 14 age comparisons. At age group 2-3 years, the mean iron intake of the two groups was equal. For median vitamin A and mean thiamine intakes, the pattern was 13 and 12, respectively, of the 15 age comparisons. The exceptions for thiamine occurred in the younger ages, 2-3, 4-5, and 8-9, and for vitamin A at ages 6-7 and 55-64 years. For vitamin C, these differences in the direction of white males were observed in 11 of the 15 age comparisons, with the exceptions dispersed throughout the age range of 1-74 years without any clear-cut pattern. For calories, white males had significantly higher mean intake than black males at ages 1, 10-17, 20-24, 45-54, and 65 years and over. At ages 6-7, 15-17, 20-24, 45-54, and 65-74, the mean iron intake of white males was significantly higher than that of black males. For vitamin A, differences in mean intake between white males and black males were significant for those aged 1, 15-17, and 55-64 years; for vitamin C, they were significant for ages 2-3 and 10-11; and for thiamine, for ages 10-11, 15-17, and 65-74.

Differences in mean caloric, calcium, thiamine, and riboflavin intakes between white and black males were largest at the age group 15-17

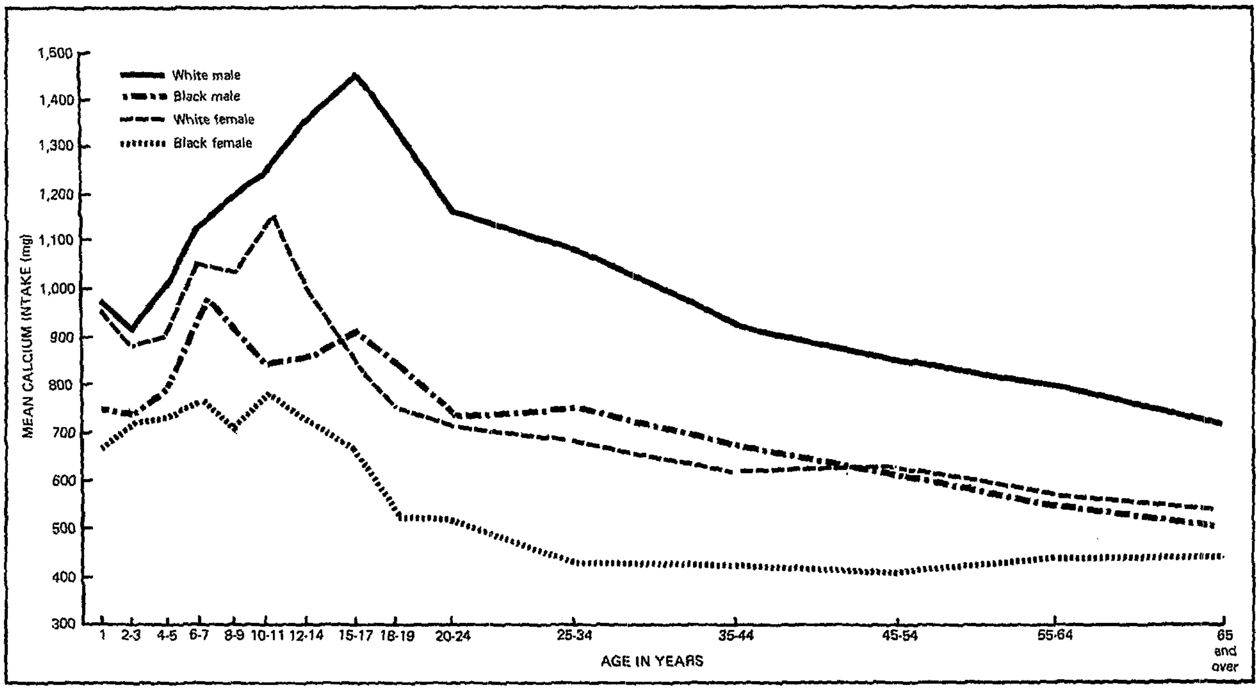

Figure 11. Mean calcium intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

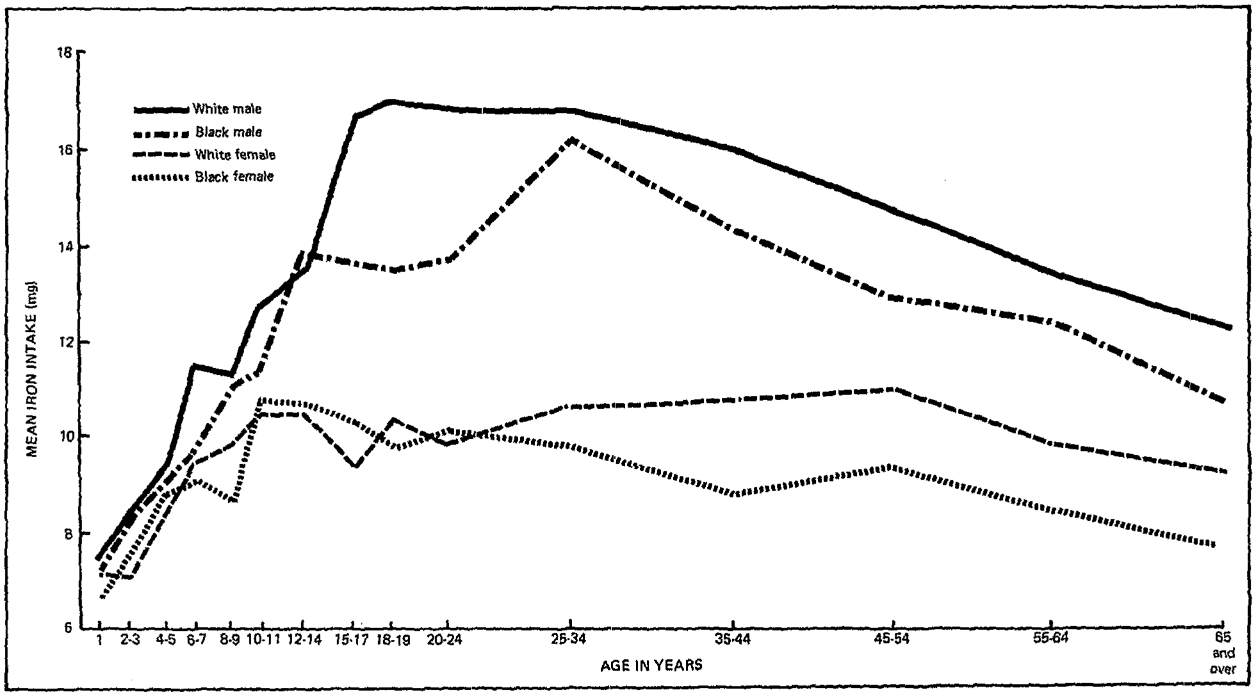

Figure 12. Mean iron intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

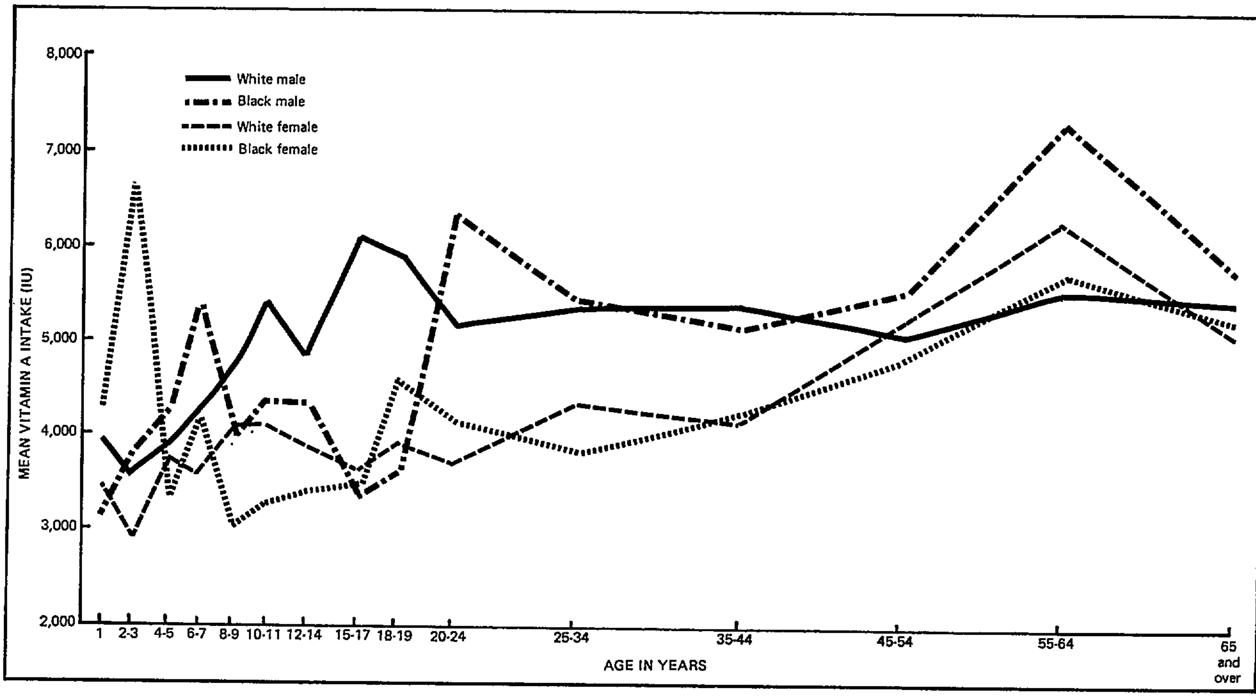

Figure 13. Mean vitamin A intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

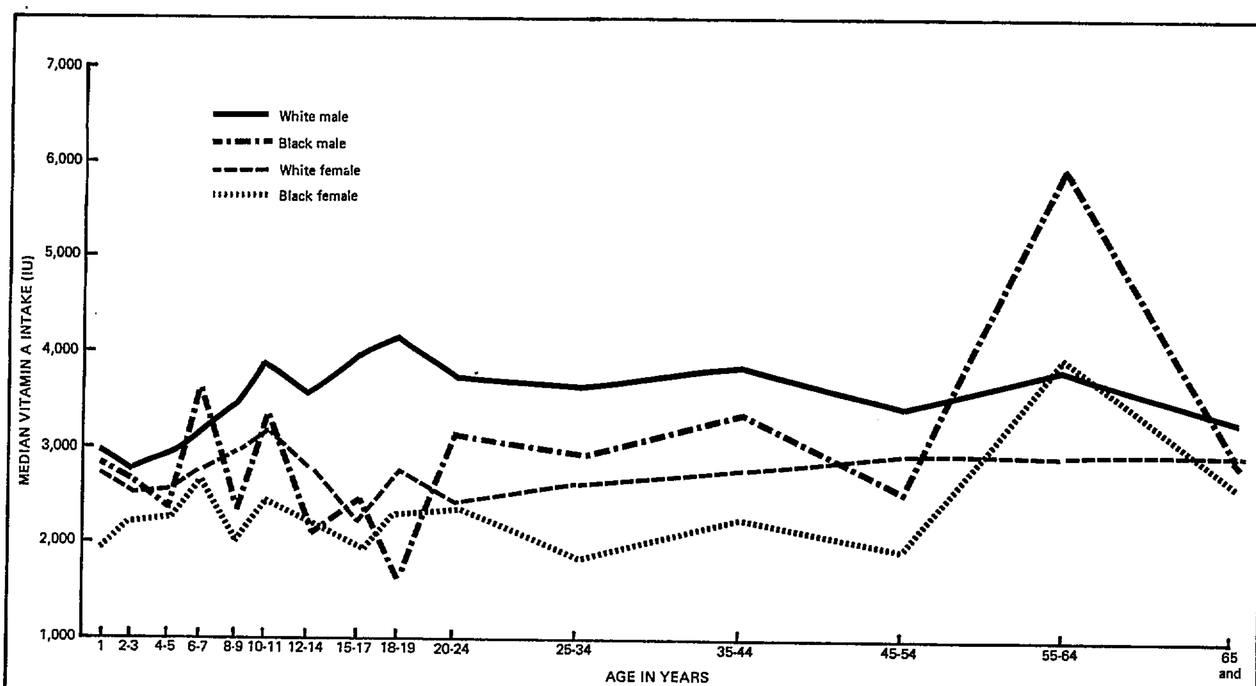

Figure 14. Median vitamin A intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

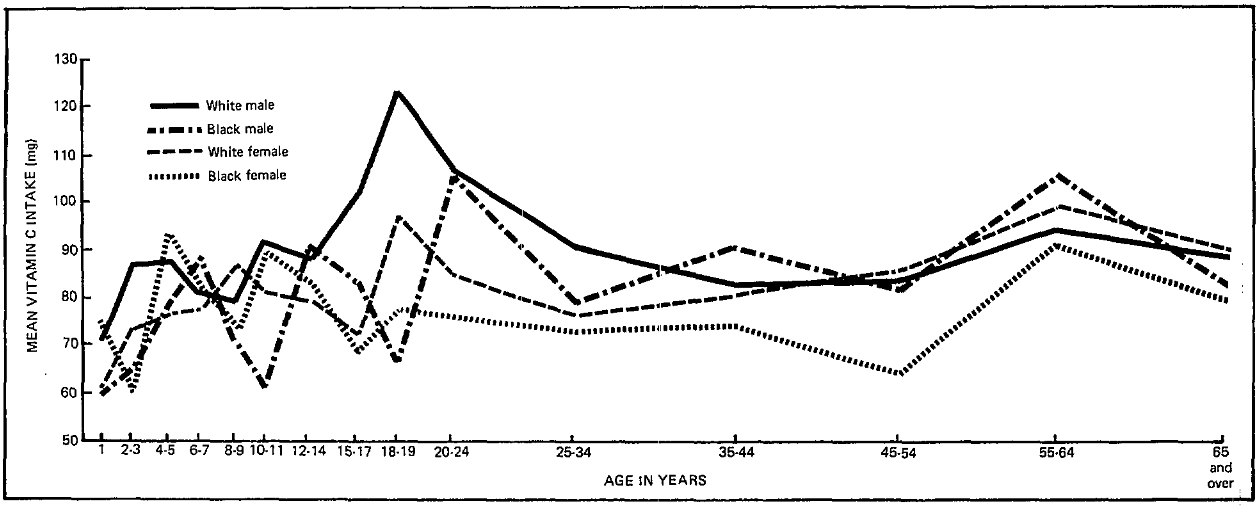

Figure 15. Mean vitamin C intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

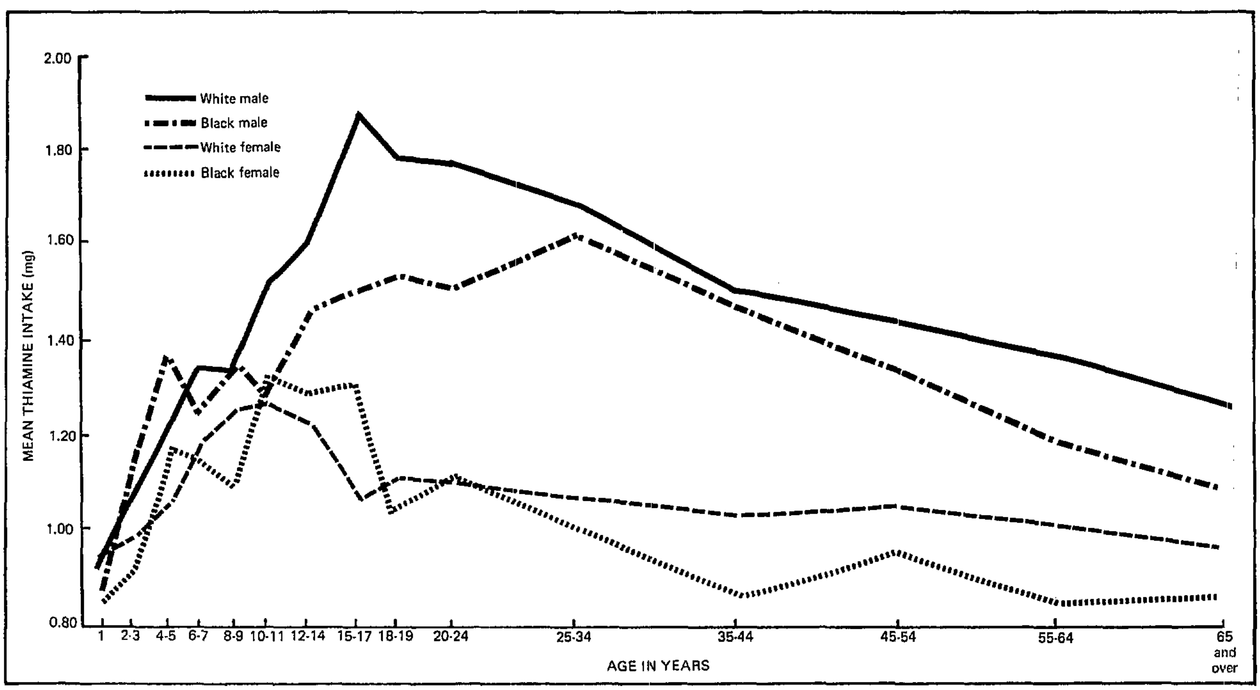

Figure 16. Mean thiamine intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

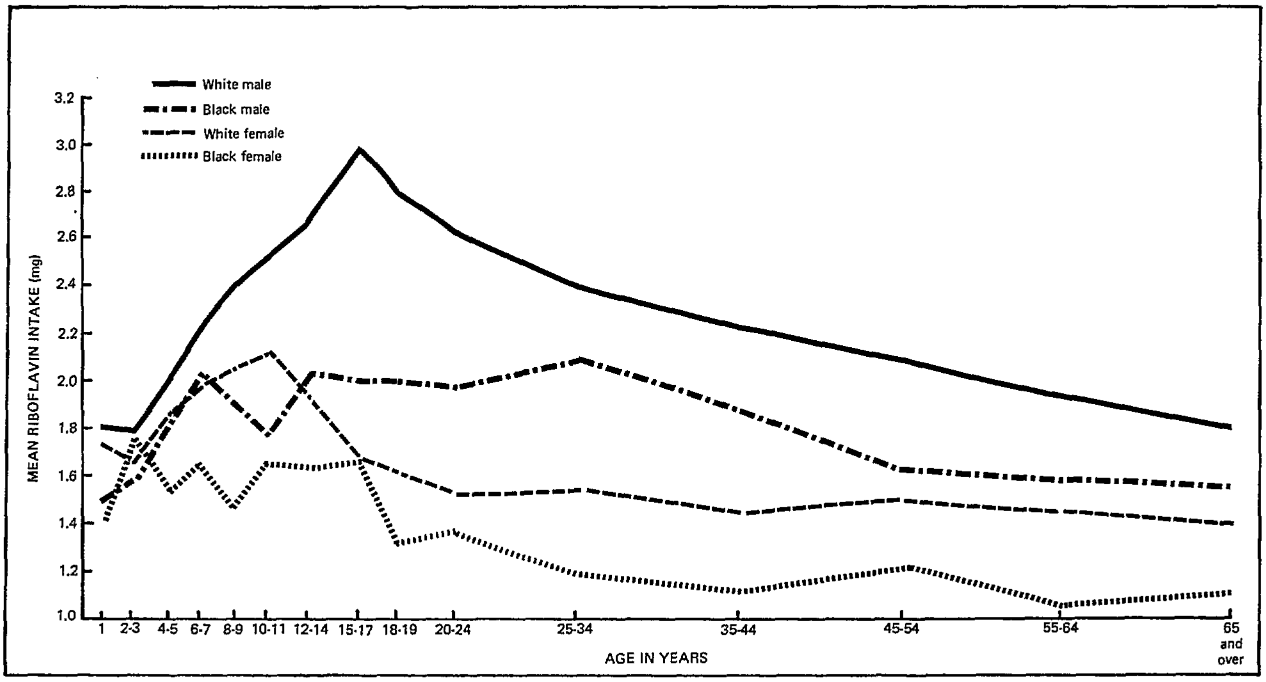

Figure 17. Mean riboflavin intake of persons aged 1-74 years, by age, race, and sex: United States, 1971-74

years. From this age on, mean calcium intake generally decreased with increase in age. In contrast, differences in mean caloric, protein, thiamine, and riboflavin intakes showed no steady decline with increase in age.

The largest differences in average iron and vitamin C and median vitamin A intakes between white and black males occurred at age group 18-19 years. White males showed smaller differences in mean iron and protein and median vitamin A intakes than black males did at the youngest ages 1 and 2-3 years, in contrast with the oldest age group 65 years and over. The opposite was true for mean vitamin C intake.

White females tended to have higher average caloric, protein, calcium, and riboflavin intakes than black females had in 13 or more of the 15 age comparisons (figures 9-11 and 17), particularly at ages less than age 25. For iron, vitamin C, and thiamine intakes, white females also generally showed larger average values than black females did; however, fewer of the age groups of white females exceeded those of black females. Here, white females had average nutrient intakes that were larger in 9-11 of the 15 age comparisons. White females had significantly higher mean calcium intake than did black females of the same age group. This observation held also for riboflavin for those ages 1, 4-11, and 20 years and over. There were no significant differences between the mean caloric, iron, protein, thiamine, vitamin A, and vitamin C intakes of white females and black females within most age groups. The exceptions were ages 8-9 and 35 years and over for calories; 8-9, 25-44, and 55-64 years for protein; 8-9 and 35-74 years for iron; 4-5, 35-44, and 55-64 years for thiamine; 8-11 for vitamin A; and 45-54 for vitamin C.

Differences in average nutrient intakes between white and black females for protein and riboflavin were greatest at age group 8-9 years and for calcium at age group 10-11 years. These were earlier ages than the ages for their male counterparts. However, for calories and iron intakes, the greatest differences in average intakes between white and black females were at the age group 35-44 years and for vitamins A and C at age groups 41-74 years.

Differences in mean caloric, iron, and thiamine intakes between white and black females were greater at the oldest ages, 65 years and over, in comparison with those at the youngest age, 1 year. A similar pattern was not evident for average protein, calcium, vitamins A and C, and riboflavin intakes. Differences between females in average intakes of these nutrients were greater at the younger ages.

White males had significantly higher mean caloric intake than white females of the same age group had. For protein and iron this observation held for those 2 years and over. For riboflavin it held for those age 4 years and over; for thiamine, it held for those ages 2-7 and 10 years and over; and for calcium, it held for those ages 4-5, 8-9, and 12 years and over. White males had higher mean vitamin A intake than white females had for ages 2-3 and for ages 10-44. Within most age groups there was no significant difference between the mean vitamin C intake of white males and that of white females. The exceptions were found for those ages 2-3, 15-17, and 20-34.

Black males showed a consistently higher intake pattern in all 15 age groups than black females did for caloric, protein, calcium, and iron intakes. Black males had higher mean thiamine and riboflavin intakes than black females had in 14 of the 15 age groups (excepting those aged 10-11 years for thiamine intake and those aged 2-3 years for riboflavin intake). This direction was less pronounced for median vitamin A and vitamin C intakes. Black males had higher median vitamin A and average vitamin C intakes than black females had in 13 and 10 of the 15 age comparisons, respectively.

There were no significant differences of mean caloric, protein, calcium, iron, and riboflavin intakes between black males and black females for those in the age group 1-5 years. With the exception of ages 2-3, this observation held also for thiamine. Black males in the older age groups, on the other hand, generally had higher mean intakes for calories and these five nutrients than black females of the same age group had. For calories and protein this observation held for those aged 15 years and over and, with the exception of those aged 55-64, it also held for calcium. For riboflavin it held for those aged 18 years and over and for thiamine and iron for those aged 20 years and over. Black males aged 8-9 had higher mean intakes for calories, protein, iron, and thiamine than black females of the same age group had, and black males aged 6-9 had higher mean calcium and riboflavin intakes than black females of the same age group had. Black males aged 12-17 had higher mean iron intake than black females of the same age group had. There were no significant differences between the mean vitamin C intake of black males and that of black females of the same age group and with the exception of ages 10-11 this observation held also for mean vitamin A.

Race, sex, age, and income.—White males in the income group above poverty level generally had higher mean caloric and nutrient intakes than white males of comparable ages in the income group below poverty level had. These differences in the direction of the upper income group occurred in each of 15 age groups for vitamin C intake. Differences also occurred in most of the age groups for other nutrients, ranging from 10 of 15 age groups in iron intake to 13 of 15 age groups in median vitamin A intake. The exceptions were generally in one or all of the age groups of 1-3 and 35-44 years for caloric, protein, calcium, iron, and vitamin A intakes. The other exceptions were in ages 1-3 and 45-54 years for riboflavin intake, and in ages 2-3, 6-7, and 35-44 years for thiamine intake. In general, differences in mean caloric and nutrient intakes between white males aged 1-17 of the lower income group and white males of the same ages in the upper income group were not statistically significant. One exception was found in riboflavin intake for ages 6-11. The other exceptions were found in caloric and iron intakes for ages 12-17. In these instances, mean intakes were higher for white males in the upper income group.

White males age 18 years and over in the upper income group have significantly higher mean vitamin C intake than white males of the same ages in the lower income group have. This observation holds also for calories for ages 45-64, for protein and vitamin A for ages 45 years and over, and for calcium and riboflavin for ages 65 years and over. There were no significant differences in mean thiamine intake of white males in the lower income group and those of white males of the same age in the upper income group.

The differences in average calories and selected nutrients found for white males by income levels for comparable age groups were also found for black males. However, a less pronounced pattern is evident in comparing the two income groups. Slightly more than half, 8 of the 15 age groups for black males in the upper income group, tended to have higher protein and vitamin A and C intakes than those in the lower income groups. The corresponding figures for calcium and riboflavin intakes are 9 of 15 age groups; for caloric, iron, and thiamine intakes, it ranged from 10 of 14 age groups to 12 of 15 age groups. The consistent exceptions to the pattern were most often found in ages 1-3, 15-17, 18-19, and 65-74 years. There were no significant differences in mean caloric and nutrient intakes between black males in the lower income group and black males of the same ages in the upper income group.

The findings for average caloric and selected nutrient intakes for white and black females paralleled the findings for their male counterparts in that females of the upper income group had higher nutrient intakes than those of the lower income group had. White females in the upper income group had mean caloric, protein, and calcium intakes that were larger in 9 of 15 age comparisons. Black females showed a similar pattern for average calcium, median vitamin A, and riboflavin intakes. The corresponding values among white females for average iron, vitamins A and C, and thiamine and among black females for average calories, protein, iron, vitamin C, and thiamine ranged from 10 to 13 of the 15 age comparisons. Exceptions to the general picture for white females were generally found in ages less than age 10. In contrast, the exceptions for black females were usually found in older ages without any clear-cut pattern.

In general there were no significant differences in mean caloric and nutrient intakes between white females in the lower income group and white females of the same ages in the upper income group. Most of the exceptions were found in the older ages. Differences in mean intakes of these subgroups were significant for protein for ages 18-74, for calcium for ages 12-17, for thiamine and vitamin C for ages 45-74, for iron for ages 18-44 and 65-74, for vitamin A for ages 18-44, and for riboflavin for ages 12-44 and 65-74.

There were no significant differences in mean caloric and nutrient intakes between black females in the lower income group and black females of the same age in the upper income group.

White males tended to have higher mean caloric and nutrient intakes than black males had, regardless of income level. There were some exceptions to the general finding in comparing the average vitamin A and C intakes between white and black males by income. Black males in the upper income group showed higher median vitamin A intake than did white males in the lower income group; black males in both income groups also showed higher mean vitamin C intake than did white males in the lower income group.

Results were significant for vitamin C only for ages 6-11 and 45-74 when white males of the lower income group were compared with black males of the upper income group, and for ages 6-11 when white males of the upper income group were compared with black males of the lower income group.

For calories, protein, thiamine, and iron, differences in mean intakes were generally significant for (at most) two age groups. Three exceptions were found. The first was the mean caloric intake of white males aged 6-17 and 45-64 with income above poverty level and of black males of the same age groups with income below poverty level; the second was the mean protein intake of white males aged 6-17 and 65-74 years in the upper income group and of black males of the same ages in the lower income group; and the third was mean iron intakes of white males ages 12-44 and 65-74 in the upper income groups and of black males of the same ages and income groups.

White males aged 1-44 years in the lower income group had significantly higher mean calcium intakes than black males of the same ages and income groups had. White males aged 12-64 in the lower income group had significantly higher mean calcium intake than had black males of the same ages with income above poverty level. White males in the upper income group, aged 6-74, had significantly higher mean calcium intake than had black males of the same ages and income groups; white males aged 1-74 of the upper income group had significantly higher mean calcium intake than black males of the same ages with income below poverty level had.

