VITAL & HEALTH STATISTICS

Diet and Iron Status, A Study of Relationships: United States, 1971–74

This report presents findings of the first National Health and Nutrition Examination Survey on the iron status of the U.S. population 1–74 years of age during 1971–74. The relationship between several dietary, health, and socioeconomic variables and iron status also are presented in this report for selected population groups.

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

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

Foreword and acknowledgments

The National Health and Nutrition Examination Survey is the only source of general U.S. population data that provides a direct link between indicators of health and nutritional status and reported dietary intake information. Congress provided resources in the "Departments of Labor, Health and Human Services, and Related Agencies Appropriation Bill, 1980" to the National Center for Health Statistics to fund an initiative to undertake more detailed analyses of nutrition-related health problems measured in the first National Health and Nutrition Examination Survey. As part of this initiative, the Division of Health Examination Statistics and the Division of Nutrition, Center for Health Promotion and Education, Centers for Disease Control, funded a contract (no. 233–79–2091) with Abt Associates, Inc. in Cambridge, Mass., to examine relationships among dietary intake of iron and measures of anemia and to relate the prevalence of anemia to various socioeconomic and demographic variables.

The approach and depth of analysis presented in this report differ from most reports from the Division of Health Examination Statistics. This report is based on a statistical rather than a descriptive presentation of the data.

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

Analyses for this report were undertaken by the staff of Abt Associates, Inc., with the assistance of several consultants in the fields of nutrition, hematology, and biochemistry. Dr. Linda Meyers, Dr. Jean-Pierre Habicht, and D. Yvonne Jones of Cornell University investigated relationships between socioeconomic status and iron status. Drs. Meyers and Habicht also helped to select appropriate definitions of anemia and to clarify the overall process of iron metabolism. Dr. James Cook of the University of Kansas Medical Center was instrumental in developing an algorithm when applied to dietary intake data—estimated available iron. Dr. Peter Dallman of the University of California, San Francisco, School of Medicine contributed especially to the knowledge of pediatric hematology, prevalence of anemia, and racial differences in iron status. In addition, Dr. Jack Smith of the Swanson Center for Nutrition, Omaha, Neb., provided overall technical guidance, particularly in the area of biochemistry. All of these consultants also helped to select variables to be investigated and to determine subgroups on which to focus the analyses. Their assistance throughout the investigation is greatly appreciated.

Several Abt Associates, Inc. staff members also gave invaluable support. In particular, Catharine Barclay directed the data processing and performed analyses for children ages 1–3 years; Dr. Barbara Dillon Goodson provided statistical support and performed analyses for menstruating women ages 12–54 years; and Dr. Patricia Granahan undertook a review of the literature as well as analyses for elderly persons ages 65–74 years. Additional computer support was provided by Dr. Charles Cole, who developed a program to estimate absorbable iron. Dr. John Himes and Mary Kay O'Neill Fox helped to prepare and review the final manuscript and tables. The support of these persons was instrumental to the successful completion of the project.

A very special acknowledgment goes to Ms. Penny Spingarn, who provided invaluable assistance in the substantive editing and revising of this report.

Robert S. Murphy
Director
Division of Health Examination Statistics

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Symbols used in tables

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

Diet and Iron Status, A Study of Relationships

by Judith D. Singer, M.A., Patricia Granahan, Sc.D., Nancy N. Goodrich, Ed.D., Abt Associates, Inc., Linda D. Meyers, Ph.D., Cornell University and Clifford L. Johnson, M.S.P.H., Division of Health Examination Statistics

Introduction

This report presents the results of a study of iron status and selected dietary, health, socioeconomic, and demographic correlates. Findings are based on data from the first National Health and Nutrition Examination Survey; the *Catalog of Publications of the National Center for Health Statistics*[1] should be consulted if previous reports are of interest to the reader.

The first National Health and Nutrition Examination Survey was one in a series of related programs carried out by the National Center for Health Statistics under authorization by Congress in the National Health Survey Act of 1956. The programs characteristically are national in scope, based on probability sampling, and used to collect a broad range of morbidity data and related health information. The essential differentiating characteristic of the health examination surveys is their primary concern with health-related data obtained only (or at least optimally) from specially standardized direct medical examinations, including tests and other procedures used in clinical practice. Examinations given to persons selected in the scientific sample permit estimates of the total prevalence of specifically defined diseases in the U.S. population. They also permit estimation of the distribution within the population of a broad variety of health-related measurements, including physical measurements, such as