Significant differences in mean riboflavin intake between white males of the lower income group and black males of the same income group occurred at ages 1-5 and 18-44, and significant differences in mean riboflavin intake between white males in the lower income group and black males of the upper income group were found for those aged 12-44. White males aged 1-74 in the upper income group had significantly higher mean intake for this nutrient than black males of similar ages in the lower income group had. This observation held also for white and black males in the upper income group, aged 6-64.

The findings for females by race for income levels tended to parallel those for males. But again results were significant only within certain age groups.

Results were significant for calcium in most subgroups. The exceptions were found in comparing white females aged 12-17 and 65-74 below poverty level and black females of the same ages and income group, and at ages 12-17 when comparing white females of the lower income group with black females aged 12-17 of the upper income group.

Results were also significant for riboflavin in most subgroups. In comparing white females of both income groups with black females of the upper income groups, the exceptions were found for ages 1-5 and 12-17; and in comparing white females of the upper income group with black females of the lower income group, the sole exception was found for ages 12-17. White females aged 1-11 in the lower income group had significantly higher mean riboflavin intake than black females of the same age and income group had.

There was one other instance for which results were significant in more than two age groups. White females aged 18-74 in the upper income group had higher mean thiamine intake than black females of the same age and income group had.

There were also other exceptions to these findings in that white females tended to have higher average nutrient intakes than black females had, regardless of income. Black females in both income groups had higher mean vitamin C intake than white females in the lower income group had. Black females in the lower income group generally showed higher mean thiamine intake than white females in the similar income group showed. The final exception was the comparison of iron intake between white females in the lower income group and black females in the upper income group. Results were significant in none of those instances.

CALORIC AND NUTRIENT INTAKES IN RELATION TO THE STANDARD

Mean caloric and nutrient intakes were evaluated in relation to dietary standards. Distribution of individuals by amounts of nutrients were also examined. This made it possible to show the proportion of individuals who had nutrient intakes that did not meet the standards.

Data from the 24-hour recall showed some individuals with extremely low caloric values whose usual intake would be higher; nevertheless, valid comparisons between subgroups can be made. This statement is applicable to all of the dietary intake data, not just to calories.

Of the examined persons, 1,396 or 7 percent had caloric intake less than 800 calories. An intake of less than 800 calories was used as the cutoff level because the majority of medically prescribed therapeutic diets for weight reduction purposes generally range from 1,000-1,800 calories, depending on age, sex, and weight status. Most of the reasons for consuming less than 800 calories encompassed reasons such as: self-imposed diets, lack of appetite, and illness on the day prior to the dietary interview. A more detailed analysis of this group of subjects by age, race, sex, and income will be reported in a *Vital and Health Statistics* series 11 report.

Caloric Intake

Mean caloric intake of males in ages 1-11 and 18-44 years approached (90-100 percent of the standard) or exceeded the standards. In the adolescent years 12-17 and in the older ages 45-74 years, the mean caloric intake furnished less than the standards, averaging about 20 percent below the recommended amounts. The mean caloric intake of females in ages less than 8 years also approached or met the standards. The corresponding values in ages 8 through 74 years failed to meet the standards, ranging from 11 percent in ages 10-11 years, to 31 percent in ages 15-17 years below the standards (figure 18 and table 1).

The pattern of mean caloric intake with relation to standards previously described for all males of the U.S. population was also evident among white males. In contrast, black males had mean values that approached or met the standards in ages 1-7 and in age group 25-34 years. Mean values among black males in all other age groups furnished less than the caloric standard; the percents varied from 16 percent below the standard in ages 18-19 years to 36 percent below the standard in ages 65-74 years. Both white and

Figure 18. Mean intake of calories and selected nutrients as a percent below the standard for persons aged 1-74 years, by income level, sex, and age: United States, 1971-74

[Based on 1-day diet; 24-hour recall]

Sex and age	Calories			Protein (gm)			Calcium (mg)			Iron (mg)		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
Male												
1 year										XXXX	XXXX	XXXX
2-3 years										XXXX	XXXX	XXXX
4-5 years										X	X	X
6-7 years												
8-9 years	X	X	X									
10-11 years	X	XXX	X									
12-14 years	XX	XXX	XX							X	X	X
15-17 years	XX	XXX	XX							X	XXX	X
18-19 years	X	XX	X							X	XX	X
20-24 years	X	XX	X									
25-34 years	X	XX	X									
35-44 years	X	X	X									
45-54 years	XX	XXX	XX									
55-64 years	XX	XXXX	XX		X							
65 years and over	XXX	XXXX	XXX	X	X							
Female												
1 year										XXXX	XXXX	XXXX
2-3 years										XXXX	XXXX	XXXX
4-5 years										XX	XX	XX
6-7 years	X	X	X							X	XX	X
8-9 years	XXX	XX	XXX							X		X
10-11 years	XX	XX	XX							XXXX	XXXX	XXXX
12-14 years	XXX	XXX	XXX							XXXX	XXXX	XXXX
15-17 years	XXXX	XXXX	XXXX	X	XX					XXXX	XXXX	XXXX
18-19 years	XX	XX	XX							XXXX	XXXX	XXXX
20-24 years	XXX	XXX	XXX		X					XXXX	XXXX	XXXX
25-34 years	XX	XX	XX		X			X		XXXX	XXXX	XXXX
35-44 years	XX	XXX	XX		X			XX		XXXX	XXXX	XXXX
45-54 years	XX	XX	XX		X		X	X	X	XXXX	XXXX	XXXX
55-64 years	XX	XXX	XX	X	XX	X	X	X	X	X	XX	X
65 years and over	XXX	XXX	XXX	X	XX	X	X	XX	X	X	XX	X

KEY

X = Below by 1-10 percent
XX = Below by 11-20 percent
XXX = Below by 21-29 percent
XXXX = Below by 30 percent or more

[1]Excludes person with unknown income.

NOTE: There was no one observed below the standard for vitamins A and C, thiamine, and riboflavin.

black males had mean caloric values that consistently met the standards only in ages 1 through 7 years (figure 19 and table 3).

As presented in the data for all females in the U.S. population, both white and black females had mean caloric intake that approached or met the standards in ages 1-7 years (figure 20). The corresponding caloric intake of females 8 through 74 years furnished less than the standards with the exception of white females in age group 10-11 years when the mean value approached the standard (90 percent).

White boys 1-9 years of age in both income groups had mean caloric intake that approached or exceeded the standards (figure 19). This was also true for white girls and black boys aged 1-7 years (figures 19 and 20). For black girls, however, the corresponding pattern was evident only at ages 1-5 years for those in the lower income group and at ages 1-7 years for those in the upper income group (figure 20).

White males aged 10 through 74 years in the lower income group generally had mean caloric intake ranging from 13 to 30 percent below the standards with the exception of males aged 35-44 years when the mean value approached the standards. In the upper income group, this observation was evident only at ages 12-17 and 45-74 years, averaging 14 and 20 percent below the standard. At ages 8-11 and 18-44 years for

Figure 19. Mean intake of calories and selected nutrients as a percent below the standard for males aged 1-74 years, by income level, race, and age: United States, 1971-74

[Based on 1-day diet; 24-hour recall]

Race and age	Calories			Protein (gm)		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
White male						
1 year						
2-3 years						
4-5 years						
6-7 years						
8-9 years	X	X	X			
10-11 years	X	XX	X			
12-14 years	XX	XXX	XX			
15-17 years	XX	XX	XX			
18-19 years	X	XX	X			
20-24 years	X	XX	X			
25-34 years	X	XX	X			
35-44 years	X	X	X			
45-54 years	XX	XX	XX			
55-64 years	XX	XXXX	XX		X	
65 years and over	XXX	XXX	XXX		X	
Black male						
1 year						
2-3 years						
4-5 years						
6-7 years						
8-9 years	XX	XX	XXX			
10-11 years	XXX	XXXX	XX			
12-14 years	XXX	XXXX	XXX			
15-17 years	XXX	XXXX	XXX			
18-19 years	XX	XX	XX			
20-24 years	XX	XXX	XX			
25-34 years	X	XX	X			
35-44 years	XX	XX	XX			
45-54 years	XXX	XXXX	XXX			
55-64 years	XXXX	XXXX	XXX		XX	
65 years and over	XXXX	XXXX	XXXX	XX	XX	XX

KEY

X = Below by 1-10 percent
XX = Below by 11-20 percent
XXX = Below by 21-29 percent
XXXX = Below by 30 percent or more

[1]Excludes persons with unknown income.

NOTE: There was no one observed below the standard for thiamine and riboflavin.

those in the upper income group, the mean caloric intake approached the standard (figure 19 and table 3).

Black males and white females in all ages from 8 through 74 years and in both income groups had mean caloric intakes below the standards (figures 19 and 20). The mean values for black males ranged from 13 to 43 percent below the standards in the lower income group and from 15 to 36 percent in the upper income group. The corresponding values for white females were 11-34 percent in the lower income group and 14-31 percent in the upper income group. Black females in almost all ages from 8 through 74 years and in both income groups had mean caloric intake below the standards; and the percent in the lower income group ranged from 11 percent to 34 percent and in the upper income group, from 19 to 35 percent (figure 20 and table 5).

An analysis of the caloric distribution data showed that a large percent of males and females had intake below the caloric standards (table 7). Females tended to have higher proportions of persons who had caloric intake below the standards than males had; exceptions occurred at age 1 and in the age range 45-74 years. The highest percents for females were in the age range 6-74 years in which ages the percents varied from 59 to 87 percent. The highest percents for males

Figure 19. Mean intake of calories and selected nutrients as a percent below the standard for males aged 1-74 years, by income level, race, and age: United States, 1971-74—Con.

[Based on 1-day diet; 24-hour recall]

Race and age	Calcium (mg)			Iron (mg)			Vitamin A (IU)			Vitamin C (mg)		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
White male												
1 year				XXXX	XXXX	XXXX						
2-3 years				XXXX	XXXX	XXXX						
4-5 years				X	X	X						
6-7 years												
8-9 years												
10-11 years												
12-14 years				X	X	X						
15-17 years				X	XXX	X						
18-19 years				X	XX	X						
20-24 years												
25-34 years											XX	
35-44 years												
45-54 years											XX	
55-64 years												
65 years and over								X			X	
Black male												
1 year				XXXX	XXXX	XXXX						
2-3 years				XXXX	XXXX	XXXX						
4-5 years				X	XX	X						
6-7 years				X	X							
8-9 years												
10-11 years					X							
12-14 years				X		X						
15-17 years				XXX	XXXX	XXX			X			
18-19 years				XX	X	XXX						
20-24 years												
25-34 years												
35-44 years												
45-54 years												
55-64 years												
65 years and over												

KEY

X = Below by 1-10 percent
XX = Below by 11-20 percent
XXX = Below by 21-29 percent
XXXX = Below by 30 percent or more

[1]Excludes persons with unknown income.

NOTE: There was no one observed below the standard for thiamine and riboflavin.

Figure 20. Mean intake of calories and selected nutrients as a percent below the standard for females aged 1-74 years, by income level, race, and age: United States, 1971-74

[Based on 1-day diet; 24-hour recall]

KEY
X = Below by 1-10 percent
XX = Below by 11-20 percent
XXX = Below by 21-29 percent
XXXX = Below by 30 percent or more

Race and age	Calories: All income	Calories: Below poverty level[1]	Calories: Above poverty level[1]	Protein (gm): All income	Protein (gm): Below poverty level[1]	Protein (gm): Above poverty level[1]
White female						
1 year						
2-3 years						
4-5 years						
6-7 years	X		X			
8-9 years	XXX	XX	XXX			
10-11 years	X	X	X			
12-14 years	XXX	XXX	XXX			
15-17 years	XXXX	XXXX	XXXX	X	XX	
18-19 years	XX	XXX	XX		X	
20-24 years	XXX	XXX	XXX		X	
25-34 years	XX	XX	XX			
35-44 years	XX	XXX	XX		X	
45-54 years	XX	XX	XX		X	
55-64 years	XX	XXX	XX		XX	
65 years and over	XXX	XXX	XXX	X	XX	X
Black female						
1 year						
2-3 years						
4-5 years						
6-7 years	X	XX	X			
8-9 years	XXXX	XXX	XXXX			
10-11 years	XXX	XXX	XX			
12-14 years	XXX	XXX	XXX			
15-17 years	XXX	XXXX	XXX	X	X	
18-19 years	XX	XX	XXX			
20-24 years	XXX	XXX	XXX		X	
25-34 years	XX	XX	XXX	X	X	X
35-44 years	XXX	XXX	XXXX	XX	XX	XX
45-54 years	XXX	XXX	XXX	X	X	X
55-64 years	XXX	XXXX	XXX	XX	XXX	XX
65 years and over	XXXX	XXXX	XXX	XX	XX	XX

[1]Excludes persons with unknown income.

NOTE: There was no one observed below the standard for thiamine and riboflavin.

were in the age range of 8-74 years when the percents varied from 61 to 86 percent. More than one-third of the males aged 1-7 years had caloric intake below the standards; females in similar age groups had percents that varied from 30 to 59 percent, averaging about 43 percent (table 7).

White males had a lower proportion of persons with caloric intake below the standards than black males had in all of the 15 age comparisons. More than one-third of the white boys had intake below the standards in ages 1-7 years in comparison with black boys who averaged more than 40 percent. The percents of males below the standards were higher in ages 8 through 74 years, where values ranged from 59 to 85 percent for white males. The corresponding percents for black males in similar ages varied from 66 to 93 percent; the highest percents were recorded at ages 65-74 years.

Although white women generally had a lower proportion of persons with caloric intake below the standard than black women had (11 of the 15 age comparisons), large percents of females of both racial groups had caloric intake below the standard (table 7). The lowest percents were in the younger ages. More than one-third of the white girls aged 1-5 years had caloric intake below the standards and more than 40 percent of the black girls aged 1-5 years had caloric intake below the standards. The higher percents of females with caloric intake below

Figure 20. Mean intake of calories and selected nutrients as a percent below the standard for females aged 1-74 years, by income level, race, and age: United States, 1971-74—Con.

[Based on 1-day diet; 24-hour recall]

Race and age	Calcium (mg)			Iron (mg)			Vitamin A (IU)			Vitamin C (mg)		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
White female												
1 year				XXXX	XXXX	XXXX					X	
2-3 years				XXXX	XXXX	XXXX						
4-5 years				XX	XX	XX						
6-7 years				X	XX	X						
8-9 years				X		X						
10-11 years				XXX	XXX	XXX						
12-14 years				XXXX	XXXX	XXXX						
15-17 years				XXXX	XXXX	XXXX		X				
18-19 years				XXXX	XXXX	XXXX		X				
20-24 years				XXXX	XXXX	XXXX		XX				
25-34 years				XXXX	XXXX	XXXX		X				
35-44 years		X		XXXX	XXXX	XXXX		X				
45-54 years				XXXX	XXXX	XXXX						
55-64 years	X		X		XX	X						
65 years and over	X	X	X	X	XX	X						
Black female												
1 year				XXXX	XXXX	XXXX						
2-3 years				XXXX	XXXX	XXXX						
4-5 years				XX	X	XX						
6-7 years				X	X	X						
8-9 years				XX	X	XXX						
10-11 years				XXXX	XXXX	XXXX						
12-14 years				XXXX	XXXX	XXXX			XX			
15-17 years		X		XXXX	XXXX	XXXX	X	XXX				
18-19 years	X		XXX	XXXX	XXXX	XXXX						
20-24 years	XX	XX	XX	XXXX	XXXX	XXXX						
25-34 years	XXXX	XXX	XXXX	XXXX	XXXX	XXXX						
35-44 years	XXXX	XXXX	XXX	XXXX	XXXX	XXXX						
45-54 years	XXXX	XXX	XXXX	XXXX	XXXX	XXXX						
55-64 years	XXX	XXXX	XXX	XX	XXX	XX						
65 years and over	XXX	XXX	XXX	XXX	XXX	XX						

KEY

X = Below by 1-10 percent
XX = Below by 11-20 percent
XXX = Below by 21-29 percent
XXXX = Below by 30 percent or more

[1]Excludes persons with unknown income.

NOTE: There was no one observed below the standard for thiamine and riboflavin.

the standards were aged 6-74 years. Here the percents were generally higher than 70 percent for both racial groups; the maximum was 88 percent recorded for white females aged 12-14 years and for black females aged 35-44 years.

Among white boys aged 1-7 years an average of more than one-third in both income groups had caloric intake below the standards (table 7). The corresponding data for black boys of similar ages for both income groups averaged about 40 percent. For white girls aged 1-5 years, in both income groups, the averaged percent was about 36 percent. For black girls of similar ages, the averaged percent was more than 40 percent.

Among white and black males aged 8 through 74 years in both income groups, the percents of those with low caloric intake ranged from more than 50 percent to a high of 88 percent for white males and a high of 95 percent for black males. A somewhat similar pattern was noted for white and black females aged 6-74 years in both income groups.

Protein Intake

Mean protein intake of males and females approached or exceeded the standards for all ages 1 through 74 years; such values were higher for males than for females (figure 18). The protein consumed by white males and females of all ages also approached or averaged more than the standards (figures 19 and 20). The pattern was similar for black males and females except for black males aged 65-74 years whose mean protein intake was 15 percent below the standard and black females aged 35-44 and 55-74 years whose mean protein intake averaged 16 percent below the standards (figures 19 and 20).

Mean protein intake for white males exceeded the standards for all income groups (figure 19). The mean values were double or more than double the standards in ages 1 through 11 years, and such values decreased with age from a high of 256 percent of the allowance in age 1 of the lower income group to a low of 92 percent at ages 65-74 years in the same income group. White males of all ages tended to show higher mean values in relation to standards than black males did.

Black males aged 1-54 years in both income groups also reported high protein intake in relation to the standards but at age group 55-64 years in the lower income and at ages 65 years and more in both income groups, the mean protein intake averaged about 13 percent below the standards. The mean values were more than double the standards in ages 1 through 7 years, and as observed for white males, the values decreased with age.

Mean protein intake for white females in the income group above poverty level approached or exceeded the standards at all ages (figure 20). Corresponding values for white females in the lower income group were similar except for those aged 15-17 and 55 years and older, whose mean values averaged about 16 percent below the standards.

Black females also had average protein intake above the standards in both income groups except for those women aged 35-44 and 55 years and older in both income groups, whose values averaged about 16 percent below the standards.

The mean protein diets of white and black females aged 1-7 years in both income groups exceeded the standards by more than twice the standards. This was also true for white females aged 8-9 years in the lower income group, but a similar pattern was not observed for black females aged 8-9 years in both income groups. As with males, females tended to show a decrease with age in the mean protein intake as a percent of standard. White females in all ages tended to show higher mean values in relation to the standard than black females did.

Table 8 shows that females had higher proportions of persons with protein intake below the standards than males had in 14 of the 15 age comparisons, except for those age 1 year when the differences in proportions are so small as to be negligible. In the younger ages, 1 through 11 years, the proportions for males ranged from 2 to 8 percent, in contrast with proportions for females whose values ranged from 3 to 13 percent.

Both males and females had higher proportions of persons with protein intake below the standards in the ages 12-74 years, ranging from 17 to 59 percent for males and from 41 to 67 percent for females.

Males and females showed smaller differences in proportion of persons with protein intake less than the standards in ages less than 12 years; the values ranged from 0.2 to 6 percent. The differences in proportions between sexes were larger in ages 12-74 years when the percents varied from 8 percent at ages 65-74 years to 31 percent at ages 15-17 years.

Black males had higher proportions of persons with protein intake below the standards than white males of corresponding ages had in all 15 age comparisons (table 8). The proportions of black females with intake below the standard were also generally higher than those of their white counterparts except at ages 15-17. As with the total population, the proportions were higher in the ages 12-74 years in contrast with ages less than 12 years for both sex-race groups.

The proportions of children with low protein intake in relation to the standard by income were smallest in the younger ages 1 through 9 years. The percents for white and black boys and white girls at these ages of both income groups ranged from no prevalence to 13 percent below the standard, and percents of black girls of similar ages and income groups varied from 2 to 19 percent below the standards (table 8).

Black females in both income groups and white females of the lower income group aged 12-74 years showed percents that ranged from 43 to 76 percent. The corresponding percents for white females in the upper income group varied from 41 to 64 percent.

There was a wide range of percents for white and black males aged 12-74 years of both income groups; the percent of persons with protein intake below the standard for white and black males in the lower income group ranged from 18 to 70 percent. The findings for black males in the upper income group were almost similar, and the percents varied from 22 to 71 percent. The variation in percents with age for white males in the upper income group was not as marked, ranging from 14 to 56 percent.

Calcium Intake

Mean calcium intake of males in all age groups 1-74 years exceeded the calcium standards. Mean calcium intake of females in ages less than 45 years of age also exceeded the dietary standards. In the age range 45-74 years, the mean calcium diets approached the standards (figure 18). Males had higher mean calcium intake that approached or exceeded the standards than females had in all comparable age groups (table 1).

Mean calcium intake for both sexes in ages less than 10 years were about double the dietary calcium standards. Males generally showed a similar pattern from ages 10 through 64 years, but the pattern was not observed for females in these ages. The mean calcium intake in relation to the standard tended to decrease from a high of 169 percent (more than 1-1/2 times the dietary standard) at ages 10-11 to a low figure of 95 percent at ages 65-74 years (table 1).

Race, sex, and age.—Mean intake of white and black males aged 1-74 years exceeded the dietary standards for calcium (figure 19 and table 3). Corresponding values for white females aged 1 through 54 years generally showed the same picture (figure 20 and table 5). However, the mean calcium intake of white females aged 55-74 years approached the dietary standards. The pattern was slightly different for black females aged 1-19 years when the mean calcium intake approached or exceeded the dietary standards. However, in adult ages 20-74 years, their diets furnished less than the dietary standard for calcium, ranging from 13 to 32 percent below the standards.

Mean calcium intake of white and black males exceeded dietary standards in all ages and income groups; white males in both income groups had higher mean values than black males (figure 19).

Mean calcium diets of white females aged less than 25 years of both income groups furnished more than the dietary standards, and the higher values were found in the younger ages. The mean values approached and were slightly above the dietary standards in ages 25-74 years, in contrast with those in the younger ages (figures 20, 21, and table 5).

Black females aged less than 15 years of both income groups had mean calcium intake that met the dietary standard (figure 20). The corresponding percents for black females in the age group 15-17 years was 99 percent in the lower income group and 114 percent in the upper income group. The mean calcium diet of black females aged 18 through 74 years of both income groups (except for those aged 18-19 years of the lower income group) furnished less than the dietary standards, ranging from 12 to 39 percent, on the average, below the standards (figure 20 and table 5).

Females showed higher proportions of persons with calcium intake below the standards than males did. This direction was evident in 14 of the 15 age comparisons (table 9). The higher proportions of low intake for women were more noticeable in the ages 18-74 years; the percents ranged from 48 percent in the age group 18-19 years to 63 percent in the age group 55-64 years. In contrast, the corresponding percents for men in comparable age ranges were 18 percent in the age group 18-19 years to 28 percent in the age group 55-64 years.

Black females consistently showed a higher proportion of persons with low calcium intake than did white females in all 15 age comparisons (table 9). The largest percents were for females aged 45-64 years—an average of 79 percent for black females and an average of about 60 percent for white females. Fifty-two percent of white females aged 18-44 and 71 percent of black females aged 18-44 had calcium intake below the standard. Within age group 65-74

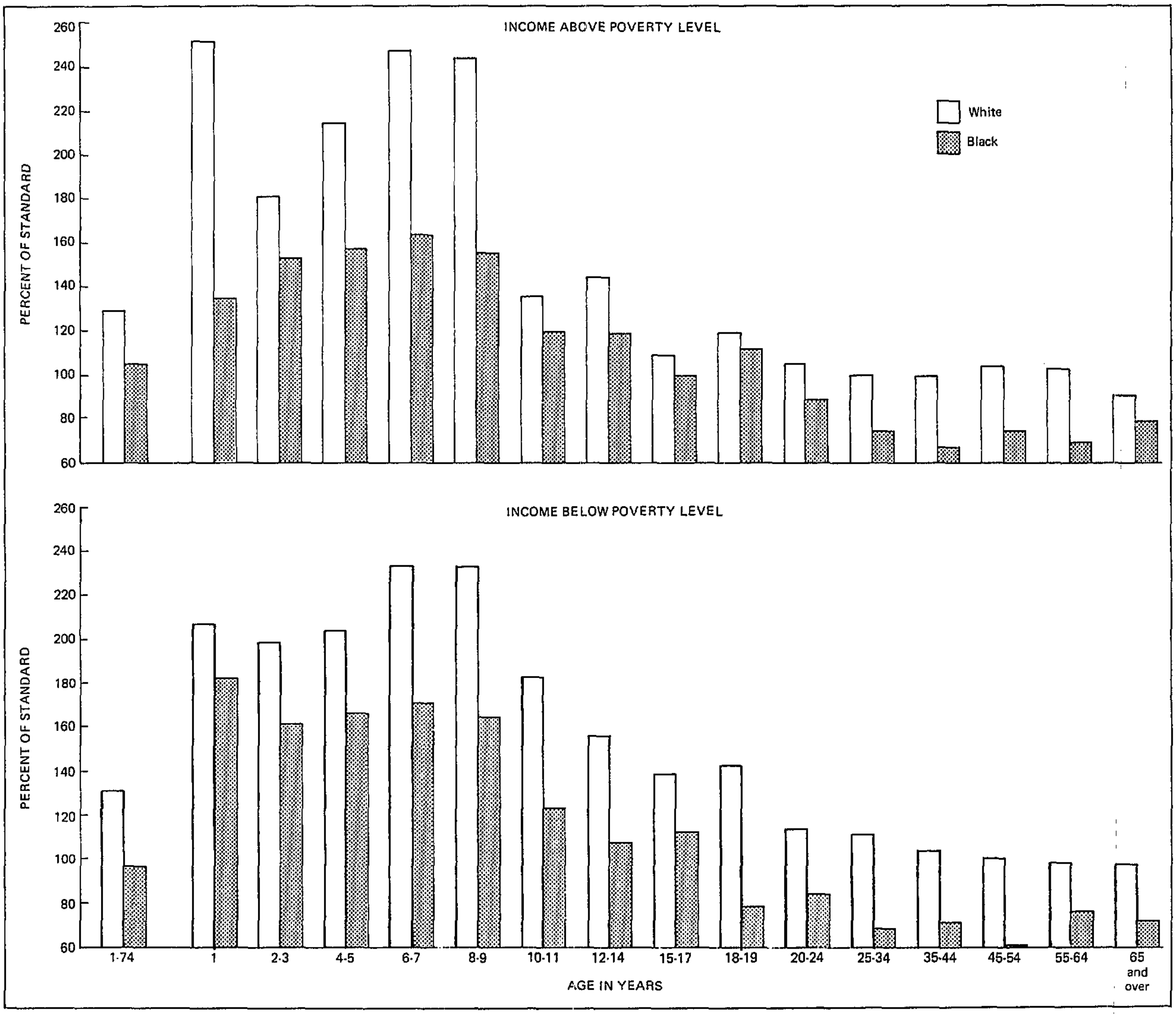

Figure 21 Mean calcium intake as a percent of standard of females aged 1-74 years, by age and race for income levels: United States, 1971-74

years, the corresponding percents were 61 percent for white females and 72 percent for black females. Within age group 12-17 years, the values were about a third, on the average, for white females and about 50 percent for black females.

Similar data for children aged 1-5 years showed that about one-third of the black girls had calcium intake that failed to meet the standards. Among white girls, the average percent was about 13 percent.

The difference in percent of low intake of calcium in the direction of females by race was also found for black and white males separately. Black males in all ages showed higher proportions of persons with calcium intake below the standards than white males did. On the average, more than one-third of black males aged 18-44 years and of black adolescents aged 12-17 years had calcium intake below the standards. The corresponding percents for white males in the same age groups were 17 and 14 percent, respectively. For black males aged 1-5 years, the values were 27 percent and for white males of similar ages, 12 percent.

A large percent of low calcium intake was observed for both white and black males aged 45-64 years; the proportion of black males averaged more than 40 percent and of white males, about 25 percent.

Females in both income groups showed a large proportion of persons with low calcium intake—an average of more than 71 percent of the black females aged 18-44 years and an average of 52 percent of the white females of the same ages. For females aged 45-64 years in both income groups, the percent of persons below the standards averaged 79 percent for black females and 60 percent for white females. The proportions of white and black females aged 65-74 years in both income groups with low calcium intake were 63 and 72 percent, respectively (table 9).

The proportions were lower in the younger ages but were still substantial. Black girls aged 1-5 years showed an average of about one-third of persons in both income groups with calcium intake below the standard of 450 mg. For white girls, in both income groups, the averaged percent was about 11 percent. The findings were higher for black and white girls aged 12-17 years, 50 and 38 percent, respectively.

The largest proportions of low calcium intake among males were recorded for black males aged 45-74 years, an average of about 45 percent in both income groups; the average percent was about 25 percent for white males of similar ages in both income groups. The proportion of black males, aged 1-5 years, with calcium intakes below the standard was 33 percent in the low income group and 22 percent in the upper income group. The corresponding percents of white males averaged about 12 percent in both income groups.

Iron Intake

Mean iron intake for females was generally below the dietary standards; however, the exceptions occurred in the age groups 6-9 years and 55 years and older. Here, the mean iron intake approached within 90 to 100 percent of the dietary standards (figure 18).

A different pattern was observed for males. In 13 of the 15 age groups, the mean iron intake approached or exceeded the dietary standards (91 to 167 percent of the dietary standard), except among the youngest ages 1-3 years for whom the intakes were about half of the value for dietary standards, similar to those observed for females in comparable ages (figure 18 and table 1).

The pattern in the relationship of mean iron intake to dietary standards found for all males in the U.S. population was also found for white and black males separately (figure 19). The mean values among both white and black males generally approached or met the iron standards in ages 4 through 74 years. Two exceptions to the general finding occurred among black males in age groups 15-17 and 18-19 years, where the mean values fell 20 and 25 percent below the dietary standards. The corresponding values were about half of the dietary iron standards in ages 1-3 years (table 3).

White and black males in most age groups for both income levels had mean iron intake that either approached or exceeded the standard (figures 19, 22, and table 3). The exceptions were among boys aged 1-3 years who had means consistently below the standards for all race and income groups (41-56 percent). White male youths aged 15-19 years in the lower income group had means that averaged 17 percent below the standard. Black boys aged 4-5 years in the lower income group had means 13 percent below the standard. Black male youths aged 15-17 years in the lower income group had means 30 percent below the standard, and those aged 15-19 years in the group above poverty level had means that averaged 26 percent below the standard.

A similar picture was observed for white and for black females when the corresponding figures were examined separately from the total female population (figure 20 and table 5). However, in contrast with the data for males, the mean iron intake was substantially below the dietary standard. At ages 1 and 2-3 years and age groups 10-54 years the percents below the

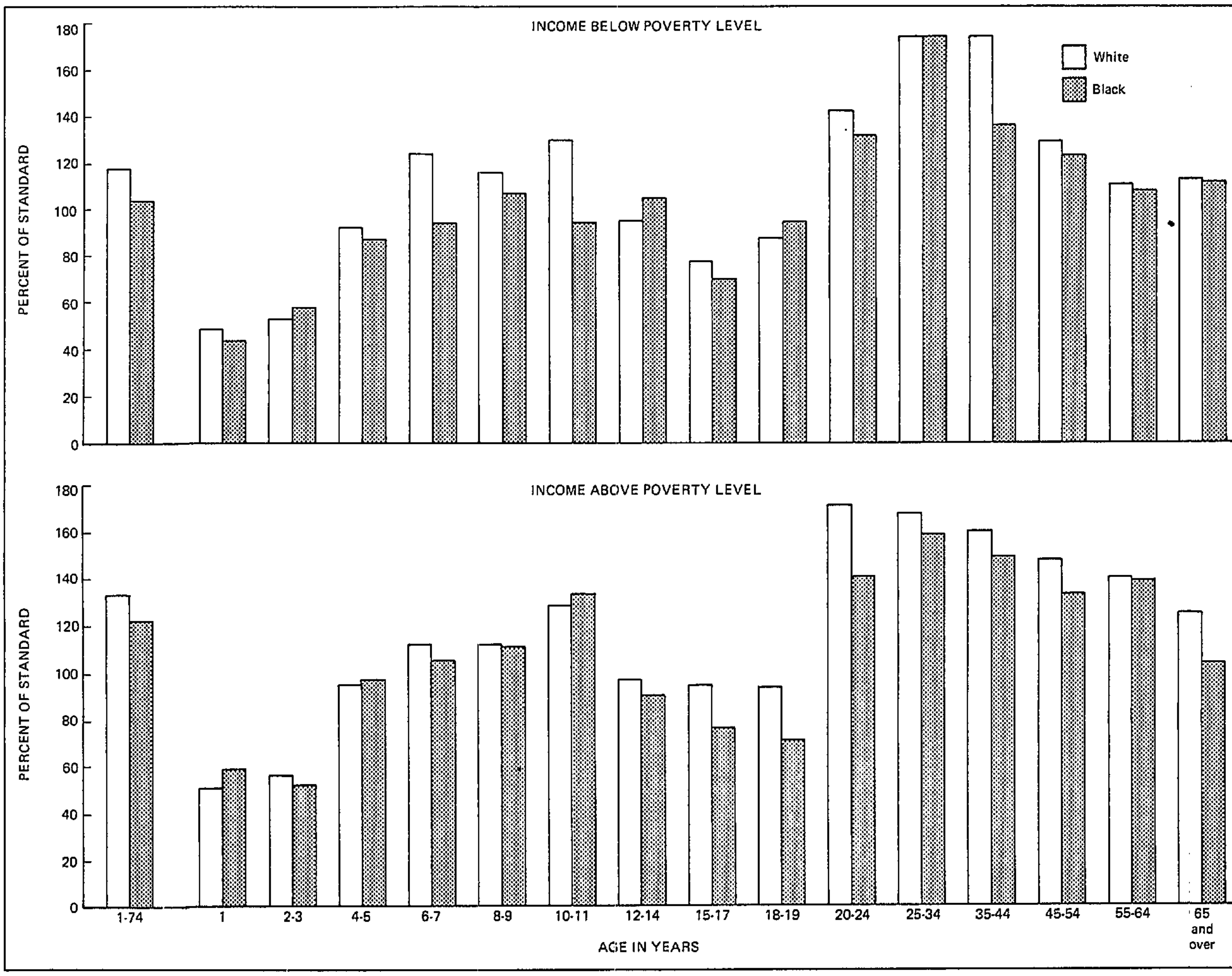

Figure 22. Mean iron intake as a percent of standard of males aged 1-74 years, by age and race for income levels: United States, 1971-74

standards ranged from 40 to 56 percent. At age group 4-5 years, the values were 11 and 17 percent for black and white females, respectively.

Black females in age groups 8-9, 55-64, and 65 years and older had mean values that did not meet the dietary standard. There were no age groups that exceeded the standard, but there were some age groups that approached the standard (90-100 percent): white and black females aged 6-7 years; white females aged 8-9 years, 55-64 years, and 65 years and older.

White and black girls aged 1-3 years in both income groups had mean iron intakes that were 42-68 percent below the standards. Adolescent girls aged 12-17 years had means that were 35-55 percent below the standard; women of childbearing ages, 18-44 years, had means that were 41-53 percent below the standard (figures 20, 23, and table 5).

White females aged 65-74 years in the upper income group approached the standard (96 percent), and white females in similar ages in the lower income group and black females in both income groups had means ranging from 16 to 26 percent below the standard.

Although the mean iron intake of males aged 4-74 years approached or exceeded the standards, there were large proportions of males whose iron intake was below the standards (table 10). In ages 4-11 years, the percents ranged from 36 to 68 percent; slightly less than two-thirds of the males aged 12-19 years had less than the standards. The percents of low intake in ages 20-74 years ranged from 15 percent in

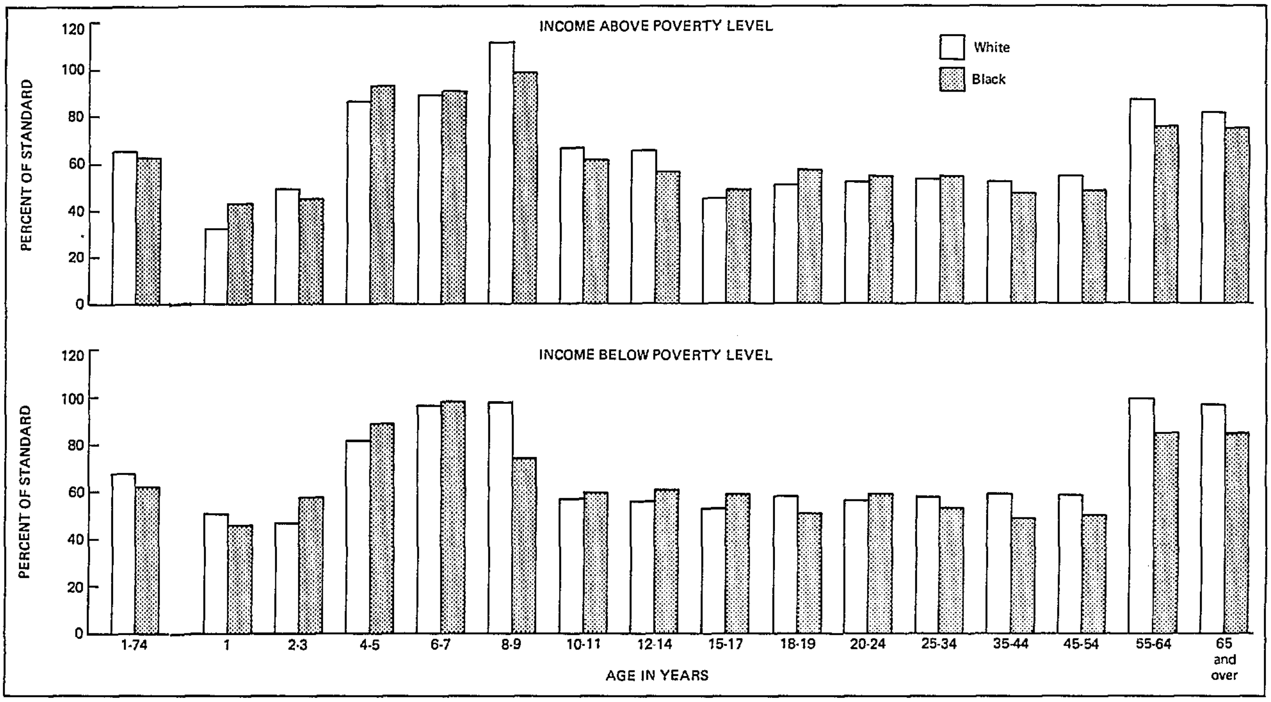

Figure 23. Mean iron intake as a percent of standard of females aged 1-74 years, by age and race for income levels: United States, 1971-74

age group 25-34 years to 40 percent in age group 65-74 years. The highest percent of low values was in ages 1-3 years where the values averaged about 95 percent.

In contrast with males, a larger proportion of females had iron intake below the standards; the percents for adolescent girls aged 12-17 years and women aged 18-54 years averaged about 93 percent. Corresponding values for girls aged 4-9 years and women aged 65-74 years were 68 and 77 percent, respectively. At ages 1-3 years, as was shown previously for boys of similar ages, the value averaged about 95 percent.

The daily iron standard for women aged 18-54 years is 18 mg; for men of comparable ages, 10 mg is the daily standard. If the standard of 10 mg were used for women, the proportion of women with iron intake below the standard would still be high, an average of more than 50 percent.

The proportion of persons with iron intake below the standards observed previously for the entire sample of U.S. population aged 1-74 years was similar to that observed for white and black persons separately. Children aged 1-3 years and females aged 10-54 years showed an average of 95 and 93 percent, respectively, of individuals whose iron intake values were less than the standards. Corresponding values for white and black females 65-74 years of age with iron intake below the standard averaged more than 70 percent (table 10).

Although all males aged 4-74 years generally approached or exceeded the standards, there were large proportions of these individuals whose iron intake values were below the standards: white males aged 45-64 and 65-74 years, averaged more than 30 percent; black males aged 4-7 years averaged more than 60 percent; black males aged 12-19 years averaged about 77 percent; black males aged 55-74 years averaged more than 50 percent.

Girls aged 1-3 years and females 10-54 years for both race and income groups, showed an average of about 93 percent of individuals with iron intake values below the standards. Corresponding values for women aged 65-74 years averaged about 72 percent whose iron intake fell below the standards.

About 95 percent of white and black boys aged 1-3 years in both income groups had iron intake below the standards. More than 60 percent of white and black males aged 4 through 19 years in the lower income group had iron intake below the standards, and more than 50 percent of all men in the two older groups had iron intake below the standards. Corresponding proportions in ages 20-54 years ranged from 11 to 42 percent, an average of 28 percent. The percents for white and black males aged 65-74 years in the upper income group were 36 and 58 percent, respectively; males of both races in the lower income group averaged more than 50 percent whose iron intake was below the standards (table 10).

Vitamin A Intake

Males had mean vitamin A intake at all ages in both race and income groups which approached or exceeded the standards (figures 18 and 19). This was also true among females in almost all age, race, and income groups (figure 20). The exceptions were found among white females aged 20-24 years in the lower income group whose means were 12 percent below the standards; and among black females aged 12-14 years in the upper income group and those aged 15-17 years in the lower income group whose means were 15 and 27 percent, respectively, below the standards (table 6).

Mean vitamin A intake values were much larger than the median values and a comparison of median vitamin A intake in relation to the dietary standard presented another picture for some population subgroups (table 2). Median vitamin A intake of males aged 1-74 years approached or exceeded the standards (table 2). Females aged less than 12 years had median vitamin A intake above the standards but those who were 12 years old had medians less than the standard—values ranged from 13 percent below the standards at ages 55-64 years to 37 percent below at ages 15-17 years. Both males and females aged 1-11 years had median vitamin A values above the standard; males had higher values than females had.

Race, sex, and age.—The relationship between median vitamin A intake and the standards (discussed previously for the male population as a whole) held also for white males, but a similar pattern was not always evident for black males when the data were examined separately (table 4). White males aged 1-74 years had vitamin A intake that approached or exceeded the standards. Among black males, this pattern was observed only for those aged 1-11 years. After age 11, the median values approached or were below the standard with the exception of black males aged 55-64 years who had a median value of 163 percent of the standard.

White males in the upper income group of all ages had median vitamin A intake that consistently approached or met the standards (table 40. This was also evident for white males in the lower income group of ages less than 25 years with the exception of ages 15-24 years, and 25 through 74 years with the exceptions of those aged 45-54 and 65-74 years. The highest values were found in the younger ages, particularly in ages less than 15 years, of both income groups. White males in the income group above poverty level in all ages generally had higher median vitamin A intake with relation to standards than those in the income group below poverty level for comparable ages had.

A similar comparison was made for black males by age for income groups (table 4). Here, income level did not consistently influence vitamin A intake with relation to standards. Median vitamin A intake of black males less than age 12 years in both income levels approached or exceeded the standards. This was also true for black males aged 20-74 years in the upper income group with the exceptions of those aged 45-54 and 65-74 years. Other exceptions in the upper income group were found for those aged 12-19 years. In the lower income group, black males aged 12-74 years had median values that approached or met the standards only in age groups 35-44 years.

White females aged 1 through 11 years of both income groups ingested diets that met the vitamin A standards (table 6). In similar age ranges, the diets of black females failed to meet the standards in age 1 year of the lower income group and in ages 8-9 years of the upper income group. The findings for both white and black females were entirely reversed in the ages 12-74 years where income level generally had little relationship to vitamin A intake. The exceptions were among black females aged 18-19 years in the lower income group and those aged 55-64 years in both income groups, when the median vitamin A values in these ages approached or exceeded standards.

There were large proportions of individuals with vitamin A intake below the standards and females had a higher proportion of low vitamin A intake than males had (table 11). The proportions of males aged 12-74 years whose vitamin A intake fell below the standards ranged from 44 percent in age group 55-64 years to 53 percent in age group 65-74 years. The proportions of females in the 12-74-years age group, ranged from 56 percent in the age group 55-64 years to 70 percent in the age group 15-17 years. The same pattern was evident in the younger ages where females still showed higher proportions of persons with vitamin A intake below the standards than males showed. The percent of boys aged 1-5 and 6-11 years who had intake of vitamin A below the standards averaged 29 and 31 percent, respectively; for girls of the same ages, the averaged percents were 36 and 41 percent, respectively.

The proportions of males with low vitamin A intake in relation to the standards found in the United States as a whole were not found for white and black males separately (table 11). The proportions of low vitamin A values were more apparent for black males than for white males, particularly in the ages 8-19 years. In these age groups, the averaged percent of low values for white males was 38 percent compared with 59 percent for black males. In the younger ages, 1 through 7 years, the differences were still in the same direction but the magnitude of the differences were smaller: white males, 29 percent, as compared with the figure for black males, 36 percent. Smaller differences in percents of persons with low vitamin A intake values were also noted in ages 20-74 years, an average of 48 percent for white males and 54 percent for black males.

Black females aged 1 through 54 years generally had higher proportions of persons with vitamin A intake below the standard than white females had. However, substantial proportions of low vitamin A intake were found in both groups; the highest percents were found in ages 12-24 years. Here more than two-thirds of both white and black females had vitamin A intake below the standard. Corresponding percents of females in younger ages 1-11 years ranged from 29 percent to 42 percent among white females, as compared with 42-60 percent among black females. White females aged 55-74 years showed higher proportions of persons with low vitamin A intake than black females did. Although differences in percents with low values were small only in the age group 65-74 years, the percents of both groups aged 55 years and more averaged more than 50 percent.

The proportion of white and black males with low vitamin A intake in all ages 1-74 years in the lower income group varied from 18 to 69 percent in the white group, and from 24 to 80 percent in the black. In the upper income group, corresponding proportions for white males ranged from 21 to 50 percent, and for black males from 28 to 70 percent (table 11).

About 43 percent of white and black girls aged 1-5 years in the low income group had vitamin A intake below the standard. The corresponding value for white girls of the same ages in the upper income group was 34 percent. The average percent of black girls aged 1-5 years in the lower income group was 48 percent in contrast with 43 percent for black girls in the upper income group (table 11).

Larger proportions of white and black females had vitamin A intake falling considerably below the standards in the ages 12-74 years. The percent of white females in the low income group ranged from 60 to 74 percent. The percent of white females in the upper income group ranged from 57 to 68 percent.

In the ages 12-74 years the percent of Negro females in the low income group varied from 50 to 78 percent and the percent of those in the upper income group ranged from 42 to 74 percent.

Vitamin C Intake

Mean vitamin C intake of males and females were above the standards in all ages 1 through

74 years (figure 18). Males had higher values than females had in 10 of the 15 age groups; most exceptions to this were found in the older ages 45 through 64 years (table 2).

Corresponding values for males by race followed the same pattern observed for all males (table 4). White males had higher mean vitamin C intake with regard to standards at ages less than 25 years of age—the values ranged from 179 to 229 percent of the standards. The lower figures were found at ages 25-74 years where values ranged from 137 to 158 percent of the standards. These patterns were also observed among black males and the lower values were also generally found in the older age groups. White males generally had higher values above the standards than black males had; the largest differences in mean values above the standards mainly were observed in ages less than 19 years (table 4).

Mean vitamin C intake of females by race paralleled the findings previously noted for males (table 6). Mean vitamin C intake was above the standards for all age groups 1-74 years. White females of ages 15-74 years had consistently higher mean vitamin C intake in relation to the standards than black females had.

The direction in values was reversed in ages less than 15 years; here black females in most ages generally showed higher values than white females showed.

Mean vitamin C intake of black males was above the standards regardless of age and income group (figure 19). This observation did not hold true for white males whose mean vitamin C intake was 12 and 18 percent below the standards at ages 25-34 and 45-54, respectively, in the lower income group. Another exception was found in the age group 65-74 years where the value approached the standard, 95 percent in the same income group.

Mean vitamin C intake of white and black females was above the standards in all age and income groups with the exception of 1-year-old white females of the lower income group where the value was 97 percent of the standard (figure 20 and table 6).

Although females had a generally higher proportion of vitamin C intake below the standard than males in the age range 1-74 years had, the differences in proportions were small and the percent of females having vitamin C levels below each of the cutoff points usually was not much greater than were the corresponding percents of males. The proportion of females in the entire age range with vitamin C intake below the standard varied from 49 percent in the age group 12-17 years to 54 percent in the age group 20-24 years. For males there was a low of 34 percent in the age group 10-11 years and a high of 51 percent in ages 25-34 and 45-54 years (table 12).

Black females also generally showed higher proportions of low vitamin C intake than white females in the age span 1-74 years did, higher percents of black females had low vitamin C intake in 8 of 15 age comparisons. The percents for the two race groups were almost the same in age groups 15-17 and 18-19 years. The largest of these differences occurred in ages 65-74 years (53 percent for black females and 39 percent for white females). Although differences in percents in the age range 1-14 years varied from 5 to 10 percent, the percents of females in both races with low vitamin C intake was about the same—the percents for black females were 38 to 52 percent, as compared with 38 to 51 percent for white females (table 12).

Black males showed higher proportions of persons with vitamin C intake less than the recommended allowances than white males in 13 of the 15 age comparisons did, especially at ages 10 through 24 years (table 12). The difference in values was negligible at age 1. At ages 10 through 24 the percents of black males ranged from 41 to 64 percent as compared with percents of white males of 32 to 43 percent. The corresponding percents for ages 20-74 years showed a small difference in percents between males, yet the percents of persons with low vitamin C intake in relation to the recommended allowances were high for both groups—the average percent was more than 54 percent for black males and it was 47 percent for white males.

White males aged 1-74 years in the lower income group had proportions of persons with low vitamin C intake ranging from 40 to 75 percent; proportions of white males in the same age range in the upper income group ranged from 29 to 49 percent. Across the same age range the lowest proportion of black males reporting low vitamin C intake in the lower income group was 35 percent and the highest value was 65 percent. These values compared with 25-71 percent for black males aged 1-74 years in the upper income group (table 12). Similar data for females supported the previous findings for males.

The proportion of low vitamin C intake in relation to standard was also high for females in comparable ages. The proportions of white females with low vitamin C values ranged from 36 to 72 percent in the low income group; the range was from 36 to 54 percent in the upper income group. The corresponding proportions of black females in the lower income group was 41-63 percent; proportions in the upper income group ranged from 31 to 58 percent (table 12).

Thiamine and Riboflavin Intakes

Mean thiamine and riboflavin intakes were above the standards for all age, sex, race, and income groups (figures 18-20). Mean riboflavin intake in relation to standards was generally highest in the younger age groups; mean intake was more than two times the standard, but the values tended to decrease with age (table 2).

Males generally had higher proportions of persons with thiamine intake that did not meet the standards than females had, particularly in the youngest ages (1-3 years) and in the age range 12 through 74 years. The only exception in the latter age group is for those in the age group 18-19 years. Although in the entire age range of 1-74 years males had higher proportion of low thiamine than females in 10 of the 15 age comparisons had, the magnitude of the difference between sexes in percent of persons with low thiamine intake was small, ranging from 0.37 to 6.4 percent and an average percent difference of 2 percent. The highest proportion of persons below standard intake of thiamine for males were in the age range 20-54 years varying from 12 to 15 percent; for females in the same age range, the percents varied from 6 to 11 percent.

For both white and black males, the percent of white males having thiamine levels below the standards tended to be greater than the recorded percent of black males. The percent of white males was generally higher at ages 1 through 11 years and at ages 35-74 years than that of black males. The values were highest for both groups at ages 15-17 and 20-54 years, ranging from 9.5 through 20.1 percent (table 13).

The pattern found for males by race was generally also found for white and black females separately (table 13). In 8 of the 15 age groups, the percent of white females with low thiamine intake in relation to the standard was higher than that of black females of the same age. Again, as with the males, these values with the slight exception of those of ages 8-9 were mainly located in ages 1-11 years.

The percent of persons with thiamine intake below the standard varied from 3 to 14 percent among white males and from 2 to 12 percent among white females. The proportion of low intake among black males ranged from 1 to 20 percent and among black females from no prevalence to 14 percent.

The differences in percents between races were small; the largest differences between males occurred in ages 20-24 and 25-34 years, 6 and 7 percent, respectively.

Differences between white and black females were largest at ages 25-34 and 65-74 years, 7 and 5 percent, respectively.

The pattern shown previously between males and females for the thiamine data was not evident for the riboflavin data. Higher proportions of females (in 9 of the 15 comparable age groups) tended to have low riboflavin intake than males did, especially in the ages 6-24 years. However, the differences in percents in these 9 age groups between sexes were small, ranging from 0.23 to 1.4 percent (table 14).

The highest proportions of persons with low riboflavin intake for both sexes were found in the age group 15 through 44 years. For females, the percents ranged from 10 percent in age group 15-17 years to 14 percent in age group 20-24 years, and for males the corresponding percents in the same age groups ranged from 8 to 13 percent. Even in these age groups, the differences in percents were small.

Black males generally had higher percents of persons with riboflavin intake that fell below the standards than white males of comparable ages had. This pattern is evident for black males in

13 of 14 age groups. The differences at ages 6-7 years were negligible and at ages 45-54 years the percent of white males was higher than of black males (table 14).

Similar patterns appeared when the differences between percents of white and black females were analyzed (table 14). Black females had higher percents of persons with low riboflavin intake in 11 of the 15 age groups than white females had. The exceptions at ages 1 year, 2-3 years, 6-7 years, and 65-74 years were small—they ranged from 0.20 to 1.14 percent.

Less than 1-12 percent of the white males had riboflavin intake below the standard as compared with .1-20 percent of black males who had intake below the standard. The percents of persons with low riboflavin intake varied from 0.50 to 13 percent for white females and from 0 to 19 percent for black females.

A higher percent of white and black males in the upper income level had thiamine and riboflavin intakes below the standards than those in the lower income group. This pattern was also evident among white and black females for thiamine intake but not for riboflavin. White females in the lower income group had 9 of the 15 age groups with higher proportions of persons with riboflavin intake below the standard than those in the upper income group. Income level was not a factor in differentiating between the percents of black females whose riboflavin intake was below the standards.

Males and females of both race and income groups throughout the age range 1-74 years generally had proportions of persons whose thiamine and riboflavin intakes were below the standard of the magnitude of less than 15 percent.

The exceptions to the riboflavin findings were generally observed for white and black females aged 15-44 years in the lower income group and black females aged 18-34 years in the upper income group.

MEAN INTAKES

Mean Caloric and Nutrient Intakes per Kilogram of Body Weight

Caloric and nutrient intakes per kilogram of body weight declined with age for both sexes (figure 24). Since caloric and nutrient needs tend to parallel the growth rate, dietary intake of children is higher in proportion to body weight than intake of older persons. The caloric intake per kilogram of body weight at age 1 was more than 6 times (for girls) and about 5 times (for boys) that of adult females and males aged 65 years and more, respectively. The corresponding figures for calcium values were about 8 times for both sexes. For other nutrients, the magnitude of the order was about 4 times and more. The higher caloric and nutrient intakes of children as compared with adults allows for growth, development, and physical activity indicative of healthy children.

The decrease in mean caloric and nutrient intakes per kilogram of body weight with age found for males and females was also found for race-sex groups separately (figures 25 and 26).

Males generally showed higher mean caloric and nutrient intakes than females in all ages 1-74 years did, yet when the mean caloric and nutrient intakes were calculated in terms of per kilogram of body weight, the differences in such values were diminished and males still exceeded females in intakes. There were some minor exceptions to these findings in the younger and adult ages for vitamin A and in the adult ages for vitamin C. Differences in the corresponding figures for mean thiamine and riboflavin between males and females were numerically small. Small differences such as these could easily arise through chance.

The pattern of differences in mean caloric and nutrient intakes by age between race-sex groups observed previously were generally similar to those observed in terms of per kilogram of body weight (figures 25 and 26). White males and females had generally greater mean caloric and nutrient intakes per kilogram of body weight than their black counterparts had. White and black persons of both sexes in the above-poverty-level income group had higher values than persons in the lower income group.[1]

Mean Nutrient Intakes per 1,000 Calories[a]

The mean calcium intake per 1,000 calories for girls at age 1 year decreased from a high of

[a] Data are available in tables 17-32 of reference 1.

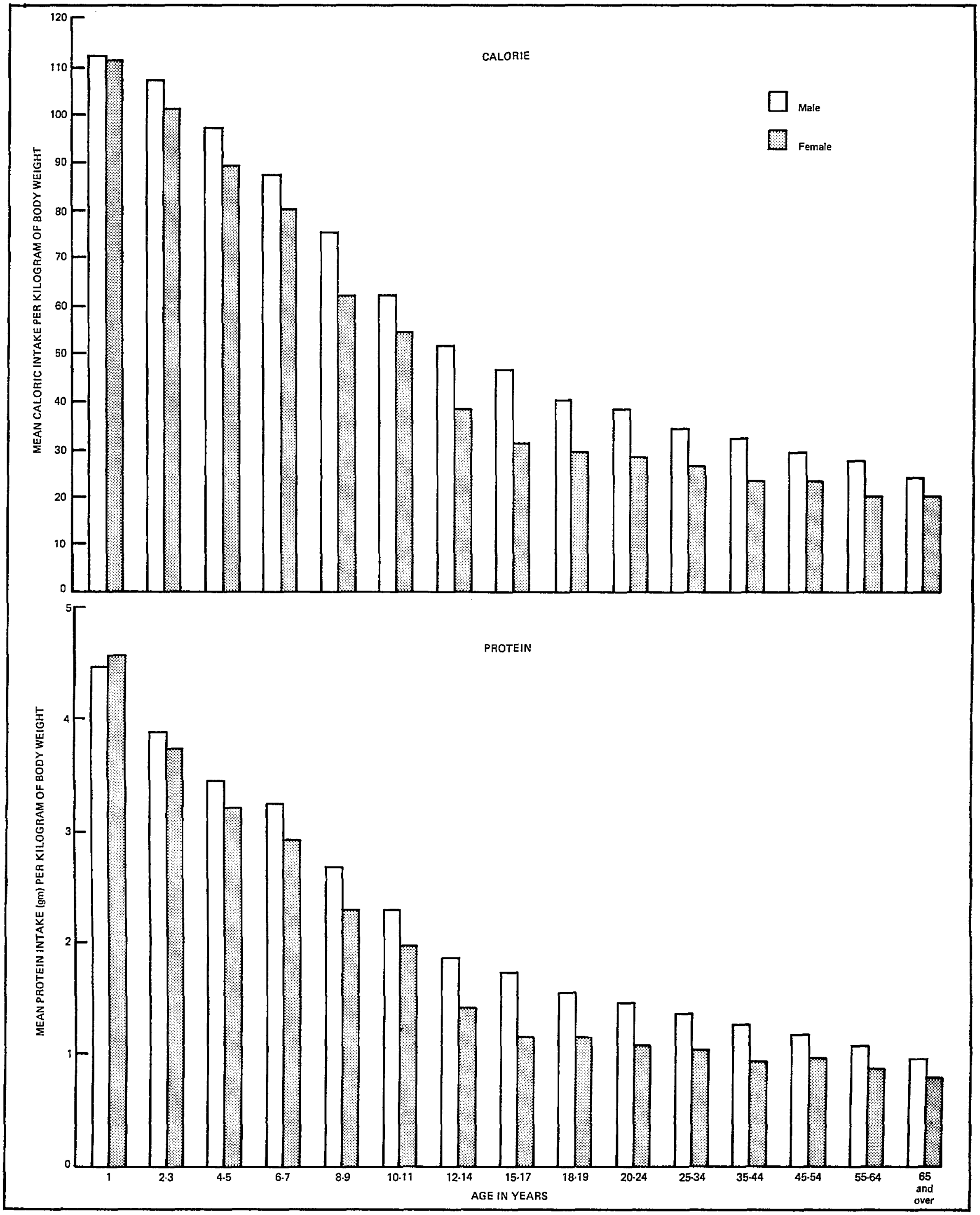

Figure 24. Mean caloric and nutrient intakes per kilogram of body weight of males and females aged 1-74 years, by age: United States, 1971-74

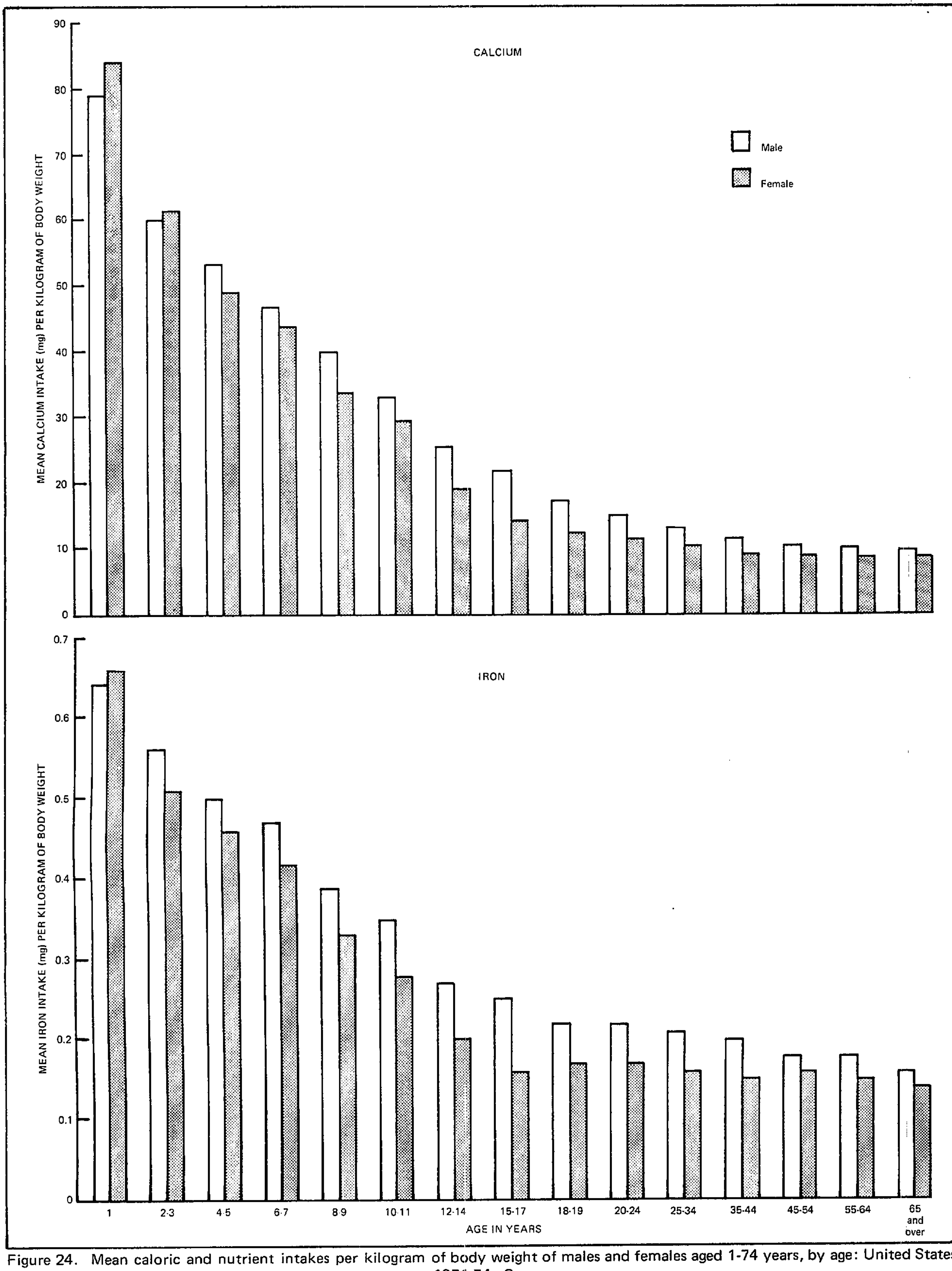

Figure 24. Mean caloric and nutrient intakes per kilogram of body weight of males and females aged 1-74 years, by age: United States, 1971-74—Con.

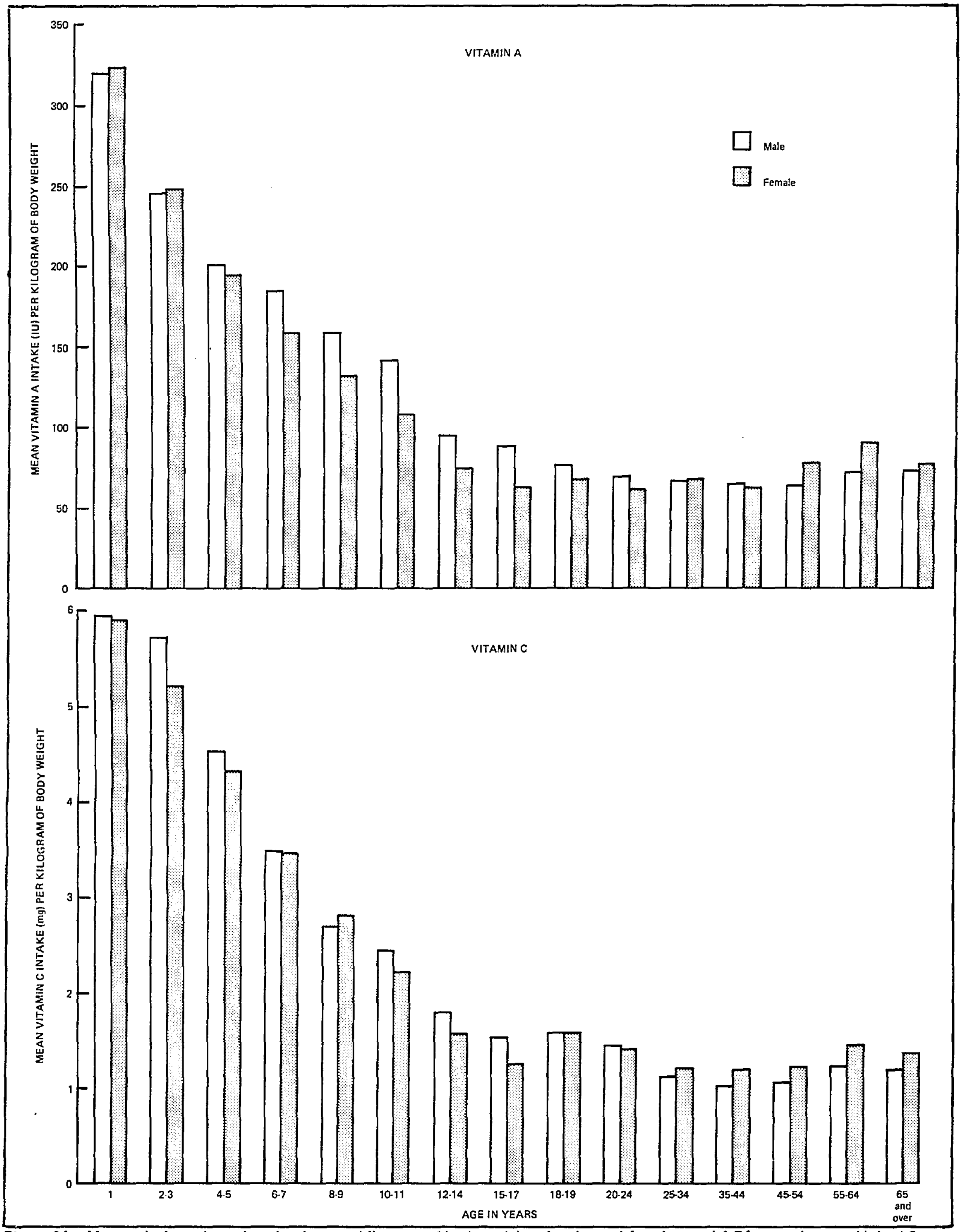

Figure 24. Mean caloric and nutrient intakes per kilogram of body weight of males and females aged 1-74 years, by age: United States, 1971-74—Con.

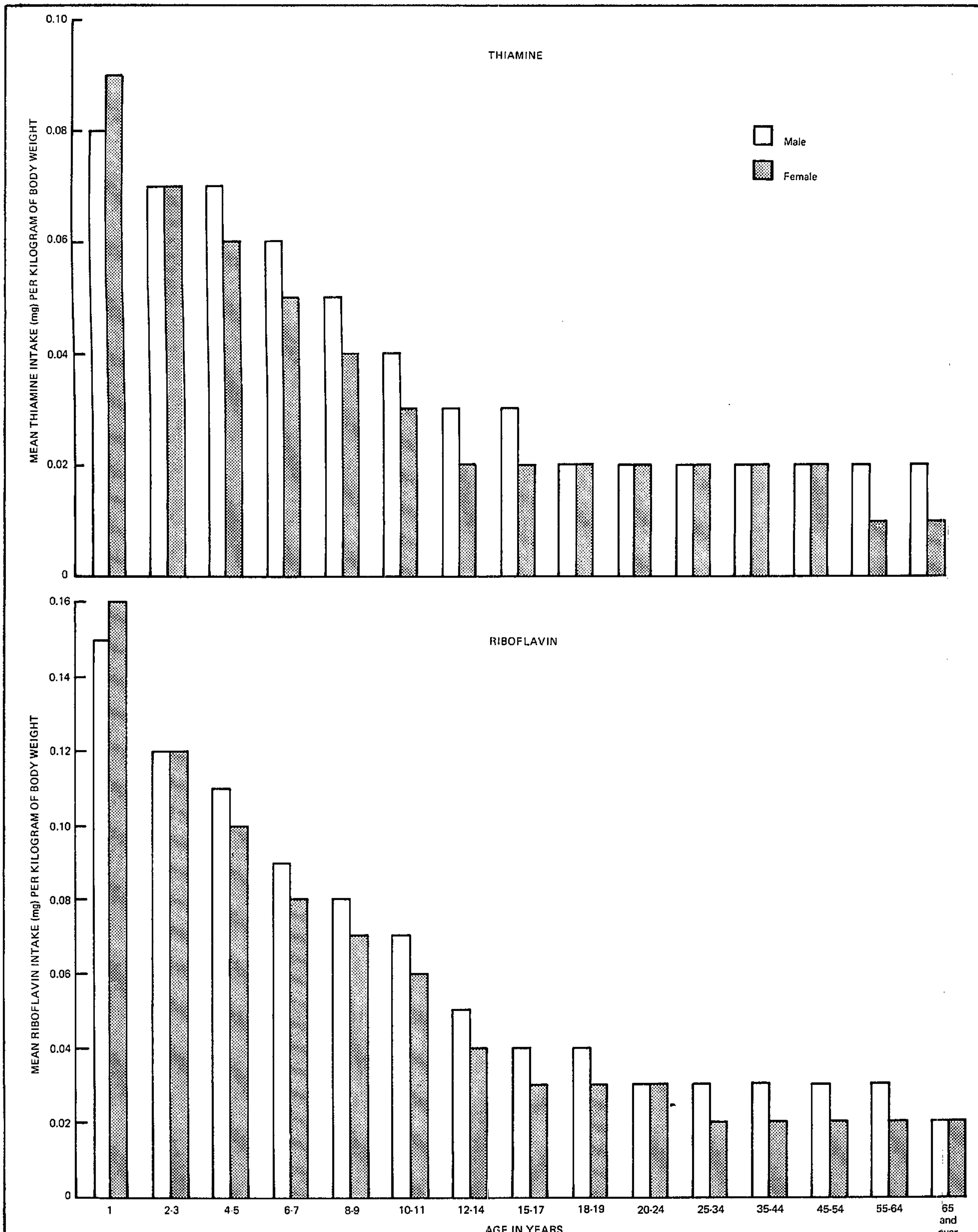

Figure 24. Mean caloric and nutrient intakes per kilogram of body weight of males and females aged 1-74 years, by age: United States, 1971-74—Con.

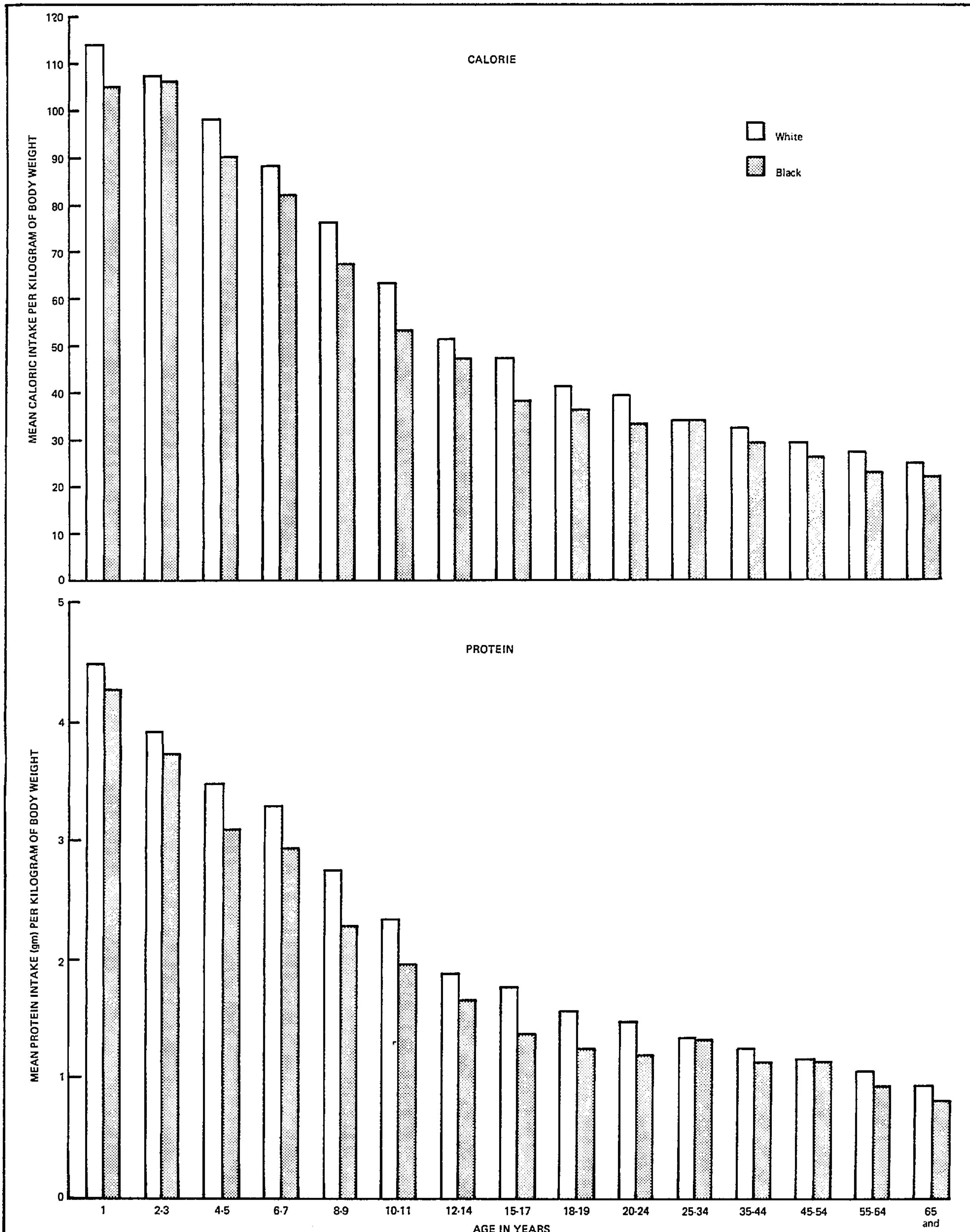

Figure 25. Mean caloric and nutrient intakes per kilogram of body weight of males aged 1-74 years, by race and age: United States, 1971-74

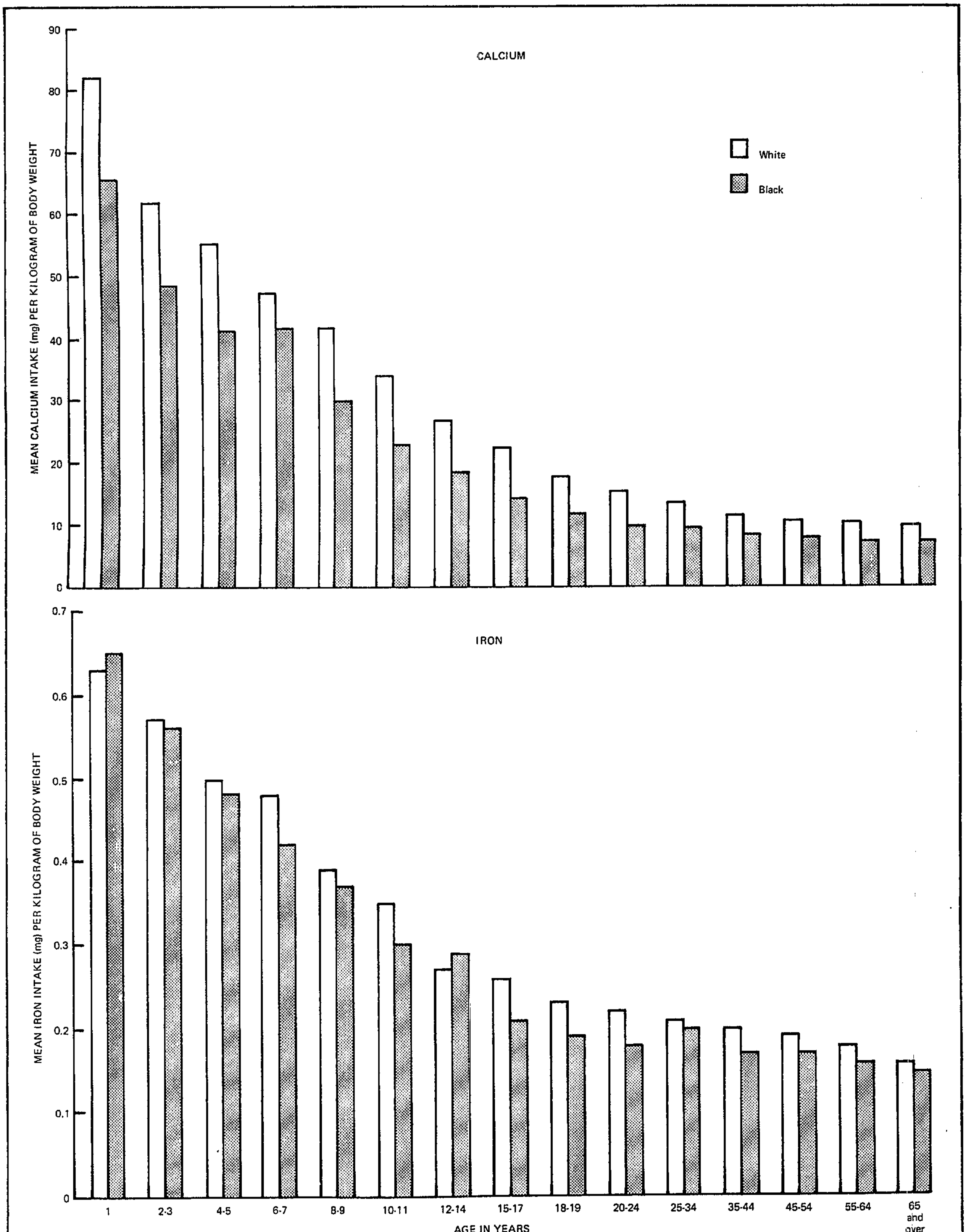

Figure 25. Mean caloric and nutrient intakes per kilogram of body weight of males aged 1-74 years, by race and age: United States, 1971-74—Con.

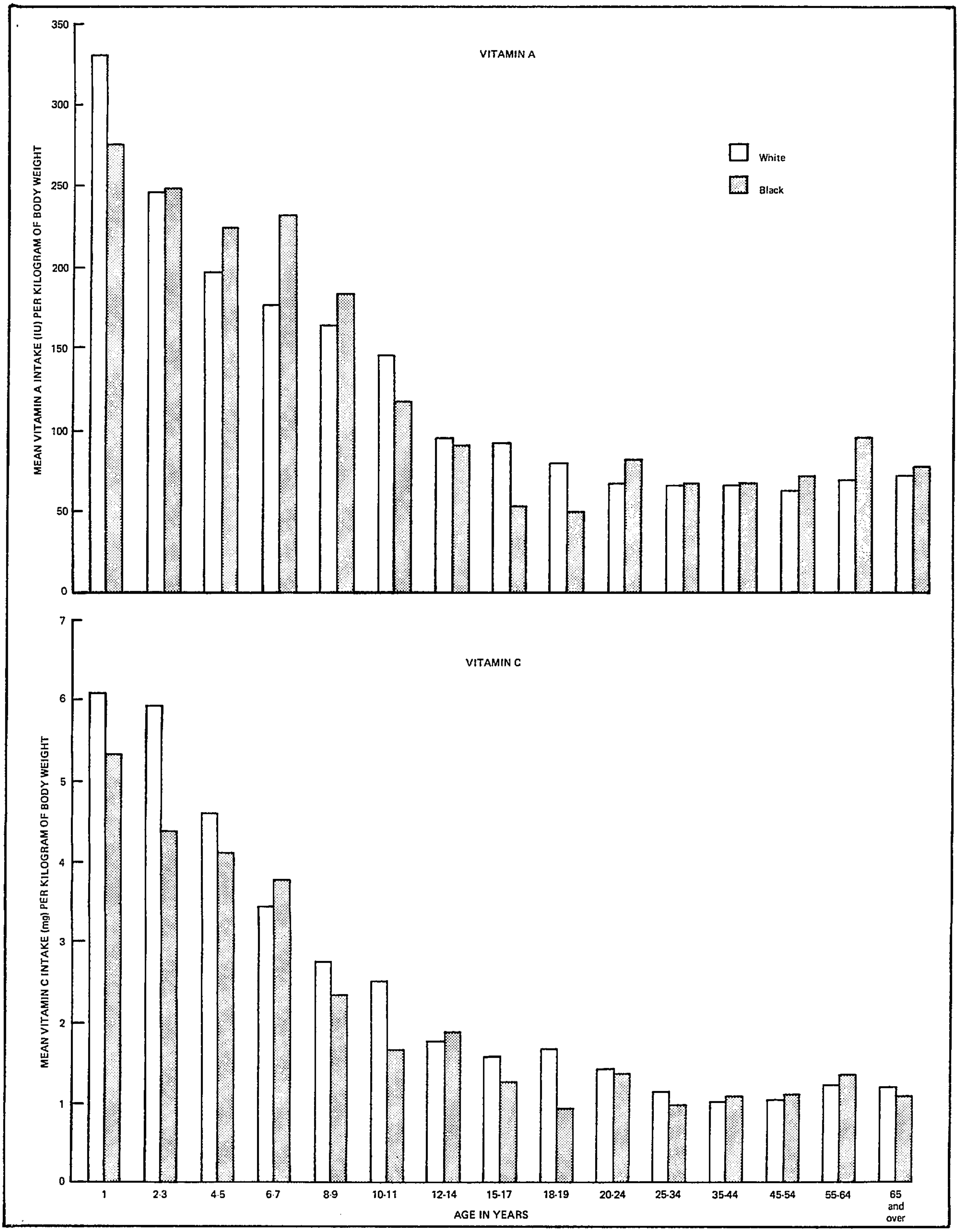

Figure 25. Mean caloric and nutrient intakes per kilogram of body weight of males aged 1-74 years, by race and age: United States, 1971-74—Con.

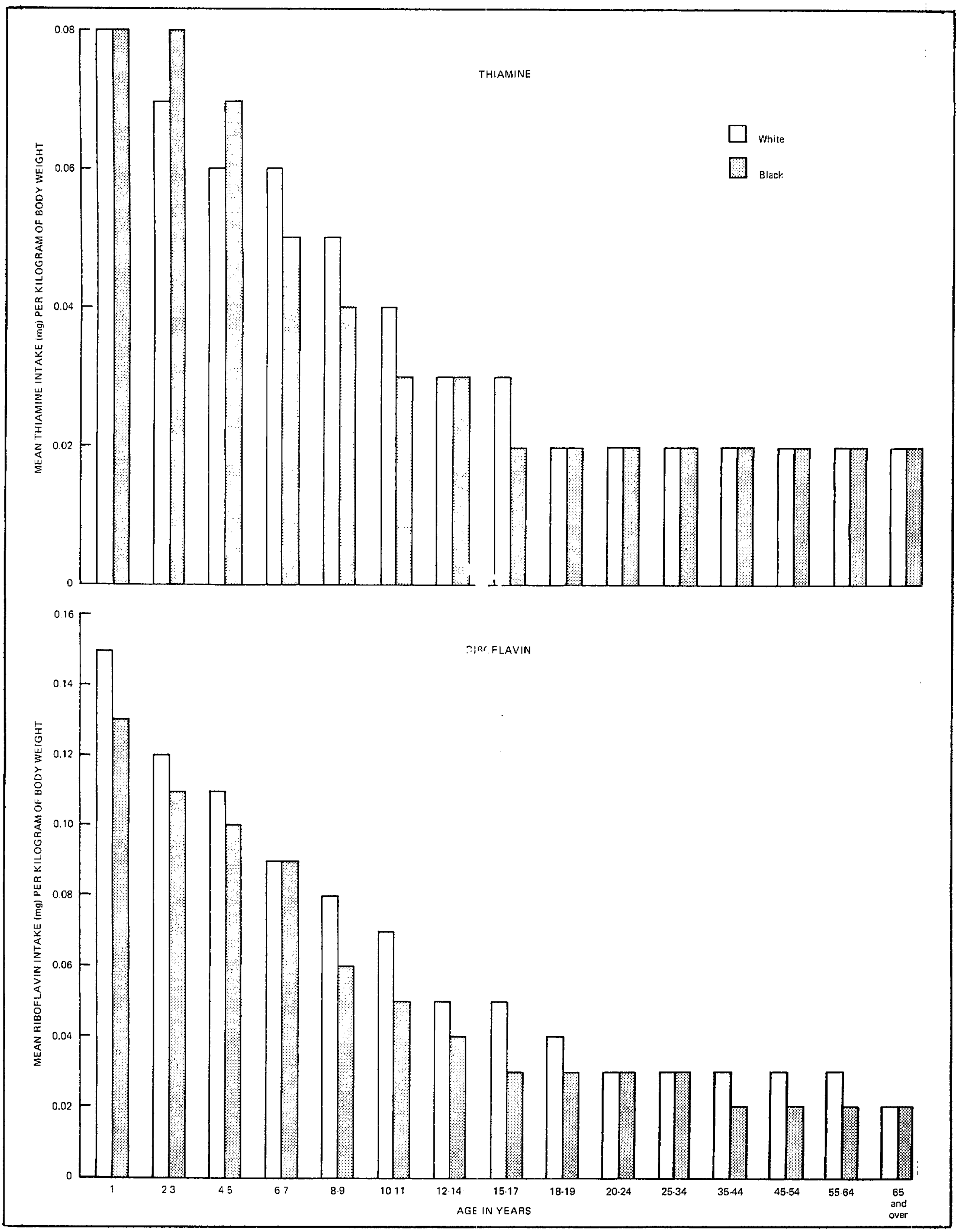

Figure 25. Mean caloric and nutrient intakes per kilogram of body weight of males aged 1-74 years, by race and age: United States, 1971-74—Con.

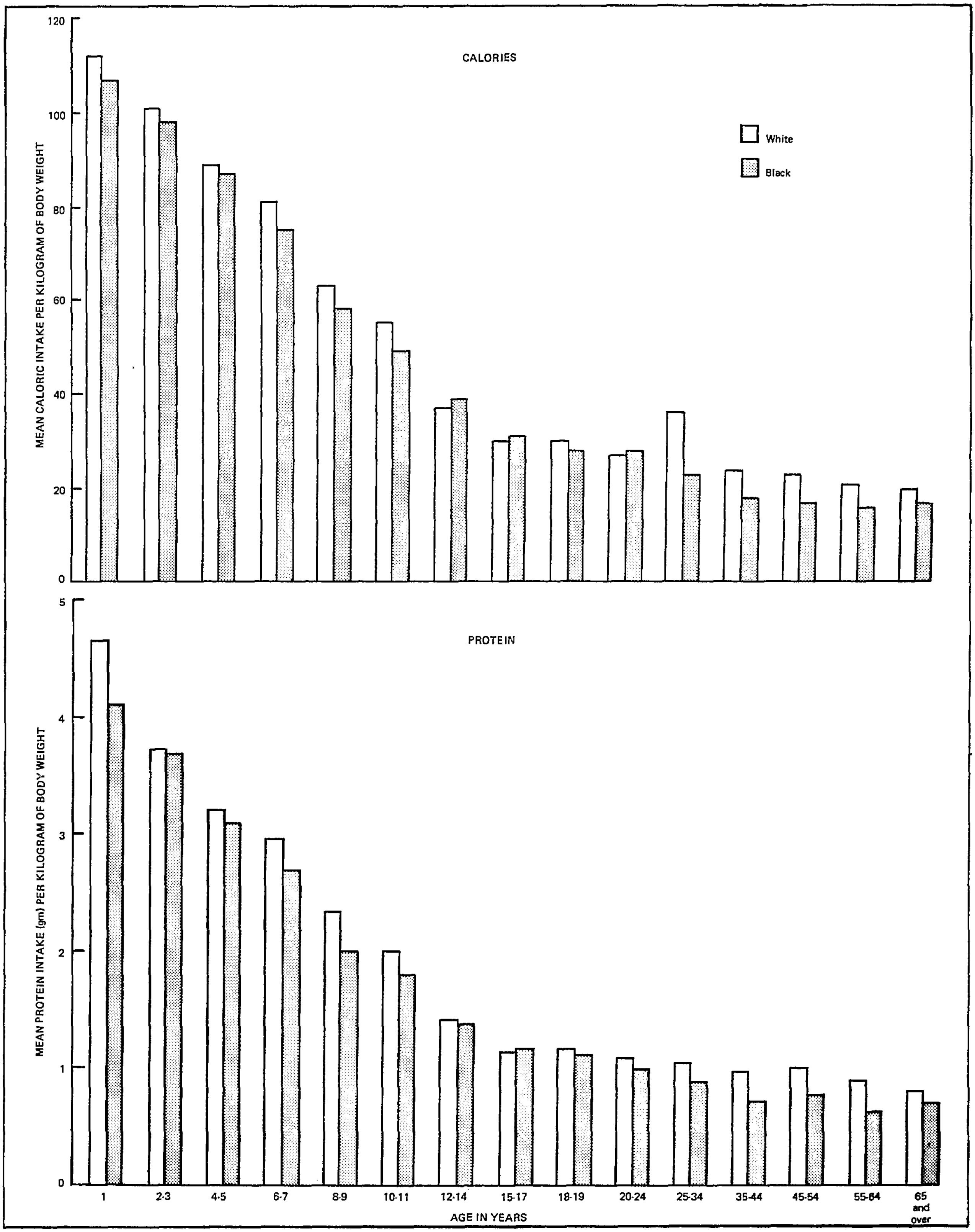

Figure 26. Mean caloric and nutrient intakes per kilogram of body weight of females aged 1-74 years, by race and age: United States, 1971-74

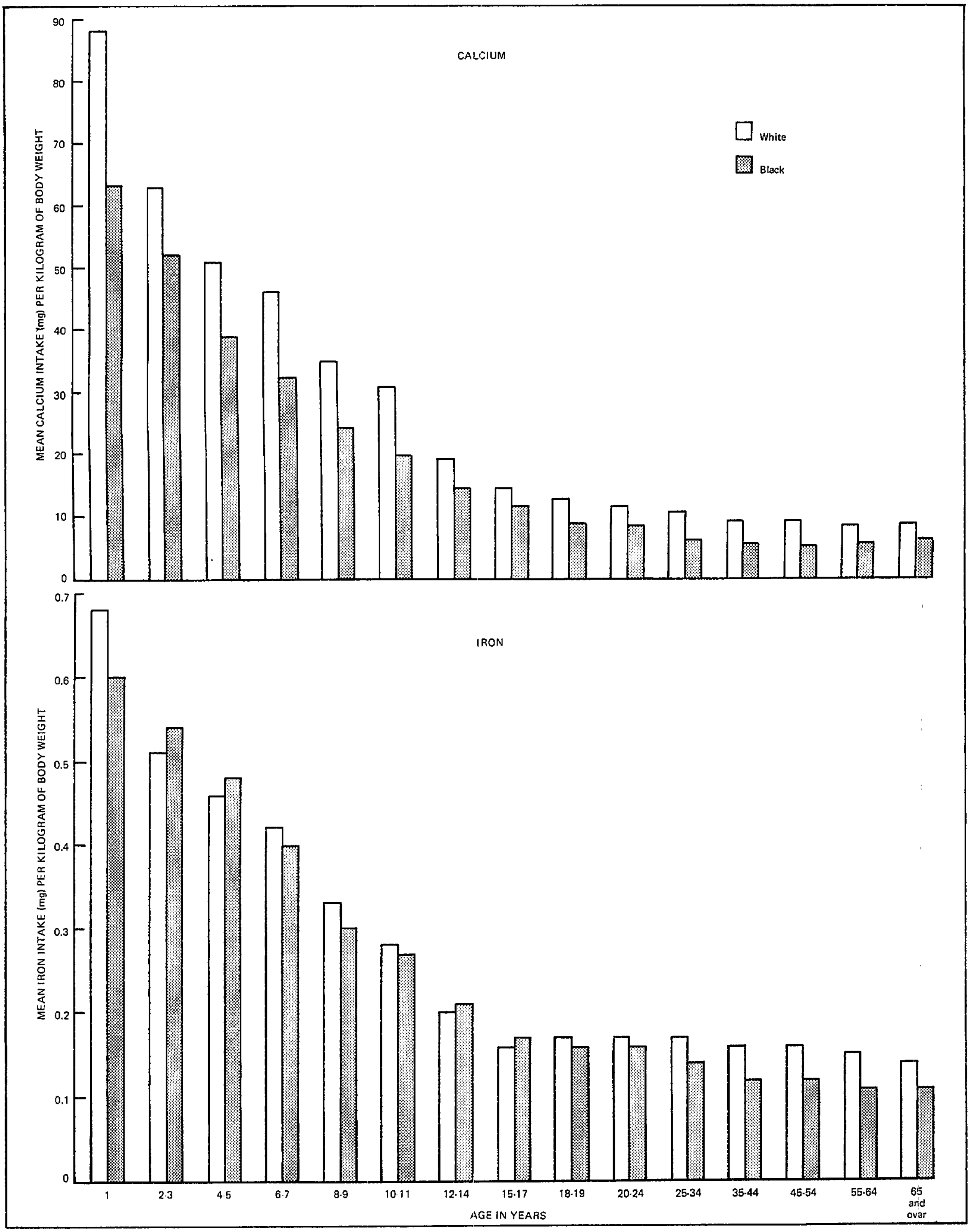

Figure 26. Mean caloric and nutrient intakes per kilogram of body weight of females aged 1-74 years, by race and age: United States, 1971-74—Con.

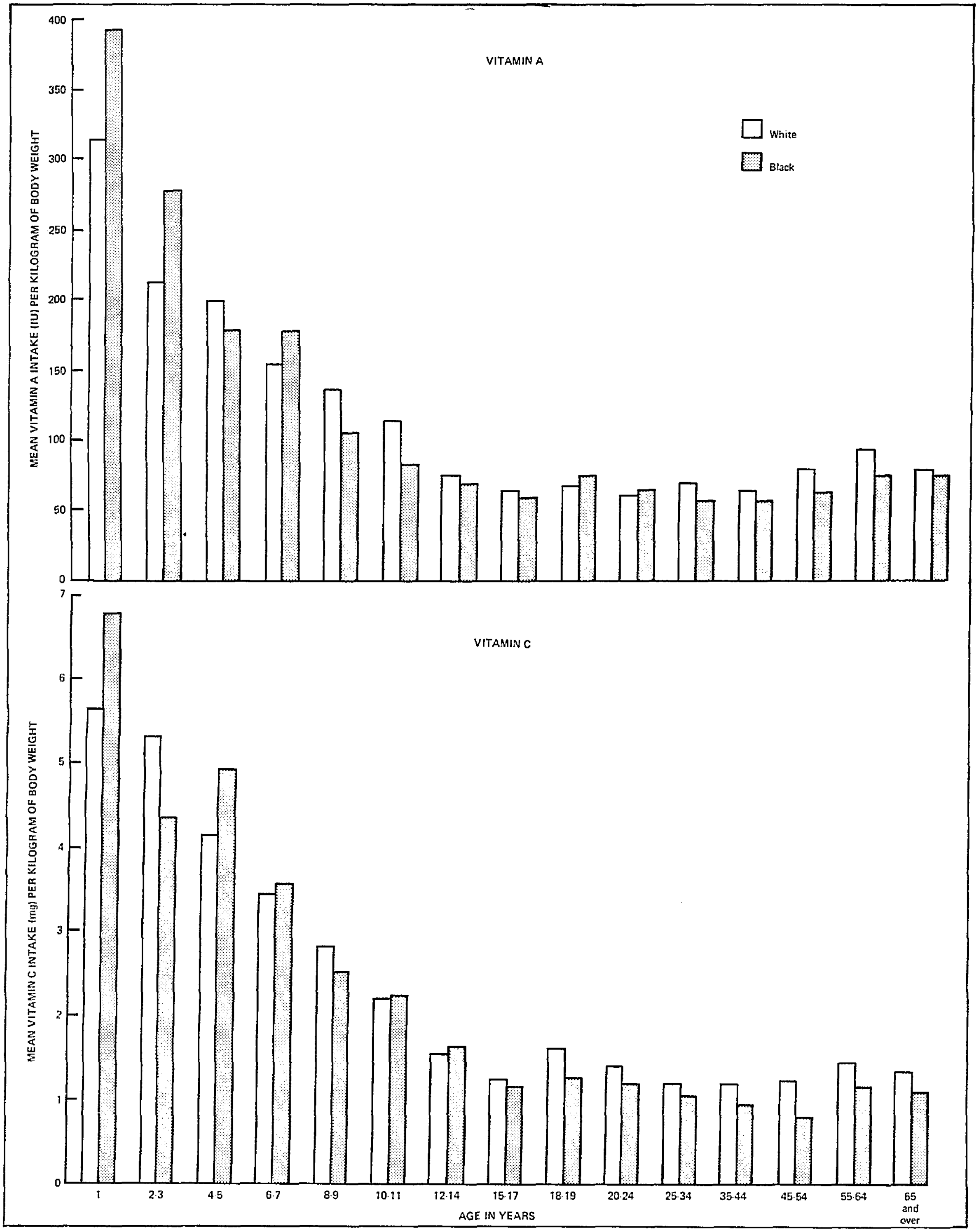

Figure 26. Mean caloric and nutrient intakes per kilogram of body weight of females aged 1-74 years, by race and age: United States, 1971-74—Con.

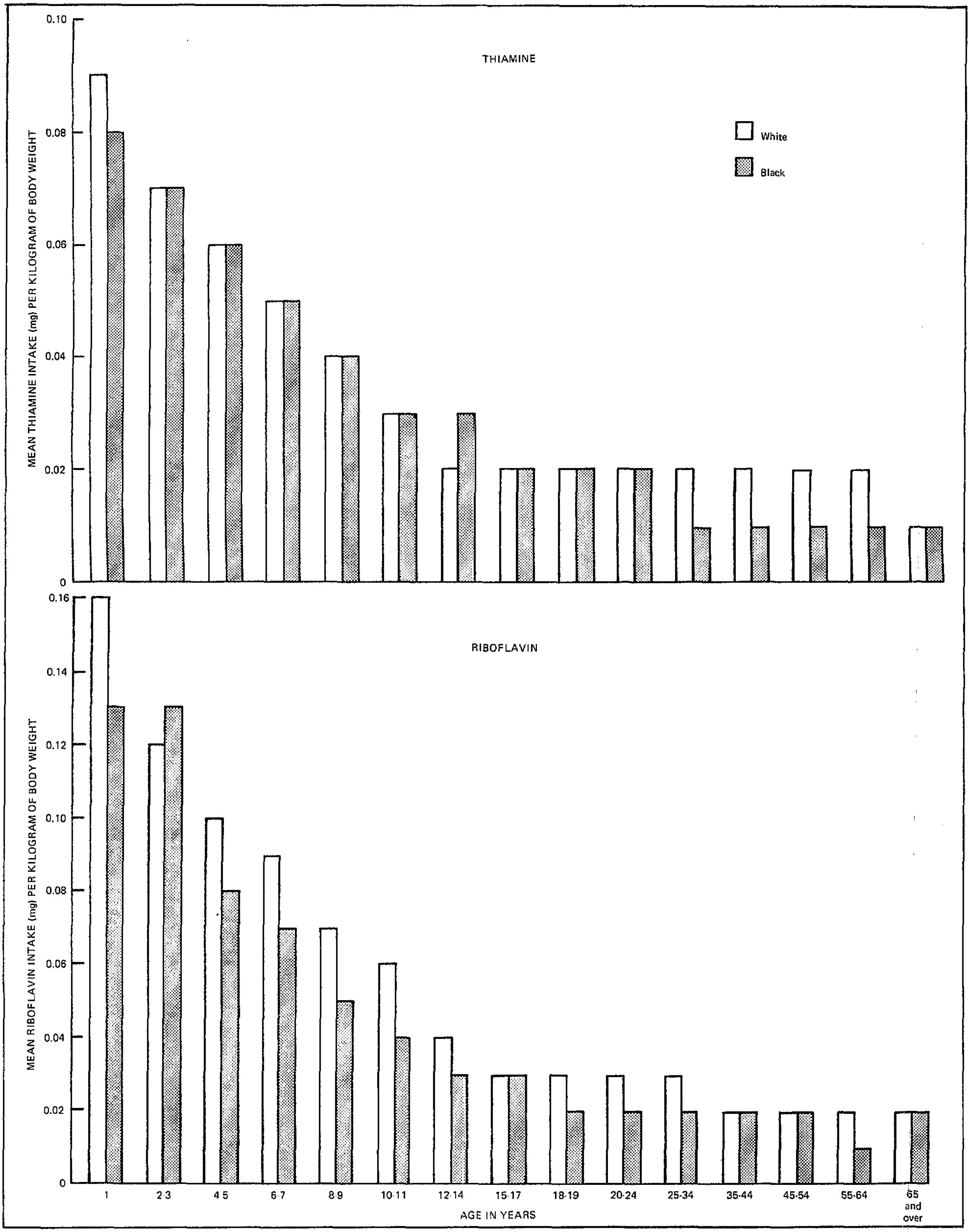

Figure 26. Mean caloric and nutrient intakes per kilogram of body weight of females aged 1-74 years, by race and age: United States, 1971-74—Con.

755 mg per 1,000 calories to a low of an average of about 385 mg per 1,000 calories at ages 35-54 years and then increased slightly at ages 55-74 years. A similar pattern occurred in calcium-to-calorie ratio for males. The highest value was also at age 1 decreasing to a low at ages 35-54 and then increasing slightly in the older adult ages.

The mean iron intake per 1,000 calories increased from a low of 5.1 mg for girls aged 2-3 years to a high of 7.1 mg for women aged 55-74 years. The corresponding ratio was a low of 5.2 mg per 1,000 calories for boys aged 4-5 years to a high of 6.7 mg for men aged 65-74 years.

The protein-to-calorie ratios for both males and females decreased at ages 2-3 from the youngest age; hereafter there was an irregular increase with age to the older adult ages 45-64 years; the ratios declined slightly at ages 65-74 years.

This pattern of mean nutrient intake per 1,000 calories with age is also observed for vitamins A and C, thiamine, and riboflavin intakes with slight exceptions occurring at ages 65-74 years.

The differences in mean nutrient intake per 1,000 calories by age found for males and females as a whole were generally also found for males by race and income levels separately.

Mean caloric intake was consistently lower for females than for males in all ages 1-74 years (figure 1). The diets of females, though lower in calories than those of males, were generally of higher quality for protein, calcium, vitamins A and C, thiamine, and riboflavin. The ratio of these nutrient intakes to calories suggested that these differences in nutrients between sexes were more related to selection of specific food sources of these nutrients than to total food intake. The relatively small differences in the ratio of iron to calories between sexes, with the exception of ages 35-64 years, indicated that food selected by females did not have more iron sources, but that the differences were due to higher caloric intake. At ages 35-64 years, the mean iron intake per 1,000 calories was higher for females than for males, indicating a higher iron-to-calorie ratio in the diets of females.

Black males in all age groups except at ages 2-3 years had lower caloric intake than white males had. However, in adult ages, the mean protein, vitamins A and C, and thiamine intakes per 1,000 calories were generally higher for black than for white males. The variation in these nutrients between males was related to quality of diet rather than to quantity of food consumed. In the younger ages, the ratio of these nutrients to calories were generally higher for white males in contrast with black males, indicating that the food selected by white males did not have more nutrients than food selected by black males, but that the differences were due to higher caloric intake. A similar pattern was noted in comparing differences in calcium and riboflavin ratio per 1,000 calories between males. The variation in these nutrients between white and black males was related to total caloric intake rather than to choice of nutrient consumed.

Black males showed a higher iron-to-calorie ratio than white males did in the younger and older ages. However, the differences in ratios between males are small. Such differences as these could easily arise through sample error indicating that iron consumption was closely related to total caloric intake.

Mean caloric intake was also generally lower for black females than for white females with the exception of age groups 12-17 and 20-24 years (figures 5 and 18). Yet the mean vitamin A intake per 1,000 calories was generally higher for black females than for white females at ages less than 8 years and also at ages 18 through 65 years and older, suggesting that the variation in vitamin A intake between females in these age groups was related to choice of nutrients consumed rather than to total caloric intake. A similar finding was noted in comparing vitamin C-to-calorie ratios among black and white females at ages less than 12 years and at age groups 35-44 and 55-64 years. This is consistent with the observation previously noted for vitamin A intake—differences in vitamin C intake per 1,000 calories between subgroups were related to nutrient density rather than to total food consumed. However, for most of the age groups, the quality of the diet was not too different among females so that any differences were more influenced by total caloric intake. This pattern was also evident for ratios between calories and protein, calcium, iron, thiamine, and riboflavin.

Income was not a factor in evaluating the quality of nutrient intake for white males and females based on nutrient intake per 1,000 calories. This pattern was not observed for black males. The quality of the diet in terms of protein, vitamin A, and riboflavin intakes of black males in the lower income group was generally different from that in the upper income group. These differences were influenced more by nutrient dependence than by total caloric intake. The differences in the direction of the lower income group were found in more than half of the age groups, and generally occurred in the youngest children (ages 1 and 2-3) and in adults (ages 20-64 years).

Iron-to-calorie and thiamine-to-calorie ratios among black males in the lower income group also generally exceeded such ratios in the upper income groups for comparable ages. These differences were dispersed throughout the age range 1-74 years without any clear-cut pattern. However, several of these differences were so small as to be negligible. The quality of diets, as far as iron and thiamine were concerned, therefore, was not too different between income groups for black males, indicating that these nutrients were obtained from total caloric intake not from a generally higher quality nutrient intake.

The mean calcium intake per 1,000 calories was fairly comparable between income groups, with the exception of ages 1, 2-3, 20-24, and 45-64 years, indicating that food selected by black males of the low income group did not have more calcium than that selected by black males in the upper income group, but that most of the differences were due to higher caloric intake.

The mean vitamin C intake per 1,000 calories was higher for black males of the lower income group at ages 1-5, 15-17, and 35-64 years. This was consistent with the observation previously made for calcium intake at specific age group—differences in vitamin C intake between income groups were more related to nutrient density than to total food consumed.

Mean nutrient intakes per 1,000 calories among black females showed little or no variation by income within most age groups, indicating that nutrient consumption was closely related to total caloric intake. An exception was found for vitamin A-to-calorie ratios. In slightly less than half of the age groups, black females in the lower income group had lower mean caloric intake than did those of the upper income group, yet based on vitamin A intake, nutrient quality for black females in age groups 4-7, 12-17, 25-34, and 45-64 years was higher.

There were small differences in nutrient-to-calorie ratios between race-sex groups by income level, suggesting that for these subgroups, nutrient intakes regardless of income were related more to caloric intake. There were some exceptions to these general findings: black males and females tended to have higher vitamin A-to-calorie ratios than their white counterparts in both income groups had, suggesting higher content of vitamin A consumed. This observation also applies to quality of vitamin C intake for comparison of similar subgroups, with the exception of black females in the income group above poverty level. Here the differences in mean vitamin C intake per 1,000 calories between black and white females in the upper income group are comparable, indicating that differences in vitamin C intake were related to total caloric intake.

The higher protein- and thiamine-to-calorie ratios for black males in the lower income group as contrasted with white males in comparable income group are also of interest. A higher ratio for black males than for white males indicated that the food they selected had a generally higher nutrient content than that selected by white males.

DISCUSSION

Dietary Intakes

This report provides dietary intake data for nutritional assessment of the U.S. population aged 1-74 years. The assessment of dietary intake is an important component in the nutritional evaluation of the population. The measurement and description of the dietary component to assess nutritional status are presented in relation to income and sociodemographic variables that can affect the nutrition of the population. These variables include ethnic group, age, sex, and income level. Other variables such as educational level, prevalence of diseases, pregnancy, growth and development, and laboratory assessment of nutritional status are not included.

The report describes the dietary status of the population, with specific reference to defined subgroups: the poor, preschool children, women of childbearing age, and the elderly. This approach permits a description of the distribution of calories and nutrients in subgroups of the population and an estimate of the magnitude of the dietary problem. The first Health and Nutrition Examination Survey (HANES I) also provided baseline data for a limited number of nutrients of proven health significance: protein, iron, vitamins A and C, and thiamine. Other conditions, such as deficiencies of calcium and riboflavin, may cause symptomatic disease, and there is some belief that they may be of public health interest. The dietary intake of sodium, cholesterol, and saturated fatty acids, which are implicated in cardiovascular disease, will be presented in a forthcoming report since cardiovascular disease, particularly coronary heart disease and hypertension, are of major public health interest.

When the 24-hour-recall dietary data are analyzed by comparing mean intakes of population groups with known demographic characteristics to dietary standards, the distributions of means across population subgroups are useful in identifying the association of diet with population characteristics. The presentation of dietary intakes relative to standards chosen to reflect different nutrient needs permits a comparison across age, sex, race, and income groups with varying dietary requirements. This method of analysis does not examine for differences in the distribution of nutrients. The mean has limited value in light of the variability of some nutrient distributions. High mean intakes can mask the fact that a substantial proportion of individuals within a group may have usual intakes that are far below the dietary standards.

Because in HANES I only data on 1-day nutrient ingestions were collected, nothing can be inferred from these data about the distribution of usual intake for individuals. Such inferences can be made, however, from the 3-month food frequency intake data that were collected during the survey and that will be presented elsewhere.

The 24-hour-recall method was used to estimate the population mean intake and the proportions of persons with caloric and nutrient intakes below the standards. The habitual intake of individuals cannot of course be estimated from the 1-day intakes collected during HANES I. Single-day-intake data, in contrast with intake data for longer periods of time, result in greater variability of nutrient intakes and lead to a higher proportion of persons with low intake when specified intakes are compared with the dietary standards.

There would be, therefore, a higher proportion of the population reported as having extreme values, whether high or low, when 1-day-observation data are used. Since a single day's low intake does not affect one's health, if compensated for by higher intake the following day, the data for persons with low intake based on the 24-hour period will overstate the proportion of persons with low intake that may affect health.

In spite of the limitations of the single-day-intake data to estimate individual habitual intake, the distributions of the means and the percent of individuals whose nutrients fell below the standards across the population subgroups are useful in identifying influences on the diet related to population characteristics. The presentation of such dietary intake data relative to the dietary standards of nutrients permits a comparison across age and sex groups that have different dietary requirements.

The dietary standards are used to interpret the dietary data for the U.S. population. It is assumed that, if a healthy person's intake exceeds the standards, the person has an adequate nutritional intake. The converse does not necessarily hold true because many persons who consume less than the standards are nevertheless adequately nourished, since the standards are guidelines for dietetic meal planning to ensure adequate nutrition, even for those whose dietary requirements are higher than usual.

Another purpose of the dietary standards is to set guidelines for nutritionists. To ensure an adequate dietary intake for persons whose nutritional requirements are unknown, the dietary standards are often set at higher levels than are necessary for most of the population. Thus if a population mean intake or the proportion of persons with a nutrient intake is below the standards, it does not necessarily follow that individuals in the study population are deficient in a specific nutrient because the high dietary standard errs on the safe side to ensure an adequate dietary intake in the planning of meals.

The important comparisons to be made with these data are those of the dietary intake with socioeconomic and ethnic status. When there are higher proportions of persons consuming less than the dietary standard among the lower income group than among the upper income group, for example, there should be concern about the adequacy of the diet among the lower income group. Inference about the inadequacy of the diet among the lower income group, however, must depend on whether performance, health, and survival is adversely affected by an inadequate nutritional intake. Information about physiological indicators of nutritional status, which are more closely related to performance, health, and survival, has been collected on these same persons and will be analyzed in a later report.

In almost all population groups, most people did not consume as much iron as the dietary standards allows, which implies that most people do not usually consume as much as recommended.

Higher density iron food sources are needed, especially by women, if the dietary standards for iron are to be attained. The desirability of meeting these standards cannot be determined from data presented in this report but must depend upon findings from the physiological and health-related evidence of inadequate iron nutrition in the population. The second Health and Nutrition Examination Survey (HANES II), now being conducted, will provide additional data relevant to making such a determination.

Most people in several population groups did not consume as many calories as the standards (which are similar to the recommended daily allowance of the National Research Council) allows. These findings do not correspond to the distribution of lean and obese persons across similar population subgroups. Various possible explanations for this discrepancy range from reporting biases in the 24-hour-recall method of dietary interview to differences in physical activity which are not reflected in the dietary standards.

Income Levels

Income generally appears to be associated with the consumption of less than the standard nutrient intakes for males regardless of race. White and black males consumed less than the standard of caloric, calcium, iron, and vitamin A intakes in the lower income group than in the upper income group. This pattern was also evident for white males with regard to protein and vitamin C intakes, but not for black males whose consumption of these nutrient intakes below the standard was associated with income above poverty level.

White and black males in the upper income levels showed higher proportions of persons with thiamine and riboflavin intakes below the standards than those in the lower income group did.

For females, race and income levels were not important variables affecting the proportions of persons with iron intake less than the standards. Females, regardless of race and income levels, tended to show higher proportions of persons whose iron intake fell below the standards. The association of lower income level with higher proportion of nutrient intakes below the standards previously noted for males was also evident for females, with some exceptions. Black females in the upper income group had higher proportions of persons with caloric intake below the standards than those in the lower income group had. Another exception was that white and black females in the upper income group also had higher proportions of persons with thiamine intake below the standards than those in the lower income group had.

A large proportion of black males generally showed caloric and nutrient intakes below the standards than white males of comparable ages did regardless of income level, with slight exceptions. White males in the lower income group had higher proportions of persons with low vitamin C intake than black males in the lower income group had. White and black males aged 1-3 years showed similar high proportions of those whose iron intake fell below the standards without regard to income level. A similar pattern was observed for females. Black females generally showed higher proportions of persons with caloric and reported nutrients less than the standards than white females did, without regard to income.

The lack of association between income level and nutrient intake was most evident for the calcium intake of black males and females—in almost all age groups of both income levels, higher proportions of black persons had low calcium intake in relation to the standard than their white counterparts had.

Differences in caloric, calcium, and riboflavin intakes less than the standard between income groups were generally more marked between black persons (males and females) and their white counterparts. This pattern was reversed in proportions of persons with low vitamin C intake. Another pattern was observed in the consumption of low protein, vitamin A, and thiamine intakes. Here the differences between income groups were generally more evident among white males than among black males and among black females than among white females.

Racial differences in the proportion of males and females with low caloric and nutrient intakes in the low and high income levels showed that there was generally more evidence of differences between white and black males in the upper income group than in the lower income group as far as low intakes of calories and all selected nutrients. The sole exception to this general finding was in the proportion of persons with low thiamine intake.

The previous finding reported for males was not evident for females. With the exceptions of proportion of persons with low protein and riboflavin intakes, there was more marked difference between white and black females in the lower income group than in the upper income group as far as low intakes of calories and other nutrients. A similar analysis was not done for the proportions of females with low iron intakes because of the high proportions of persons, regardless of race and income group, with low iron intake.

There is such a discrepancy between the patterns of nutrition adequacy of iron and calories as measured by the proportion of persons with low intake relative to the standards when compared with the much smaller extent of inadequacy as measured by physiological measures, that one must reserve judgment about the relationships of income, race, sex, and age to malnutrition until these measures are interpreted together.

Race and Sex

Race, regardless of sex, appears to be associated with the consumption of nutrients less than the standard. More black males in most age groups showed this pattern with regard to calories and nutrient intakes than white males did, with the exception of thiamine intake. Here white males generally consumed less thiamine than the standard. A similar observation was noted among females. Black females in most age groups consumed calories and nutrients less than the standard. Again, one exception was the thiamine intake of white females. Another exception was the iron intake of both white and black females, which was considerably less than the standard.

Sex was clearly an important variable affecting nutrient intake. More females in most ages consumed less than the standard of calories and nutrients than males did on the day previous to the dietary interview. The sole exception was noted for thiamine intake—males in 10 of the 15 age groups tended to consume less than the standard than females did.

Females tended to show lower mean caloric intake than males did, yet the mean nutrient intakes per 1,000 calories were generally higher for females than males, indicating the selection of foods of higher nutrient content. This was particularly evident for protein, calcium, vitamins A and C, thiamine, and riboflavin intakes, but not so for iron intakes. Females showed higher iron-to-calorie ratios for most age groups than males did, but the differences in ratios between the sexes were too small to be meaningful.

The higher mean nutrient per 1,000 calories for females suggested that the quality of diet was different from that of males and that the differences were more influenced by nutrient density than by total food consumption. The ratio of nutrient to calories for males, however, suggested that the differences in nutrients were more related to total caloric intake than to nutrient densities of food consumed.

Mean calcium, iron, and riboflavin intakes per 1,000 calories showed little or no variation by race within most age groups, indicating that consumption of these nutrients was closely related to total caloric intake.

Mean protein, vitamins A and C, and thiamine intakes per 1,000 calories were higher for black males than for white males mainly in the adult ages and throughout the younger ages without any clear-cut pattern in these ages. Black males in these age groups had lower observed mean caloric intakes than white males had, yet based on the previously identified intakes per 1,000 calories nutrient quality for black males was greater.

There were suggestions of racial differences in intakes of vitamins A and C per 1,000 calories. There were differences between white and black persons without regard to income levels, particularly in subgroups of females in the youngest ages and in ages 25-74 years and of males generally in the younger ages of the lower income group and in the adult ages of both income groups. This would indicate that the quality of diet was different and that differences were influenced by nutrient density rather than by total food consumption. Further analysis of food groups and types and amounts consumed will be done in other reports when data on frequency of food consumption as well as foods reported in the 24-hour recall will be analyzed.

SUMMARY

Dietary intake findings among individuals 1-74 years of age in the civilian noninstitutionalized population of the United States collected during the Health and Nutrition Examination Survey of 1971-74 are presented and analyzed in this report. Analysis of the data for certain groups at high risk of malnutrition—the poor, preschool children, women of childbearing ages, and the elderly are included. Age, sex, race, and income level differences in dietary intake are also analyzed.

These data, based on only dietary intake, permit only limited general conclusions about the nutritional status of the U.S. population. There is evidence of a deficiency in the caloric and iron intakes. This dietary deficiency occurred at all age levels and was not limited to persons in the below-poverty-level group.

Comparisons among subgroups provide some evidence of relative deficiencies of certain nutrients in particular age, sex, race, and income groups. Some of the principal findings are summarized as follows.

- The mean nutritive content of diets consumed by different age, sex, race, and income groups was compared with the standards for calories, protein, calcium, iron, vitamins A and C, thiamine, and riboflavin. Major findings included:

  The analysis of the intake of some nutrients, namely thiamine and riboflavin, showed adequate or more than adequate mean intake for all population subgroups defined by two levels of income, race, and sex for ages 1-74 years. The analysis of other nutrients, namely protein, calcium, and vitamins A and C, revealed that some, but not most, population subgroups had lower mean intakes than the standard.

  1. Calcium mean intake was consistently lower than the standard only for adult black women: those aged 20-74 years in the lower income group with mean values 25 percent below the standard, and those aged 18-74 years in the upper income group with mean values 27 percent below the standard.
  2. Protein mean intake either approached (90-100 percent of the standard) or was below the standard for adolescent and adult women and for older black men in the low income group. This pattern was also observed for adult black females and black older men in the upper income group.
  3. Males had mean vitamin A intake at all ages in both race and income groups that approached or exceeded the recommended allowances. This was also true for females in almost all age, race, and income groups. The exceptions were white females 20-24 years in the lower income group and black females 12-14 years in the upper income group and those 15-17 years in the lower income group.

Median values were lower than mean values and presented a different pattern of relation to the standards. Vitamin A, on the basis of median value, was more often found below the standards in subgroups except for white males in the upper income group.

4. The mean dietary intakes of calories and iron were below the standards for most population subgroups. Caloric intake was below the standards for all except the younger child regardless of sex, race, and income group. Iron intake was generally below the standard for all female income, race, and age groups and for males of preschool ages 1-3 years and adolescents.

- Distributions of individuals by the amounts of nutrients in their diets were obtained, making it possible to show the proportions of individuals who had calories and nutrients that did not meet the standards on the day preceding the interview. These data for calories and nutrients are:

    1. Approximately 95 percent of the children of ages 1-3 years and about 93 percent of females of ages 10-17 and 18-54 years in both race and income groups had iron intake below the standard.

    2. About 38 percent of white male adults and 59 percent of black male adults aged 65 years and over had iron intake below the standard. The corresponding figures for white and black females of the same ages were 65 and 77 percent, respectively.

    3. There was a lower percent of white individuals in all age groups without regard to income level who had calcium intake less than the standard in comparison with black individuals of comparable age, race, and income group.

    4. A higher percent of black males tended to have low caloric, protein, calcium, vitamins A and C, and riboflavin intakes below the standard than white males had regardless of income level. The exceptions were white males in the low income level who had a higher proportion of persons reporting low vitamin C intake than black males in the same income group had, and white males in the upper income level who had a higher proportion of low thiamine intake than their black counterparts in the upper income group had. White and black males in the lower income group tended to have higher percentages of low caloric, calcium, iron, and vitamin A intakes than those in the upper income group. This observation is also evident for percent of low protein and vitamin C intakes for white males. On the other hand, black males in the upper income group had higher percents of individuals with protein and vitamin C intakes that did not meet the standards than those in the lower income group had.

    5. White and black females in the low income group tended to have a higher proportion of persons reporting low protein, calcium, vitamins A and C, and riboflavin intakes than those in the upper income group had. This pattern was also observed for white females with regard to caloric intake. The direction was reversed for low caloric intake of black females and for low thiamine intake of white and black females when the higher proportion of persons with intake less than the standard is noted in the upper income group.

There is such a discrepancy between the patterns of nutrition in adequacy of calories and iron when measured either by the mean intake or by the percent of persons both relative to the standards, as compared with the much smaller extent of inadequacy when measured by physiological measures, that one must reserve judgment about the existence of inadequate nutrition and the relationship of income, race, sex, and age to malnutrition until these measures are interpreted together.

Although energy intake estimated from the 24-hour recall appears low compared with the estimated requirements, actual energy stores in the form of body fat belie these findings. The nutritional problem is apparently opposite, in that unhealthy overconsumption of energy evidenced by obesity affects a sizable proportion of the population.

Differences in nutrients associated with sex were more related to the selection of specific food sources of protein, calcium, vitamins A and C, thiamine, and riboflavin intakes than to total food intake.

The mean vitamins A and C intakes per 1,000 calories were generally higher for the black population than for the white population without regard to income. Differences in intakes of vitamins A and C between racial groups were more related to nutrient density than to total food consumed.

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LIST OF DETAILED TABLES

Table 1. Mean caloric, protein, calcium, and iron intakes of persons aged 1-74 years as a percent of standard for income levels, by sex and age: United States, 1971-74

Sex and age	Calories			Protein			Calcium			Iron		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard											
Male												
1 year	124	127	124	235	240	235	207	203	208	50	47	51
2-3 years	125	129	124	230	240	226	194	193	193	55	54	55
4-5 years	119	116	120	231	220	233	223	188	231	94	90	95
6-7 years	113	120	112	265	275	264	243	214	258	112	114	111
8-9 years	94	95	93	212	216	211	258	226	267	113	113	112
10-11 years	92	79	95	193	166	199	185	155	190	127	114	129
12-14 years	82	75	83	158	145	161	198	158	205	96	99	97
15-17 years	85	74	87	154	133	157	229	201	232	91	74	93
18-19 years	92	83	93	156	142	156	227	181	234	92	88	92
20-24 years	94	84	95	143	125	145	279	242	281	165	143	168
25-34 years	91	81	92	142	139	142	262	194	267	167	172	167
35-44 years	90	94	90	134	142	134	229	278	226	159	164	159
45-54 years	84	75	84	125	114	126	210	186	212	146	126	147
55-64 years	80	68	82	113	91	117	194	193	196	137	111	141
65 years and over	74	70	75	99	91	102	179	152	184	121	113	123
Female												
1 year	124	120	125	240	234	242	202	196	204	48	37	51
2-3 years	118	114	119	221	221	221	190	170	195	48	48	48
4-5 years	110	116	109	217	232	214	199	192	201	84	88	83
6-7 years	97	97	97	224	223	225	222	210	226	96	89	98
8-9 years	77	81	77	179	194	177	223	208	228	97	106	96
10-11 years	89	88	89	171	176	170	169	129	178	58	64	57
12-14 years	73	74	72	120	118	120	148	131	152	58	61	57
15-17 years	69	67	69	99	88	101	131	106	137	53	46	54
18-19 years	83	82	84	114	107	117	130	116	137	56	53	57
20-24 years	78	78	78	104	94	105	111	100	113	56	53	56
25-34 years	83	81	83	105	98	106	107	91	109	57	54	58
35-44 years	83	77	84	103	94	103	100	88	101	58	51	58
45-54 years	86	82	85	108	97	107	99	93	99	59	52	59
55-64 years	80	73	81	98	80	99	96	90	97	97	81	98
65 years and over	77	71	78	90	84	92	95	88	97	92	80	96

[1]Excludes persons with unknown income.

Table 2. Mean and median vitamin A intake and mean vitamin C, thiamine, and riboflavin intakes of persons aged 1-74 years as a percent of standard for income levels, by sex and age: United States, 1971-74

Sex and age	Vitamin A						Vitamin C (mean)			Thiamine (mean)			Riboflavin (mean)		
	Mean			Median											
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard														
Male															
1 year	189	226	182	145	169	136	175	136	186	175	165	178	242	245	240
2-3 years	180	199	176	137	132	139	209	186	215	173	178	170	205	205	204
4-5 years	189	197	189	143	112	149	214	181	223	170	175	168	198	182	202
6-7 years	175	184	171	130	132	130	205	173	217	163	165	163	195	178	202
8-9 years	186	167	191	131	107	138	196	176	201	150	147	152	195	175	200
10-11 years	207	157	210	152	118	157	223	125	233	165	170	163	191	181	193
12-14 years	157	165	154	111	99	114	195	168	205	158	170	150	184	185	184
15-17 years	166	125	172	107	89	108	195	170	199	152	150	152	173	171	173
18-19 years	161	104	166	113	48	115	212	173	216	147	153	145	165	154	167
20-24 years	152	139	150	110	80	114	180	153	186	150	157	147	160	167	156
25-34 years	153	146	151	102	92	103	150	103	152	153	165	150	160	158	158
35-44 years	153	175	149	110	132	109	138	129	139	147	160	147	160	171	158
45-54 years	148	142	149	96	63	98	140	115	143	155	157	157	163	160	163
55-64 years	163	133	166	111	93	112	160	114	165	165	163	165	171	183	171
65 years and over	157	113	167	95	73	101	147	107	156	172	170	172	178	167	180
Female															
1 year	176	155	182	133	112	143	160	117	170	193	165	198	258	253	258
2-3 years	174	163	175	124	130	123	182	162	186	173	175	170	218	216	218
4-5 years	178	181	176	128	125	129	198	179	203	165	170	165	200	191	202
6-7 years	146	159	143	112	116	111	199	177	206	163	158	165	193	187	195
8-9 years	158	210	150	114	117	116	210	254	202	165	175	163	193	185	185
10-11 years	161	166	162	129	123	130	208	192	213	158	170	152	187	165	191
12-14 years	124	128	123	81	76	82	174	154	177	160	165	160	181	171	184
15-17 years	102	89	108	63	58	66	143	143	146	158	140	163	175	153	181
18-19 years	114	109	118	75	78	74	186	176	187	157	160	157	163	145	170
20-24 years	106	108	106	71	64	72	153	148	154	165	163	163	163	156	165
25-34 years	122	105	125	72	58	75	138	113	140	163	163	163	171	158	173
35-44 years	120	98	122	78	64	80	145	116	149	163	160	165	167	163	167
45-54 years	152	218	149	83	53	86	150	107	153	170	163	170	178	213	176
55-64 years	177	142	179	87	74	87	178	122	183	180	170	180	193	178	194
65 years and over	148	126	157	85	76	89	164	130	174	185	182	185	193	191	194

[1]Excludes persons with unknown income.

Table 3. Mean caloric, protein, calcium, and iron intakes of males aged 1-74 years as a percent of standard for income levels, by race and age: United States, 1971-74

Race and age	Calories			Protein			Calcium			Iron		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard											
White male												
1 year	127	139	126	239	256	236	217	234	213	50	49	51
2-3 years	125	132	124	230	243	228	200	218	196	55	53	56
4-5 years	121	124	121	235	232	235	230	207	234	95	92	95
6-7 years	115	127	112	271	293	265	249	219	259	114	124	112
8-9 years	96	99	95	218	233	216	268	238	276	113	116	112
10-11 years	94	87	95	199	192	200	192	189	192	128	130	128
12-14 years	83	78	84	162	156	164	208	181	211	96	95	97
15-17 years	87	80	88	158	142	160	240	250	239	93	78	95
18-19 years	94	81	94	161	147	161	239	209	242	94	88	94
20-24 years	96	86	97	146	124	148	291	238	294	169	143	171
25-34 years	92	80	93	142	137	142	273	210	276	168	174	168
35-44 years	91	98	90	135	154	134	234	331	228	161	174	160
45-54 years	85	82	85	126	113	126	216	207	217	148	129	148
55-64 years	80	70	81	114	92	116	199	204	198	137	111	140
65 years and over	75	71	75	101	92	103	183	155	188	123	113	125
Black male												
1 year	114	115	116	221	224	224	166	174	160	50	44	59
2-3 years	128	126	128	228	238	214	160	160	159	55	58	52
4-5 years	110	103	120	207	195	222	175	152	206	91	87	97
6-7 years	105	107	108	237	237	249	216	204	242	97	94	145
8-9 years	82	87	77	177	187	162	201	205	194	111	107	111
10-11 years	75	68	82	157	135	179	136	115	158	113	94	133
12-14 years	73	69	74	134	127	135	135	120	140	96	105	90
15-17 years	70	66	71	123	120	123	149	139	144	75	70	77
18-19 years	84	87	82	128	138	122	158	148	164	80	95	71
20-24 years	82	78	84	120	122	119	187	247	162	138	132	140
25-34 years	92	87	94	143	149	142	189	157	198	162	174	159
35-44 years	83	83	85	125	110	134	172	146	194	143	136	149
45-54 years	72	67	75	119	114	122	151	161	145	129	123	133
55-64 years	69	57	78	101	87	115	143	134	160	125	108	139
65 years and over	64	67	64	85	88	85	136	140	135	106	112	104

[1]Excludes persons with unknown incomes.

Table 4. Mean and median vitamin A intake and mean vitamin C, thiamine, and riboflavin intakes of males aged 1-74 years as a percent of standard for income levels, by race and age: United States, 1971-74

Race and age	Vitamin A						Vitamin C (mean)			Thiamine (mean)			Riboflavin (mean)		
	Mean			Median											
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard														
White male															
1 year	197	276	187	147	179	142	181	109	191	173	158	175	244	256	242
2-3 years	179	190	179	136	127	139	216	195	220	170	168	173	209	215	207
4-5 years	186	196	186	145	116	151	217	173	226	165	168	165	198	185	200
6-7 years	167	174	164	126	97	128	203	158	214	163	165	163	195	169	202
8-9 years	191	183	191	138	116	142	199	183	200	150	145	152	200	181	202
10-11 years	213	167	211	154	132	155	229	133	232	165	175	163	195	196	195
12-14 years	160	161	157	117	108	117	195	163	200	120	170	150	187	184	187
15-17 years	174	133	178	113	88	115	199	156	203	152	152	152	176	185	175
18-19 years	171	109	174	117	73	118	224	170	228	147	147	145	169	173	169
20-24 years	147	113	148	110	72	114	179	147	185	150	155	147	162	167	158
25-34 years	154	148	151	106	121	106	152	88	155	150	163	150	162	162	160
35-44 years	155	195	149	111	139	110	137	115	139	147	157	147	160	181	158
45-54 years	147	121	148	97	61	100	139	82	143	155	145	155	163	162	163
55-64 years	159	109	165	110	93	112	158	112	163	165	160	165	173	180	173
65 years and over	156	97	167	96	70	103	149	95	158	172	167	172	178	169	178
Black male															
1 year	158	179	138	142	165	115	152	163	148	180	173	193	229	233	222
2-3 years	185	213	154	134	133	122	162	177	147	180	195	163	184	193	175
4-5 years	214	198	239	116	106	144	196	194	199	200	193	208	193	173	218
6-7 years	217	203	243	146	148	152	219	203	260	163	165	163	193	196	189
8-9 years	162	139	194	95	90	98	178	165	211	168	152	170	167	162	175
10-11 years	172	151	196	131	92	157	149	118	180	163	165	163	176	164	167
12-14 years	139	170	112	76	86	74	196	175	247	160	165	163	167	189	145
15-17 years	100	101	97	67	89	58	160	190	130	150	158	143	147	149	142
18-19 years	106	105	106	47	44	63	123	151	106	147	163	140	138	129	145
20-24 years	181	215	159	97	87	99	175	138	185	150	152	145	142	169	132
25-34 years	155	149	158	86	75	90	132	107	139	153	162	150	142	145	140
35-44 years	147	126	166	97	119	97	150	164	150	152	165	147	143	129	153
45-54 years	159	167	158	65	66	63	139	156	129	172	172	172	156	154	156
55-64 years	217	257	197	163	90	180	178	122	203	165	177	163	162	205	154
65 years and over	166	167	170	97	87	89	135	148	128	177	182	172	183	158	200

[1]Excludes persons with unknown income.

Table 5. Mean caloric, protein, calcium, and iron intakes of females aged 1-74 years as a percent of standard for income levels, by race and age: United States, 1971-74

Race and age	Calories			Protein			Calcium			Iron		
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard											
White female												
1 year	125	126	125	246	254	244	212	252	207	49	32	51
2-3 years	119	116	119	222	232	221	196	181	199	47	49	47
4-5 years	111	124	109	218	247	214	206	214	204	83	86	82
6-7 years	99	104	98	228	243	226	235	248	234	96	89	97
8-9 years	79	87	78	183	214	180	233	243	232	99	111	98
10-11 years	90	94	90	174	185	172	177	135	183	58	66	57
12-14 years	72	75	72	120	126	119	155	144	156	57	65	56
15-17 years	69	66	69	99	85	101	135	109	139	52	45	53
18-19 years	84	79	85	114	99	119	137	119	143	56	51	58
20-24 years	79	78	78	104	95	105	114	105	116	56	52	56
25-34 years	83	81	83	106	100	107	112	100	113	58	53	58
35-44 years	84	78	85	104	97	104	104	99	104	59	52	59
45-54 years	87	89	86	110	98	109	102	104	102	60	54	59
55-64 years	81	77	81	100	85	100	99	102	98	100	86	99
65 years and over	77	72	79	91	83	92	97	91	98	93	81	96
Black female												
1 year	119	117	126	218	217	224	153	134	182	44	43	46
2-3 years	113	111	116	214	203	225	159	152	162	52	45	58
4-5 years	107	104	111	207	206	214	161	157	166	89	93	89
6-7 years	90	88	91	202	197	209	167	163	172	94	90	98
8-9 years	69	72	65	152	164	142	156	155	164	86	98	74
10-11 years	78	78	81	154	161	154	119	119	124	59	61	59
12-14 years	75	74	76	118	110	125	114	118	108	59	56	61
15-17 years	71	69	71	99	93	101	109	99	114	56	49	59
18-19 years	80	89	71	113	124	106	97	112	79	53	57	51
20-24 years	79	78	79	100	92	106	87	88	85	57	54	59
25-34 years	80	81	79	96	94	97	70	74	69	53	54	53
35-44 years	71	74	70	87	88	87	69	66	72	48	47	49
45-54 years	74	71	72	98	95	91	68	74	61	51	48	50
55-64 years	71	66	74	81	73	87	72	68	76	80	75	84
65 years and over	69	68	71	84	85	85	74	78	72	79	74	84

[1]Excludes persons with unknown income.

Table 6. Mean and median vitamin A intake and mean vitamin C, thiamine, and riboflavin intakes of females aged 1-74 years as a percent of standard for income levels, by race and age: United States, 1971-74

Race and age	Vitamin A						Vitamin C (mean)			Thiamine (mean)			Riboflavin (mean)		
	Mean			Median											
	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]	All income	Below poverty level[1]	Above poverty level[1]
	Percent of standard														
White female															
1 year	170	138	175	139	124	146	153	97	161	193	163	198	264	293	260
2-3 years	149	144	147	126	134	124	187	167	189	173	175	173	215	218	215
4-5 years	180	187	178	129	126	130	190	153	198	163	163	163	204	198	205
6-7 years	141	146	141	113	136	111	197	166	203	163	150	163	196	198	196
8-9 years	164	258	153	119	128	120	214	275	207	165	180	163	196	202	195
10-11 years	167	184	165	134	123	134	205	178	213	152	165	150	191	167	193
12-14 years	126	126	126	82	73	82	173	137	176	160	170	158	185	178	187
15-17 years	104	95	108	64	60	67	145	149	147	152	135	158	176	158	181
18-19 years	111	94	117	76	77	76	192	181	192	157	167	157	167	149	173
20-24 years	103	88	106	71	62	72	155	151	155	165	160	160	167	158	167
25-34 years	124	96	127	74	61	77	138	107	140	163	160	163	174	162	174
35-44 years	120	98	121	80	67	81	146	111	150	163	163	163	169	178	167
45-54 years	153	260	150	85	62	87	153	107	155	167	147	170	180	222	178
55-64 years	179	136	180	86	72	85	180	124	182	180	172	180	196	191	196
65 years and over	148	125	157	86	77	89	165	130	174	185	180	185	196	194	196
Black female															
1 year	213	181	266	99	88	125	185	139	242	183	163	205	220	200	247
2-3 years	330	195	464	111	107	110	151	152	154	165	173	188	236	211	180
4-5 years	166	171	160	116	124	104	230	220	238	183	180	188	176	176	180
6-7 years	166	176	153	103	92	123	207	190	227	165	168	163	171	173	167
8-9 years	121	138	108	85	102	76	183	223	123	165	168	165	160	156	173
10-11 years	130	138	129	101	125	107	220	215	208	173	175	173	160	164	160
12-14 years	109	129	85	74	79	67	180	170	194	163	160	165	155	165	142
15-17 years	96	73	108	53	46	55	137	127	142	183	152	198	169	142	184
18-19 years	130	139	126	68	92	47	151	164	136	155	150	163	143	140	149
20-24 years	115	134	103	67	70	67	139	138	140	170	172	170	143	156	136
25-34 years	109	121	104	56	46	62	132	123	139	160	167	155	140	149	134
35-44 years	123	101	133	67	55	72	133	127	135	163	157	165	156	142	163
45-54 years	137	142	141	61	44	71	117	106	118	180	190	170	169	193	158
55-64 years	163	164	170	104	110	107	167	123	199	172	167	177	163	153	171
65 years and over	150	128	160	76	75	77	146	132	167	182	190	170	169	176	165

[1]Excludes persons with unknown income.

Table 7. Percent of persons aged 1-74 years with caloric intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	31.1	29.9	34.5	13.2	27.9	32.5	36.9
2-3 years	33.2	32.2	40.1	28.6	36.2	32.9	46.1
4-5 years	35.1	32.9	48.2	33.9	54.8	33.2	40.0
6-7 years	39.7	38.8	45.6	46.4	41.6	35.6	47.5
8-9 years	60.7	59.0	70.3	56.1	64.6	59.0	78.4
10-11 years	63.2	60.8	82.5	63.7	88.1	60.0	77.3
12-14 years	75.2	73.4	85.4	81.3	82.1	71.9	92.0
15-17 years	70.0	67.6	86.1	86.3	90.4	65.8	86.1
18-19 years	65.4	63.6	72.8	67.1	80.4	63.6	68.1
20-24 years	61.9	60.0	72.0	66.4	73.9	60.6	70.4
25-34 years	65.3	64.8	66.0	79.8	73.3	64.0	63.5
35-44 years	67.4	66.3	78.8	54.3	78.1	67.3	76.7
45-54 years	75.4	74.1	87.2	74.3	91.7	74.8	84.6
55-64 years	78.8	78.5	89.1	87.5	90.7	77.7	85.9
65 years and over	86.1	85.5	92.8	86.3	88.5	85.2	95.1
Female							
1 year	29.8	28.3	36.1	26.1	31.9	28.8	36.4
2-3 years	37.5	36.5	43.5	49.8	47.8	34.8	39.8
4-5 years	45.6	44.6	51.2	30.8	46.8	46.5	51.8
6-7 years	58.9	55.8	73.1	54.0	74.8	55.4	71.1
8-9 years	81.8	80.8	87.4	74.0	84.2	81.2	88.4
10-11 years	70.5	69.7	76.2	50.7	76.9	72.9	72.8
12-14 years	86.5	87.8	80.9	81.8	78.4	88.1	84.7
15-17 years	86.8	87.3	83.3	88.3	87.8	87.8	81.2
18-19 years	75.2	75.3	73.9	76.6	54.6	76.0	92.2
20-24 years	78.8	79.1	76.4	80.0	73.0	78.9	78.9
25-34 years	78.2	78.1	79.7	81.0	82.4	78.0	77.6
35-44 years	77.9	76.9	88.4	83.6	79.8	76.7	91.6
45-54 years	73.7	72.3	86.6	73.5	90.9	73.2	88.5
55-64 years	78.4	78.1	82.5	82.2	82.2	77.9	82.3
65 years and over	82.4	82.3	83.8	87.5	81.2	81.1	84.4

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 8. Percent of persons aged 1-74 years with protein intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	3.6	2.7	5.6	0.0	0.0	3.1	13.2
2-3 years	5.0	5.0	5.6	5.6	5.1	4.9	6.3
4-5 years	3.9	2.9	10.7	1.8	10.5	3.0	11.0
6-7 years	2.7	2.6	3.2	8.1	0.0	1.2	1.0
8-9 years	2.3	0.78	10.1	2.4	8.9	0.0	12.9
10-11 years	8.1	7.0	15.1	23.2	22.8	5.4	7.4
12-14 years	16.7	15.2	26.5	18.0	31.0	14.2	26.5
15-17 years	26.8	24.9	42.7	37.9	42.6	23.7	44.6
18-19 years	22.9	20.9	25.9	40.0	30.1	39.4	30.1
20-24 years	29.3	27.3	45.4	33.9	41.4	26.8	48.3
25-34 years	27.4	26.6	29.7	27.5	18.3	26.2	32.0
35-44 years	29.6	29.4	35.5	30.8	58.7	29.3	22.1
45-54 years	33.8	32.4	44.9	31.2	59.4	32.7	37.8
55-64 years	41.5	40.4	59.2	62.8	68.0	38.3	46.4
65 years and over	58.6	57.3	71.6	65.8	69.5	55.6	71.3
Female							
1 year	3.4	2.7	7.3	0.0	9.6	3.1	4.6
2-3 years	5.6	5.2	8.2	13.2	9.6	3.9	6.8
4-5 years	5.5	5.2	7.1	4.2	10.9	5.4	2.1
6-7 years	4.3	3.4	8.5	4.0	3.5	3.3	14.0
8-9 years	8.2	7.1	16.2	7.1	18.8	7.3	17.0
10-11 years	13.1	12.2	19.0	17.4	16.6	11.1	16.0
12-14 years	40.9	40.4	46.7	43.2	45.8	40.9	48.1
15-17 years	57.9	58.3	54.0	64.7	66.2	57.1	48.0
18-19 years	53.6	44.2	50.8	52.8	42.0	42.5	54.0
20-24 years	54.2	53.7	58.4	54.1	63.8	54.0	54.6
25-34 years	53.0	52.4	59.0	61.7	67.6	52.1	54.0
35-44 years	56.0	54.7	68.1	57.8	62.2	54.9	71.1
45-54 years	52.5	50.4	72.2	55.9	71.9	50.5	75.3
55-64 years	60.2	58.9	71.1	69.5	70.8	58.1	70.3
65 years and over	67.0	66.4	72.4	75.8	72.0	63.9	73.8

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 9. Percent of persons aged 1-74 years with calcium intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	11.1	8.6	20.9	16.6	26.4	7.7	15.8
2-3 years	17.8	15.1	33.0	13.4	37.0	15.6	29.6
4-5 years	13.6	10.9	28.4	9.6	34.4	11.3	20.5
6-7 years	6.1	5.4	9.5	7.4	10.0	5.1	2.8
8-9 years	3.6	3.4	4.7	12.2	2.1	1.5	7.8
10-11 years	18.7	15.9	36.4	29.6	52.6	14.1	19.3
12-14 years	16.3	13.9	32.5	15.0	45.2	12.8	25.3
15-17 years	16.0	13.2	37.2	10.7	39.5	13.9	36.3
18-19 years	17.9	14.2	35.8	30.6	48.8	12.8	27.9
20-24 years	19.6	16.8	40.6	15.7	26.9	17.2	46.8
25-34 years	17.9	16.2	28.9	25.1	34.4	15.4	27.9
35-44 years	19.9	19.3	30.0	5.6	30.0	20.3	25.1
45-54 years	23.3	21.4	40.5	26.1	44.1	21.1	39.3
55-64 years	27.5	25.8	49.1	30.1	55.4	25.0	41.8
65 years and over	27.2	25.5	41.4	30.5	41.8	24.2	39.7
Female							
1 year	15.6	12.0	34.2	2.5	41.0	13.2	27.9
2-3 years	19.4	16.4	36.9	18.9	33.5	16.0	41.2
4-5 years	13.3	11.1	24.1	5.5	28.6	12.0	20.0
6-7 years	11.6	10.0	19.0	13.1	17.4	9.5	20.9
8-9 years	8.0	6.8	15.9	12.1	14.6	6.3	8.4
10-11 years	26.9	23.9	44.4	34.4	42.7	23.1	40.7
12-14 years	34.2	31.6	50.7	34.5	52.9	31.4	47.5
15-17 years	39.0	37.7	48.5	52.5	60.7	35.1	42.5
18-19 years	48.0	45.2	62.6	60.6	59.4	39.9	68.5
20-24 years	53.2	51.3	67.7	55.1	71.8	51.0	66.5
25-34 years	54.8	52.1	78.1	51.7	80.8	52.5	76.1
35-44 years	60.9	58.7	76.8	62.9	75.9	58.0	76.3
45-54 years	61.0	58.7	82.6	58.9	74.5	59.3	88.7
55-64 years	63.3	61.8	74.9	60.2	77.0	62.3	72.9
65 years and over	61.8	60.7	72.1	65.3	69.7	60.0	73.7

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 10. Percent of persons aged 1-74 years with iron intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	95.0	95.0	94.8	93.8	96.2	95.1	92.5
2-3 years	94.3	94.2	94.2	92.0	93.4	94.5	95.0
4-5 years	68.0	67.8	67.7	66.7	75.5	67.8	57.0
6-7 years	48.1	45.3	62.9	42.8	64.1	46.1	59.0
8-9 years	46.5	48.2	38.1	38.4	41.9	49.8	41.2
10-11 years	36.2	33.1	56.5	45.9	78.6	32.0	34.5
12-14 years	63.7	62.2	71.2	67.8	71.8	61.0	72.5
15-17 years	64.1	61.2	82.7	75.2	86.4	59.9	82.9
18-19 years	62.6	59.5	78.4	61.0	63.9	59.9	87.3
20-24 years	18.4	16.1	37.0	23.4	39.2	15.2	37.5
25-34 years	14.6	13.3	21.2	11.3	22.7	13.6	21.0
35-44 years	16.7	15.7	27.3	19.0	26.9	14.7	27.2
45-54 years	20.8	19.3	33.1	42.0	37.7	18.2	30.9
55-64 years	30.6	29.3	48.5	40.4	64.2	27.7	37.8
65 years and over	40.1	38.1	58.9	51.8	56.2	35.8	58.3
Female							
1 year	92.3	91.3	96.8	100.0	100.0	90.0	92.2
2-3 years	96.8	96.9	96.3	91.4	97.5	97.6	94.9
4-5 years	73.7	76.0	63.3	70.9	57.1	77.8	66.2
6-7 years	68.7	69.9	63.7	74.5	70.9	68.9	55.7
8-9 years	61.0	59.3	70.0	47.3	60.0	60.0	79.9
10-11 years	92.4	92.1	93.3	81.6	89.9	93.4	95.5
12-14 years	93.1	93.9	90.7	86.0	91.3	94.6	90.5
15-17 years	92.7	92.7	92.8	98.4	96.2	92.9	91.4
18-19 years	92.4	92.4	92.2	97.7	85.4	91.2	100.0
20-24 years	93.6	94.0	91.3	96.5	90.2	93.4	92.0
25-34 years	93.0	93.0	94.2	93.9	90.8	92.8	96.1
35-44 years	92.8	92.5	97.3	96.2	97.8	92.4	96.9
45-54 years	92.3	92.1	93.7	92.4	93.3	92.4	94.4
55-64 years	59.2	57.7	72.1	72.6	68.3	58.0	73.5
65 years and over	66.2	65.1	77.3	74.3	77.4	62.4	75.8

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 11. Percent of persons aged 1-74 years with vitamin A intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	22.4	20.4	32.1	18.3	23.5	21.0	39.8
2-3 years	32.6	31.3	43.7	42.1	42.5	29.6	46.8
4-5 years	31.2	29.7	39.2	45.9	45.0	26.9	31.8
6-7 years	34.5	35.7	29.3	51.8	28.8	31.2	31.6
8-9 years	33.5	29.7	54.5	39.7	58.7	28.1	51.6
10-11 years	25.9	23.5	42.0	34.1	55.0	22.5	28.2
12-14 years	51.8	49.5	66.5	55.3	68.9	49.0	64.9
15-17 years	46.8	44.9	63.2	56.0	55.6	44.5	70.1
18-19 years	44.8	40.4	67.2	55.0	79.7	39.8	59.6
20-24 years	46.6	46.6	52.3	63.6	55.0	44.1	52.1
25-34 years	49.6	47.8	60.0	42.5	73.7	47.8	56.6
35-44 years	46.3	45.5	51.1	36.2	45.5	45.9	51.5
45-54 years	51.9	50.9	60.8	69.0	56.9	49.7	61.1
55-64 years	43.9	44.4	41.3	55.7	51.1	43.3	41.3
65 years and over	52.7	52.0	58.0	66.2	55.3	49.3	57.4
Female							
1 year	32.6	29.0	51.7	35.5	57.8	27.7	39.6
2-3 years	37.8	37.5	42.3	37.8	48.0	37.7	38.4
4-5 years	37.1	36.0	43.5	38.9	39.0	35.7	49.5
6-7 years	43.0	41.6	49.0	35.7	55.5	42.5	42.4
8-9 years	43.6	40.9	59.8	35.7	49.0	40.7	69.7
10-11 years	37.1	34.0	52.9	37.2	49.8	33.8	50.2
12-14 years	63.1	62.6	68.3	60.5	63.6	62.7	73.9
15-17 years	69.9	69.6	71.0	74.8	77.8	67.5	67.6
18-19 years	67.0	66.8	67.5	67.5	63.3	66.2	69.4
20-24 years	66.1	66.5	66.4	70.8	64.3	65.7	66.7
25-34 years	63.8	62.9	72.5	69.9	72.9	62.1	71.8
35-44 years	61.1	60.1	66.4	70.3	70.4	59.4	65.0
45-54 years	59.4	58.3	69.8	66.9	76.6	57.2	65.2
55-64 years	56.3	57.2	47.2	65.3	49.6	56.9	42.4
65 years and over	58.4	58.4	57.2	61.3	60.7	56.9	54.4

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 12. Percent of persons aged 1-74 years with vitamin C intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	50.0	49.5	50.4	70.7	41.0	46.7	60.8
2-3 years	39.9	39.3	45.9	47.2	41.3	37.5	52.9
4-5 years	36.1	33.8	49.1	51.3	42.2	30.2	58.5
6-7 years	35.2	35.7	32.5	49.2	34.6	32.0	24.6
8-9 years	42.3	41.5	46.7	52.3	52.1	40.7	33.2
10-11 years	34.4	32.1	53.6	69.1	65.3	29.0	42.6
12-14 years	38.2	37.7	40.9	49.0	40.9	35.9	32.9
15-17 years	41.9	41.0	50.1	60.1	52.4	39.5	51.1
18-19 years	43.4	41.7	58.0	40.1	57.2	42.0	58.4
20-24 years	44.9	43.1	63.9	51.7	47.2	42.0	71.0
25-34 years	50.5	49.9	53.9	66.1	52.8	49.0	54.3
35-44 years	49.2	48.0	58.9	62.2	50.0	47.1	62.9
45-54 years	50.7	50.1	56.9	75.4	50.1	48.4	63.1
55-64 years	42.6	43.3	37.4	55.3	65.2	42.7	30.3
65 years and over	45.6	44.9	50.4	65.4	54.9	41.9	49.2
Female							
1 year	49.1	50.7	42.5	64.7	52.0	48.5	33.1
2-3 years	44.1	43.4	48.5	46.0	51.1	43.1	44.5
4-5 years	45.9	47.8	39.3	60.1	41.1	45.7	38.1
6-7 years	42.5	43.8	37.8	60.1	41.4	40.7	34.4
8-9 years	42.6	41.8	50.0	35.8	44.3	42.4	58.4
10-11 years	38.9	37.5	46.8	38.7	41.0	35.9	52.1
12-14 years	46.5	46.2	52.3	67.8	54.2	44.6	49.4
15-17 years	50.5	50.5	49.5	54.5	51.4	49.5	48.5
18-19 years	42.0	42.2	42.0	51.7	63.3	40.4	50.7
20-24 years	53.6	54.1	50.9	60.5	56.0	54.1	47.8
25-34 years	52.8	52.6	56.4	71.7	56.6	50.8	55.8
35-44 years	49.9	49.1	57.9	63.5	60.0	48.1	56.7
45-54 years	45.0	44.0	54.0	63.3	59.8	43.3	55.3
55-64 years	40.1	40.2	37.0	63.7	46.8	39.6	30.6
65 years and over	39.9	38.7	52.5	50.8	50.4	36.2	53.4

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 13. Percent of persons aged 1-74 years with thiamine intake below the standard for income levels, by race, sex, and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	3.6	4.1	1.6	8.8	3.1	3.6	0.0
2-3 years	2.9	2.8	3.8	2.9	2.0	2.8	6.1
4-5 years	2.9	3.1	1.3	1.2	1.7	3.5	0.8
6-7 years	3.0	3.3	1.6	4.7	0.9	3.0	2.7
8-9 years	4.1	4.2	3.5	0.0	5.7	5.1	2.1
10-11 years	4.5	5.0	2.2	1.6	1.6	5.5	2.9
12-14 years	4.9	4.9	5.5	0.9	1.4	5.3	11.0
15-17 years	9.7	9.5	12.5	2.8	10.4	10.0	15.0
18-19 years	6.1	6.4	5.4	3.8	8.3	6.8	3.6
20-24 years	14.6	14.1	20.1	11.9	8.4	13.9	24.8
25-34 years	13.6	13.0	20.1	9.5	3.3	12.9	24.2
35-44 years	13.3	13.8	9.5	2.8	10.0	14.3	10.3
45-54 years	11.7	11.8	11.1	22.8	4.1	10.9	15.0
55-64 years	6.6	6.6	6.9	10.8	2.6	5.9	7.4
65 years and over	5.2	5.3	4.7	6.3	7.9	5.0	2.7
Female							
1 year	1.3	1.6	0.0	0.0	0.0	1.8	0.0
2-3 years	1.9	2.2	.68	1.0	1.4	2.4	0.0
4-5 years	3.7	4.4	.60	6.2	1.4	4.1	0.0
6-7 years	3.4	4.1	0.0	6.6	0.0	3.7	0.0
8-9 years	5.8	5.8	6.0	1.0	1.7	6.0	12.9
10-11 years	5.5	5.9	3.4	1.3	3.5	6.7	2.8
12-14 years	4.1	4.0	4.6	1.5	4.4	4.5	5.0
15-17 years	9.4	8.9	13.0	12.1	9.3	8.3	15.2
18-19 years	6.7	6.9	4.0	10.1	4.6	5.7	3.9
20-24 years	11.1	11.5	8.3	10.0	5.4	11.7	10.8
25-34 years	8.1	7.4	13.9	8.0	9.4	7.3	16.3
35-44 years	6.8	6.5	9.5	3.7	6.6	6.6	10.0
45-54 years	6.4	6.4	5.8	9.3	1.0	6.5	8.6
55-64 years	4.0	3.7	4.4	2.7	7.8	4.1	2.5
65 years and over	3.6	3.1	8.4	1.7	9.4	3.3	8.7

[1]Total includes all races.
[2]Excludes persons with unknown income.

Table 14. Percent of persons aged 1-74 years with riboflavin intake below the standard for income levels, by race, sex and age: United States, 1971-74

Sex and age	All income			Below poverty level[2]		Above poverty level[2]	
	Total[1]	White	Black	White	Black	White	Black
	Percent of persons						
Male							
1 year	0.71	0.38	2.23	0.0	1.3	0.4	3.6
2-3 years	3.65	2.95	8.34	5.1	4.6	2.6	13.0
4-5 years	3.48	2.90	7.57	5.8	7.5	2.5	7.7
6-7 years	1.22	1.22	1.23	0.0	0.9	1.6	1.9
8-9 years	2.55	1.80	6.53	7.7	14.1	0.8	1.2
10-11 years	2.24	1.74	3.86	0.0	5.8	1.3	1.9
12-14 years	4.46	3.60	10.04	6.3	15.1	2.9	7.0
15-17 years	8.31	6.89	19.13	4.3	11.4	7.3	25.7
18-19 years	10.61	8.17	18.45	11.1	19.6	8.1	17.8
20-24 years	12.93	11.82	19.61	7.4	3.8	12.9	25.9
25-34 years	9.68	8.79	15.80	1.7	4.2	9.2	19.0
35-44 years	7.27	7.19	9.35	2.5	8.6	7.5	7.4
45-54 years	7.77	7.96	6.48	11.5	9.4	7.4	4.5
55-64 years	6.26	5.57	5.75	3.3	8.9	5.5	4.1
65 years and over	4.29	3.85	8.07	3.8	7.7	3.6	8.8
Female							
1 year	0.61	0.73	0.0	0.0	0.0	0.8	0.0
2-3 years	4.80	5.00	3.86	8.7	8.2	4.5	0.0
4-5 years	1.50	0.50	6.44	0.7	7.0	0.5	6.7
6-7 years	2.20	2.25	2.05	2.9	1.7	2.2	2.5
8-9 years	3.55	3.28	5.53	6.1	7.0	3.0	5.1
10-11 years	3.62	3.23	4.59	2.8	3.7	3.4	5.9
12-14 years	5.64	3.68	15.95	1.5	12.1	4.1	21.4
15-17 years	9.52	9.21	11.98	7.2	17.0	8.7	9.4
18-19 years	11.75	10.67	18.19	19.8	19.8	8.1	17.7
20-24 years	13.57	12.64	18.91	15.1	16.6	12.1	21.4
25-34 years	8.50	7.40	17.40	10.5	16.0	7.2	17.6
35-44 years	7.50	6.51	14.83	4.3	18.9	6.6	12.8
45-54 years	4.98	4.15	11.74	6.7	7.5	3.9	10.5
55-64 years	4.34	3.81	9.52	10.1	14.9	3.4	5.2
65 years and over	3.49	7.39	6.89	3.0	7.2	3.3	7.8

[1]Total includes all races.
[2]Excludes persons with unknown income.

APPENDIXES

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APPENDIX I

STATISTICAL NOTES

Survey Design

The sampling plan of the Health and Nutrition Examination Survey (HANES) followed a highly stratified multistage probability design in which a sample of the civilian noninstitutionalized population of the coterminous United States, 1-74 years of age, was selected. Excluded from the selection process were those persons confined to institutions or residing on any of the reservation lands set aside for use by American Indians. Successive elements dealt with in the process of sampling are the primary sampling unit (PSU), census enumeration district (ED), segment (a cluster of households), household, eligible person, and finally, sample person.

The starting points in the first stage of this design were the 1960 decennial census lists of addresses and the nearly 1,900 PSU's into which the coterminous United States was divided. Each PSU is either a standard metropolitan statistical area, a single county, or two or three contiguous counties. The PSU's were grouped into 357 strata for use in the Health Interview Survey and subsequently collapsed into 40 superstrata for the Health and Nutrition Examination Survey.

Of the 40 superstrata, 15 contained a single large metropolitan area of more than 2 million population. These 15 large metropolitan areas were chosen for the sample with certainty. The remaining 25 superstrata were formed by classifying the noncertainty strata into 4 population density groups within each of 4 geographic regions. Then using a modified Goodman-Kish controlled-selection technique to assure proportionate representation of specified State groups and rate-of-population-change classes, 2 PSU's were chosen from each of the 25 noncertainty superstrata with the probability of selection of a PSU proportionate to its 1960 population. In this manner, a total first-stage sample of 65 PSU's or "stands" included the areas within which a sample of persons would be selected for examination. The PSU's were scheduled to be sampled over a 3-year period with 300-600 persons to be examined per stand (table I).

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 HANES sample. The 1970 census data were used for the last 21 stands of the sample.

Beginning with the use of the 1970 census data, the segment size was changed from an expected 6 households selected from compact clusters of 18 households to an expected compact cluster of 8 households. The change was made because of operational advantages, and research by the U.S. Bureau of the Census indicated that precision of estimates would not be appreciably affected by the change from noncompact clusters to compact clusters.

For ED's not having usable addresses (generally located in rural areas), area sampling was employed and consequently some variation in the segment size occurred. To make the sample representative of the current population of the United States, the address or ED segments were supplemented by a sample of housing units that had been constructed since the 1960 and 1970 Decennial Censuses.

Within each PSU, a systematic sample of segments was selected. The ED's that fell into 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 family income of less than $3,000 in 1959 (based on the 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 the first 42 stands, sample segments in nonpoverty-stratum ED's were divided into 8 random subgroups and one of the subgroups was chosen to remain in the HANES sample. Research indicated that efficiency of estimates could be increased by changing the ratio of poverty to nonpoverty segments from 8:1 to 2:1. Therefore, in the later stands, 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 HANES sample. The differential sampling permits a separate analysis with adequate reliability of those classified as being below the poverty

Table I. Sample locations of the Health and Nutrition Examination Survey, by region, county, State, and probability design

Region, county,[1] and State	Probability design 1-65
Northeast	
Essex, Morris, Union, Somerset, Hudson, Middlesex, N.J.	X
Nassau, Queens, Suffolk, N.Y.	X
Bronx, N.Y.	X
Kings, Richmond, N.Y.	X
Westchester, Rockland, N.Y.: Bergen, Passaic, N.J.	X
Bucks, Chester, Delaware, Montgomery, Philadelphia, Pa.	X
Philadelphia, Pa.: Camden, Gloucester, Burlington, N.J.	X
Essex, Middlesex, Norfolk, Plymouth, Suffolk, Mass.	X
Allegheny, Beaver, Washington, Westmoreland, Pa.	X
Albany, Schenectady, Rensselaer, Saratoga, N.Y.	X
Lackawanna, Pa.	X
Holyoke, Chicopee, Springfield, Mass.	X
Bristol, Newport, Providence, Kent, Washington, R.I.	X
Hartford, Tolland, Conn.	X
Chemung, Tioga, Tompkins, N.Y.	X
Mercer, Pa.	X
Bedford, Fulton, Pa.	X
Midwest	
Lake, Porter, Cook, Will, Kane, Ill.	X
Cook, DuPage, Kane, Lake, McHenry, Ill.	X
Macomb, Oakland, Wayne, Mich.	X
Milwaukee, Waukesha, Wis.	X
Hennepin, Ramsey, Anoka, Dakota, Washington, Minn.	X
Lake, Cuyahoga, Ohio	X
Franklin, Ohio	X
Buchanan, Mo.	X
Cass, N. Dak.: Clay, Minn.	X
Jefferson, St. Charles, St. Louis, Mo.: Madison, St. Clair, Ill.	X
Bay, Mich.	X
DeKalb-Stueben, Ind.: Branch, Mich.	X
Cass, St. Joseph, Mich.	X
Fayette, Ross, Ohio	X
LaPorte, Marshall, Starke, Ind.	X
Boone, Greene, Iowa	X
Howard, Iowa: Fillmore, Minn.	X

[1]County, parish, or borough.

Table I. Sample locations of the Health and Nutrition Examination Survey, by region, county, State, and probability design—Con.

Region, county,[1] and State	Probability design 1-65
South	
St. Bernard, Jefferson, Orleans, La.	X
Washington, D.C.: Fairfax, Arlington, Va.: Prince Georges, Montgomery, Md.	X
Richland, Lexington, S.C.	X
Knox, Anderson, Blount, Tenn.	X
Roanoke, Va.	X
Chatham, Ga.	X
Hillsborough, Pinellas, Fla.	X
Palm Beach, Fla.	X
Natchitoches, La.	X
Lamar, Marion, Miss.	X
Cabarrus, Stanley, Union, N.C.	X
Hancock, Hamblen, Hawkins, Claiborne, Tenn.	X
Barbour, Ala.	X
Bullock, Jenkins, Ga.	X
Sussex, Del.: Worcester, Md.	X
Fayette, W. Va.	X
West	
Orange, Los Angeles, Calif.	X
Los Angeles, Calif.	X
Alameda, Contra-Costa, San Mateo, San Francisco, Solano, Calif.	X
Collin, Denton, Dallas, Ellis, Tex.	X
Bexar, Tex.	X
Pima, Ariz.	X
Douglas, Nebr.: Pottawattamie, Iowa	X
San Diego, Calif.	X
Fresno, Calif.	X
Monterey, Calif.	X
Clallum, San Juan, Wash.	X
Grant, Wash.	X
Gila, Ariz.	X
Avoyelles, La.	X
Ottertail, Minn.	X

[1]County, parish, or borough.

level and those classified as being above the poverty level.

After identification of 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 sample segments to be examined in HANES and at the same time to oversample certain groups at high risk of malnutrition, all household members aged 1-74 years in each segment were first 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 then listed on the worksheet under the appropriate age-sex group column. The sample selection worksheets were next put in segment-number order and a systematic random sample of persons in each age-

Table II. Sampling rates by age-sex groups

Age and sex	Rate
1-5 years (male and female)	1/2
6-19 years (male and female)	1/4
20-44 years (male)	1/4
20-44 years (female)	1/2
45-64 years (male and female)	1/4
65-74 years (male and female)	1

sex group was selected to be examined using the sampling rates shown in table II.

The persons selected in the 65-stand sample of HANES made up a representative sample of the target population and included 28,043 sample persons 1-74 years of age of whom 20,749 or 74 percent were examined. When adjustments were made for different sampling for high-risk groups, the response rate became 75 percent.

All data presented in this report are based on "weighted" observations. That is, data recorded for each person are inflated to characterize the subuniverse from which that sample person was drawn. The weight for each examined person is a product of the reciprocal of the probability of selecting the person, an adjustment for nonresponse cases (i.e., persons not examined), and poststratified ratio adjustment which increases precision by bringing survey results into closer alignment with known U.S. population figures for 20 age, race, and sex groups as of November 1, 1972, the approximate midpoint of HANES.

A more detailed description of the survey design and selection technique can be found in "Plan and Operation of the Health and Nutrition Examination Survey, United States, 1971-73," *Vital and Health Statistics,* Series 1, No. 10a.[4]

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, namely that of nonresponse. Usually a sizable number of sample persons will not participate in the examination. A further potential for bias results if the sample persons who do not participate differ from the sample persons examined with respect to the characteristics under examination. Intensive efforts were made in HANES 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 and inducements are discussed in "Plan and Operation of the Health and Nutrition Examination Survey, United States, 1971-73," Series 1, No. 10a.[4]

Despite these intensive efforts, 25.0 percent of the sample persons from 65 stands were not examined. Consequently, the potential for a sizable bias does exist in the estimates in this publication. From what is known about the nonrespondents and the nature of nonresponse, it is believed that the likelihood of sizable bias is small. For instance, only a small proportion of persons in the first 65 stands gave reasons for nonparticipation which would lead to the belief that they may differ from examined persons with respect to the characteristics under examination.

An analysis of medical history data obtained for nonexaminees as well as examinees indicates there is no sizable bias due to nonresponse. No large differences were found between the examined group and nonexamined group for the statistics compared. For example, 12 percent of persons examined reported having an illness or condition that interferes with their eating as compared to 10 percent of persons not examined but who had completed a medical history. The percent of persons examined reporting 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 was 4 percent. The corresponding percents for nonexamined persons were: arthritis, 18 percent; high blood pressure, 22 percent; and diabetes, 4 percent.

As was mentioned earlier, the data in this report were based on weighted observations, and one of the components of the weight assigned to an examined person was an adjustment for nonresponse. A procedure was adopted which multiplies the reciprocal of the probability of

NOTE: A list of references follows the text.

selection of sample persons who were examined by a factor that brings estimates based on examined persons up to a level that would have been achieved if all sample persons had been examined. The nonresponse-adjustment factor was calculated by dividing the sum of the reciprocals of the probability of selection for all selected sample persons in each of five income groups within each stand by the sum of the reciprocals of the probability of selection for examined sample persons in the same stand and income group. The five income groups were: under $3,000; $3,000-$6,999; $7,000-$9,999; $10,000-$14,999; and $15,000 and over. For sample weighting purposes, income group was imputed for 5.6 percent of the sample persons using educational level of the head of the household. To the extent that the income-within-stand classes were homogeneous with respect to the health characteristics under study, the adjustment procedure was effective in reducing the potential of bias due to nonresponse. The percent distribution of the nonresponse adjustment factors computed for the 65-stand sample of HANES is shown in table III.

Missing Data

Examination surveys are subject to the loss of information not only from the failure to examine all sample persons, but also from the failure to obtain and record all items of information for examined persons. For the 24-hour recall, number of missing data cases was generally very low for all items over the entire sample of examined persons, 70 or 0.3 percent of the 20,749 persons examined. There were also 479 persons with unsatisfactory interview questionnaires.

Table III. Percent distribution of nonresponse adjustment factors, stands 1-65, Health and Nutrition Examination Survey: United States, 1971-74

Size of factor	Percent distribution
Total	100.0
1.00-1.24	32.6
1.25-1.49	38.5
1.50-1.74	18.2
1.75-1.99	7.4
2.00-2.49	2.8
2.50-2.99	0.3
3.00[1]	0.3

[1]A size of 3.00 was assigned for all factors greater than 3.00. The final poststratified ratio adjustment corrects for this truncation.

Estimates in this report for the 24-hour recall include imputed values for all missing and unsatisfactory dietary intake interviews. This was done by randomly assigning a value for the missing item from among similar examined persons with that item of information. This process preserves both the expected values and the distribution of values of the recorded information.

After these subjects were imputed by randomly assigning nutrient values of subjects of the same age, race, sex, and region and urbanization, it was found that 129 of these subjects had body weights that differed from the body weight of the corresponding subject from which it had been imputed by more than 30 pounds. Since the nutrient intakes of subjects whose weights differ by more than 30 pounds are substantially different, these subjects were then reimputed by finding when possible a subject in the same age-race-sex-region and urbanization category whose weight was within 30 pounds of the given subject. In 7 cases it was necessary to go outside of region and urbanization categories in order to find a subject within 30 pounds of the given subject and in 7 cases it was necessary to go outside of racial bounds to achieve this end.

Small Numbers

In some tables, magnitudes are shown for cells for which the sample size is so small that the standard error may be several times as great as the statistic itself. Obviously, in such instances, the numbers if shown have been included to convey an impression of the overall story of the table.

Standard Errors

The probability design of the survey makes possible the estimation of standard errors corresponding to the weighted estimates presented.

The standard error is primarily a measure of sampling variability; that is, the variations might occur by chance because only a sample of the population is surveyed.

As calculated for this report, the standard error also reflects part of the variation that arises in the measurement process. It does not include estimates of any biases that might lie in the data. The chances are about 68 out of 100 that an estimate from the sample would differ from a complete census by less than the standard error. The chances are about 95 out of 100 that the difference would be less than twice the standard error and about 99 out of 100 that it would be less than 2½ times as large.

Estimates of standard errors are obtained from the sample data and are themselves subject to sampling error when the number of cases in a cell is small or, even occasionally, when the number of cases is substantial.

Estimates of the standard errors for selected statistics used in this report are presented in tables 1-1 through 1-28 of reference 16. These estimates have been prepared by a replication technique that yields overall variability through observation of variability among random subsamples of the total sample. Again, readers are reminded that these estimated standard errors do not reflect any residual bias that might still be present after the attempted correction for nonresponse.

Variance-Covariance Matrix[22-29]

The variance-covariance matrix of a random vector

$$y' = (Y_1, Y_2, \ldots, Y_n)$$

is a matrix of the form

$$\mathbf{V}_p = \begin{bmatrix} \sigma_{1\,1}^2 & \sigma_{1\,2} & \cdots & \sigma_{1\,n} \\ \sigma_{2\,1} & \sigma_{2\,2}^2 & \cdots & \sigma_{2\,n} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \sigma_{n\,1} & \sigma_{n\,2} & \cdots & \sigma_{n\,n}^2 \end{bmatrix}$$

where $\sigma_{i\,i}^2$ is the variance of $y_i (i = 1, \ldots, n)$ and σ_{ij} is the covariance of Y_i and $Y_j (i \neq j)$.

The variance of the random variable y_i is a measure of the extent to which y_i is dispersed about its mean and is estimated by the balanced half-sample replication method which reflects the sampling design.[28]

The covariance σ_{ij} of Y_i and $Y_j (i \neq j)$ is a measure of the extent to which Y_i and Y_j vary together and is a function of the units of measurement. It too is estimated by the balanced half-sample replication method. A discussion of the importance of the estimation of the full covariance matrix is given by Freeman and Brock.[29]

Analytic Methodology

In comparing the mean caloric and nutrient intakes between males and females and those of various race-sex subgroups (e.g., white males vs. black males) for the 15 age groups, the categorical data analysis approach developed by Koch, Freeman, and Freeman[22] and Freeman, Freeman, Brock, and Koch[23] was used.

Let

$$y' = (\overline{Y}_{1G_1}, \overline{Y}_{1G_2}, \overline{Y}_{2G_1}, \overline{Y}_{2G_2}, \ldots, \overline{Y}_{15G_1}, \overline{Y}_{15G_2})$$

be a vector of 30 elements

$$\overline{Y}_{iG_j} \qquad i = 1, \ldots, 15, j = 1, 2$$

where $\overline{Y}_{iG_1}$ is the observed mean caloric or nutrient intake of the G_j subgroup within the i age group (e.g., G_1 = males, G_2 = females). We assume that the $\overline{Y}_{iG_j}$ can be expressed as linear combinations of the unknown model parameters $\beta_1, \beta_2, \ldots, \beta_{30}$ plus error terms $e_1, e_2, \ldots, e_{30}$, that is

$$\overline{Y}_{iG_j} = X_{k\,1}\beta_1 + X_{k\,2}\beta_2 + \ldots + X_{k\,30}\beta_{30} + e_k$$

$$k = 1, \ldots, 30$$

NOTE: A list of references follows the text.

or, equivalently, in matrix notation

$$y = \mathbf{X}\beta + e$$

where

$$\mathbf{X} = \begin{bmatrix} X_{1\,1} & X_{1\,2} & \cdots & X_{1\,30} \\ X_{2\,1} & X_{2\,2} & \cdots & X_{2\,30} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ X_{30\,1} & X_{30\,2} & \cdots & X_{30\,30} \end{bmatrix}$$

is called the design matrix

$$\beta' = (\beta_1, \ldots, \beta_{30})$$

$$e' = (e_1, \ldots, e_{30}) .$$

(NOTE: β' is a vector of unknown constants; e' is a random vector with an asymptotic multivariate normal distribution.)

In the cases under consideration, preliminary examination showed that the differences $\overline{Y}_{iG_1} - \overline{Y}_{iG_2}$ between subgroups within age generally tended to increase as i increased (i.e., there was an increase with age), reached a maximum and then generally decreased, thus suggesting an interaction of age with sex and with race-sex. With this consideration in mind, the following form of $\mathbf{X}$ was proposed.

$$\mathbf{X} = \left.\begin{bmatrix} 1 & 1 & 0 & \cdots & 0 & 1 & 0 & 0 & \cdots & 0 \\ 1 & 1 & 0 & \cdots & 0 & 0 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 & 0 & 1 & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 & 0 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & 0 & 1 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & 0 & 0 & \cdots & 0 \\ \cdot & \cdot & \cdot & & \cdot & \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot & \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot & \cdot & \cdot & \cdot & & \cdot \\ 1 & 0 & 0 & \cdots & 1 & 0 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 1 & 0 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & 0 & 0 & \cdots & 1 \\ 1 & 0 & 0 & \cdots & 0 & 0 & 0 & 0 & \cdots & 0 \end{bmatrix}\right\} \text{30 rows}$$

15 columns   15 columns

The first column, containing thirty 1's, represents a baseline figure for the second subgroup under consideration in the last age group. The next 14 columns represent the age effects and the last 15 columns represent the subgroup effects within age.

We further assume that

$$\mathrm{E}(e') = (\mathrm{E}(e_1), \ldots, \mathrm{E}(e_{30})) = (0, \ldots, 0)$$

or equivalently

$$\mathrm{E}(y) = \mathbf{X}\beta \qquad |\mathbf{XX}'| \neq 0 \quad \text{and} \quad |\mathbf{V}| \neq 0 \qquad (1)$$

where $\mathbf{V}$ denotes a valid and consistent estimate for the variance-covariance matrix of y. ($\mathbf{V}$ is symmetric, that is, $\mathbf{V}' = \mathbf{V}$.) The elements of $\mathbf{V}$ are calculated by the balanced half-sample replication method (see McCarthy[28]). Then estimates b_i of parameters β_i are calculated by weighted least squares as follows:

$$b = (\mathbf{X}'\mathbf{V}^{-1}\mathbf{X})^{-1}\mathbf{X}'\mathbf{V}^{-1}y \qquad (2)$$

$$b' = (b_1, b_2, \ldots, b_{30})$$

$$\mathrm{Var}\,(b) = (\mathbf{X}'\mathbf{V}^{-1}\mathbf{X})^{-1} \qquad (3)$$

In our case when the model parameters have been estimated we have

$$y = \mathbf{X}b$$

or

$$\begin{bmatrix} \overline{Y}_{1G_1} \\ \overline{Y}_{1G_2} \\ \overline{Y}_{2G_1} \\ \overline{Y}_{2G_2} \\ \overline{Y}_{3G_1} \\ \overline{Y}_{3G_2} \\ \cdot \\ \cdot \\ \overline{Y}_{8G_1} \\ \overline{Y}_{8G_2} \\ \cdot \\ \cdot \\ \overline{Y}_{14G_1} \\ \overline{Y}_{14G_2} \\ \overline{Y}_{15G_1} \\ \overline{Y}_{15G_2} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & \cdots & 0 \\ 1 & 1 & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ 1 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 \\ \cdot & \cdot & \cdot & & \cdot \\ \cdot & \cdot & \cdot & & \cdot \\ 1 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 1 \\ 1 & 0 & 0 & \cdots & 0 \end{bmatrix} \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \\ b_5 \\ b_6 \\ \cdot \\ \cdot \\ b_{15} \\ b_{16} \\ \cdot \\ \cdot \\ b_{27} \\ b_{28} \\ b_{29} \\ b_{30} \end{bmatrix}$$

where $b_1, \ldots, b_{15}$ represent estimates of age effects, and $b_{16}, \ldots, b_{30}$ represent estimates in differences of subgroup effects within age.

In general, once the model parameters have been estimated it is desirable to test the goodness of fit of the model. The statistic

$$Q_E = (y - \mathbf{X}b)' \mathbf{V}^{-1} (y - \mathbf{X}b) \tag{4}$$

is used for this purpose. In the comparisons made, the sample sizes of each of the subgroups considered were sufficiently large so that $\overline{Y}_{iG_j}$ can be assumed to be approximately normally distributed by the Central Limit Theorem and, therefore, since $\mathbf{V}$ is a consistent estimate of the population variance-covariance matrix, Q_E has an approximate χ^2 distribution with degrees of freedom equal to the number of rows minus the number of columns of $\mathbf{X}$. If Q_E is nonsignificant, the model is assumed to fit.

However, in our case, $\mathbf{X}$ is a square matrix so that the number of rows of $\mathbf{X}$ equals the number of columns of $\mathbf{X}$, and Q_E is degenerate. We, therefore, examine the total variation statistic

$$Q_T = y' \mathbf{V}^{-1} y \tag{5}$$

which as a consequence of the Central Limit Theorem has χ^2 distribution with degrees of freedom equal to the number of rows of y minus 1, or, in our case, 29.

If Q_T is significant, there is significant variation in the data set and it is of interest to determine where the variation lies. This can be done by constructing appropriate contrast matrices $\mathbf{C}$ and testing hypotheses of the form

$$\mathrm{H}_0 : \mathbf{C}\beta = (0, \ldots, 0)' \tag{6}$$

The statistics used to test such hypotheses have the form

$$Q_c = b'\mathbf{C}' [\mathbf{C}(\mathbf{X}'\mathbf{V}^{-1}\mathbf{X})^{-1}\mathbf{C}']^{-1} \mathbf{C}b .$$

These statistics have an approximate χ^2 distribution with degrees of freedom equal to the number of rows of $\mathbf{C}$ when H_0 is true.

In this report, we are mainly interested in assessing differences in mean caloric or nutrient intakes for those in various age groups and subgroups within age. This is accomplished by noting that

$$\mathrm{E}(\overline{Y}_{iG_j}) = \mu_{iG_j}$$

$$\beta_{16} = \mu_{1G_1} - \mu_{2G_2}$$

$$\beta_{17} = \mu_{2G_1} - \mu_{2G_2}, \ldots, \beta_{30}$$

$$= \mu_{15G_1} - \mu_{15G_2}$$

$$\beta_{16} = \beta_{17} = \ldots = \beta_{30} = 0$$

and the contrast matrix is of the form

$$\mathbf{C} = \left.\begin{bmatrix} 0 & . & . & . & 0 & 1 & 0 & . & . & . & 0 \\ 0 & . & . & . & 0 & 0 & 1 & . & . & . & 0 \\ . & & & & . & . & . & & & & . \\ . & & & & . & . & . & & & & . \\ . & & & & . & . & . & & & & . \\ 0 & . & . & . & 0 & 0 & 0 & . & . & . & 1 \end{bmatrix}\right\} \text{15 rows}$$

$$\underbrace{\qquad\qquad\qquad}_{\text{15 columns}} \qquad \underbrace{\qquad\qquad\qquad}_{\text{15 columns}}$$

If Q_C is found to be significant, that is, not all

$$\mu_{iG_1} = \mu_{iG_2} ,$$

it is of interest to test

$$\mathrm{H}_0 : \beta_i = 0 \qquad i = 16, \ldots, 30$$

for which the contrast matrix takes the form

$$c = (\underbrace{0, \ldots, 0}_{\text{15 elements}}, \underbrace{0, \ldots, 0}_{i-1}, \underbrace{1}_{\substack{i\text{th} \\ \text{element}}}, \underbrace{0, \ldots, 0}_{15-i})$$

Although we are interested mainly in the differences between subgroups within each age group it may happen that when the hypothesis

(a) $\quad H_0 : \beta_{16} = \beta_{17} = \ldots = \beta_{30} = 0$

is tested, it will be accepted. However because the behavior of the differences in the means between subgroups within age groups suggests interaction of age with the subgroups under consideration, it is necessary to test for this, that is,

(b) $$H_0 : \beta_{16} - \beta_{17} = 0,\ \beta_{16} - \beta_{18} = 0, \ldots, \beta_{16} - \beta_{30} = 0$$

should be tested. If (b) is rejected and (a) is accepted, the correct conclusion would be not that there are no differences in means of subgroups but rather when effects of the differences between subgroups are averaged over the levels of age, no differences in these average effects of subgroups over age would be demonstrated. In other words, the effects of age and subgroup characteristics are not additive. To test hypothesis (b), the appropriate contrast matrix would be

$$C = \left.\begin{bmatrix} 0 & \cdots & 0 & 1 & -1 & 0 & \cdots & 0 \\ 0 & \cdots & 0 & 1 & 0 & -1 & \cdots & 0 \\ \vdots & & \vdots & \vdots & \vdots & \vdots & & \vdots \\ 0 & \cdots & 0 & 1 & 0 & 0 & \cdots & -1 \end{bmatrix}\right\} \text{14 rows}$$

$$\underbrace{\hphantom{0 \cdots 0}}_{\text{15 columns}} \quad \underbrace{\hphantom{1 \ -1 \ 0 \cdots 0}}_{\text{15 columns}}$$

In our analysis we have constructed a model that is saturated and, therefore, necessarily fits the data. However, it is desirable to seek a reduced model that fits the data under consideration. This can be done once it is determined where the variation in the model exists by constructing contrast matrices and testing the corresponding hypothesis just explained. If it is demonstrated that differences between subgroups within a subset of the age groups are nonsignificant, a new design matrix **X** can be constructed by eliminating the columns that reflect this difference. If each of the differences between subgroups is significant, we then look for similarities of differences between subgroups within the particular age groups. For example, if we find that the differences between subgroups for the 6th, 7th, and 8th age groups are the same, the appropriate hypothesis would be

$$H_0 : \beta_{21} = \beta_{22},\ \beta_{21} = \beta_{21},\ \beta_{23} = \beta_{24}$$

and the appropriate contrast matrix would be

$$C = \begin{bmatrix} 0 & \cdots & 0 & 1 & -1 & 0 & 0 & \cdots & 0 \\ 0 & \cdots & 0 & 1 & 0 & -1 & 0 & \cdots & 0 \\ 0 & \cdots & 0 & 1 & 0 & 0 & -1 & \cdots & 0 \end{bmatrix}$$

$$\underbrace{\hphantom{0 \cdots 0}}_{\text{20 columns}} \quad \underbrace{\hphantom{1 \ -1 \ 0 \ 0 \cdots 0}}_{\text{10 columns}}$$

If H_0 were accepted, the design matrix **X** would be a 30 X 28 matrix of the following form:

$$\begin{array}{c} \hphantom{X = 1\ 1\ 0 \cdots 0\ 1 \cdots} \text{21st column} \\ X = \begin{bmatrix} 1 & 1 & 0 & \cdots & 0 & 1 & \cdots & 1 & \cdots & 0 \\ 1 & 1 & 0 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 1 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots & & \vdots & & \vdots \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 1 & {\scriptstyle\text{11th element}} & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 1 & {\scriptstyle\text{13th element}} & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 1 & {\scriptstyle\text{15th element}} & 0 \\ \vdots & \vdots & \vdots & & \vdots & \vdots & & \vdots & & \vdots \\ 1 & 0 & 0 & \cdots & 1 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 1 & 0 & \cdots & 0 & \cdots & 0 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 1 \\ 1 & 0 & 0 & \cdots & 0 & 0 & \cdots & 0 & \cdots & 0 \end{bmatrix} \end{array}$$

and Q_E defined in equation 4 would be calculated to determine if the model thus constructed fits the data.

Conclusions drawn on the basis of the reduced models would be identical to those obtained from the original model. The reduced model is simply a more concise and easily recognized representation of the variation that is actually shown by the data.

When comparisons were made for each of the four race-sex groups (white males, black males, white females, and black females) with income below poverty level and those of the same race-sex group with income above poverty, it was found that the differences in mean caloric and nutrient intakes within age $(\overline{Y}_{iG_1} - \overline{Y}_{iG_2})$ did not follow the same pattern as those for sex and race-sex within age. Therefore, analysis was carried out using six broader age groups 1-5, 6-11, 12-17, 18-44, 45-64, and 65 years and over. Using these age groups we found a similar pattern in $(\overline{Y}_{iG_1} - \overline{Y}_{iG_2})$ with increasing ages as for sex and race-sex. These age groups were used also when comparing white and black persons of the same sex and income group. In these instances, analysis was carried out on the logarithm of the mean because of the skewness of the distribution.

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APPENDIX II

DEMOGRAPHIC AND SOCIOECONOMIC TERMS

The demographic and socioeconomic characteristics of the population sampled are defined as follows:

Age.—The age recorded for each examinee was the age at last birthday on the date of examination. The age criterion for inclusion in the sample used in this survey was defined in terms of the examinee's age at time of census interview. Some of those who were 74 years old at the time of interview became 75 years old by the time of the examination. There were 20 such cases. In the adjustment and weighting procedures used to produce national estimates, these persons were included in the 74-year-old group.

Race.—For each individual, race was recorded by observation as "white," "black," or "other races." The last category included American Indians, Chinese, Japanese, and all races other than white or black. Mexican persons were included with white unless definitely known to be American Indian or of another race other than white. Black persons and persons of mixed black and other parentage were recorded as "black."

Family income.—The income recorded was the total income reported during the past 12 months by the head of the household and all other household members related to the head by blood, marriage, or adoption. This income was the total cash income (excluding pay in kind, as, meals, living quarters, or supplies provided in place of cash wages) except in the case of a family with its own farm or business, in which case net income was recorded. Also included in the family income figure were allotments and other money received by the family from a member of the Armed Forces whether he was living at home or not.

Poverty index.—Income status was determined by the poverty income ratio (PIR). Poverty statistics published in the Census Bureau reports[30] were based on the poverty index developed by the Social Security Administration (SSA) in 1964. (For a detailed discussion of the SSA poverty standards, see references 31 and 32). Modifications in the definition of poverty were adopted in 1969.[33] The standard data series in poverty for statistical use by all executive departments and establishments has been established.[34]

The two components of the PIR are the total income of the household (numerator) and a multiple of the total income necessary to maintain a family with given characteristics on a nutritionally adequate food plan[34] (denominator). The dollar value of the denominator of the PIR is constructed from a food plan (economy plan) necessary to maintain minimum recommended daily nutritional requirements. The economy plan is designated by the Department of Agriculture for "emergency or temporary use when funds are low."

For families of three or more persons, the poverty level was set at three times the cost of the economy food plan. For smaller families and persons living alone, the cost of the economy food plan was adjusted by the relatively higher fixed expenses of these smaller households.

NOTE: A list of references follows the text.

The denominator or poverty income cutoff adjusts the family poverty income maintenance requirements by the family size, the sex of the family head, the age of the family head in families with one or two members, and the place of residence (farm, nonfarm). Annual revisions of the poverty income cutoffs are based on the changes in the average cost of living as reflected in the Consumer Price Index.

As shown in table IV, the annual income considered to be the poverty level increases as the family size increases. A family with any combination of characteristics and with the same income as shown in the table has been designated as having a PIR (or poverty level) of 1.0. The same family with twice the income found in the table would have a PIR of 2.0. Ratios of less than 1.0 can be described as "below poverty;" ratios greater than 1.0 as "above poverty."

Poverty thresholds are computed on a national basis only. No attempt has been made to adjust these thresholds for regional, State, or other local variation in the cost of living (except for the farm-nonfarm difference). None of the noncash public welfare benefits such as food stamp bonuses or free food commodities are included in the income of the low income families receiving these benefits.

The threshold income values for the combinations listed above are shown in table IV.

Table IV. Weighted average thresholds at the low income level in 1971, by farm-nonfarm residence, sex of family head, and size of family: United States, 1971

Size of family	Total	Nonfarm			Farm		
		Total	Male head[1]	Female head[1]	Total	Male head[1]	Female head[1]
All unrelated individuals	$2,033	$2,040	$2,136	$1,978	$1,727	$1,783	$1,669
Under 65 years	2,093	2,098	2,181	2,017	1,805	1,853	1,715
65 years and over	1,931	1,940	1,959	1,934	1,652	1,666	1,643
All families	3,700	3,724	3,764	3,428	3,235	3,242	3,079
2 persons	2,612	2,633	2,641	2,581	2,219	2,224	2,130
Head under 65 years	2,699	2,716	2,731	2,635	2,317	2,322	2,195
Head 65 years and over	2,424	2,448	2,450	2,437	2,082	2,081	2,089
3 persons	3,207	3,229	3,246	3,127	2,745	2,749	2,627
4 persons	4,113	4,137	4,139	4,116	3,527	3,528	3,513
5 persons	4,845	4,880	4,884	4,837	4,159	4,159	4,148
6 persons	5,441	5,489	5,492	5,460	4,688	4,689	4,656
7 persons or more	6,678	6,751	6,771	6,583	5,736	5,749	5,516

[1]For unrelated individuals, sex of the individual.

Source: U.S. Bureau of the Census: Characteristics of the low-income population, 1971, *Current Population Reports,* Series P-60, No. 86. U.S. Government Printing Office, Washington, 1972.

APPENDIX III

FOOD SOURCES OF CALORIES AND NUTRIENTS AND STANDARDS FOR DIETARY INTAKES

Table V. Major functions, problems associated with deficiency, and major food sources of calories and selected nutrients

Calorie and nutrient	Major function	Problems associated with deficiency	Major food sources
Calorie	Supplies energy for growth and development, basal metabolism, and physical activity	Inadequate caloric intake in children is evidenced by lack of growth and energy, loss of weight in all age groups	All foods; starchy, sweet, and fat foods are concentrated sources
Protein	Essential for normal growth and development; for maintenance and repair of all body tissue	A severe or prolonged deficiency results in retarded growth; symptoms may include edema, lassitude, and decreased resistance to infections	Eggs, milk and milk products, meats, fish, poultry, soybeans, dried beans, peas, and nuts
Vitamin A	Essential for the maintenance of healthy skin and mucous membranes, for normal night vision; aids in maintaining resistance to infections	Deficiency signs: night blindness and skin changes characterized by dry, rough skin. Prolonged deficiency can lead to permanent blindness	Liver, whole milk and whole milk products, and dark green leafy and deep yellow vegetables
Vitamin C	Production of intercellular cementing substance; wound healing; plays a role in normal resistance to infections	Deficiency results in soft, spongy gums, prolonged wound healing, and in the advanced deficiency state, the classical disease scurvy	Citrus fruits, tomatoes, strawberries, cantaloupe, raw cabbage, and green peppers
Calcium	Necessary for formation of bones and teeth; plays a role in blood coagulation and normal reactions of nerve and muscle tissue	Deficiency in children may be associated with rickets; in adults, calcium may be lost from the bones (osteoporosis)	Milk and milk products, certain green leafy vegetables, oysters, clams, and shrimp
Iron	Necessary for formation of hemoglobin, the oxygen-carrying pigment of red blood cells	Weakness and fatigability; advanced deficiency leads to anemia	Liver and other organ meats, dark green leafy vegetables, dried fruits, whole grain and enriched cereals and cereal products, and molasses
Thiamine	Essential for growth, normal function of the nervous system, and normal metabolism	Deficiency results in retarded growth, edema, and changes in the nervous system; advanced deficiency can result in beriberi	Liver, eggs, whole grain or enriched cereals and cereal products, and lean meat
Riboflavin	Essential for utilization of protein and is also involved in other metabolic processes	Deficiency can result in skin changes such as angular lesions, tongue changes, and poor growth	Dairy products are the major source, but meats and green leafy vegetables are other sources
Niacin	Essential for normal digestion and utilization of food	The classical deficiency state is pellagra, characterized by diarrhea, dermatitis, dementia, and death	Liver, meats, whole grain, and enriched cereals and cereal products

Table VI. Standards for evaluation of daily dietary intakes used in the Health and Nutrition Examination Survey, by age, sex, and physiological state: United States, 1971-74

Age, sex, and physiological state	Calories (per kg)	Protein (gm per kg)	Calcium (mg)	Iron (mg)	Vitamin A[1] (IU)	Vitamin C (mg)	B vitamins (all ages)
Age and sex							
1-5 years:							
12-23 months, male and female	90	1.9	450	15	2,000	40	Thiamine,
24-47 months, male and female	86	1.7	450	15	2,000	40	0.4 mg/
48-71 months, male and female	82	1.5	450	10	2,000	40	1,000
6-7 years, male and female	82	1.3	450	10	2,500	40	calories
8-9 years, male and female	82	1.3	450	10	2,500	40	
10-12 years:							Riboflavin,
Male	68	1.2	650	10	2,500	40	0.55 mg/
Female	64	1.2	650	18	2,500	40	1,000
13-16 years:							calories
Male	60	1.2	650	18	3,500	50	
Female	48	1.2	650	18	3,500	50	Niacin,
17-19 years:							6.6 mg/
Male	44	1.1	550	18	3,500	55	1,000
Female	35	1.1	550	18	3,500	50	calories
20-29 years:							
Male	40	1.0	400	10	3,500	60	
Female	35	1.0	600	18	3,500	55	
30-39 years:							
Male	38	1.0	400	10	3,500	60	
Female	33	1.0	600	18	3,500	55	
40-49 years:							
Male	37	1.0	400	10	3,500	60	
Female	31	1.0	600	18	3,500	55	
50-54 years:							
Male	36	1.0	400	10	3,500	60	
Female	30	1.0	600	18	3,500	55	
55-59 years:							
Male	36	1.0	400	10	3,500	60	
Female	30	1.0	600	10	3,500	55	
60-69 years:							
Male	34	1.0	400	10	3,500	60	
Female	29	1.0	600	10	3,500	55	
70 years and over:							
Male	34	1.0	400	10	3,500	60	
Female	29	1.0	600	10	3,500	55	
Physiological state							
Pregnancy (5th month and beyond), add to basic standard	200	20	200		1,000	[2]5	
Lactating, add to basic standard	1,000	25	500		1,000	5	

[1]Assumed 70 percent carotene, 30 percent retinol.
[2]For all pregnancies.

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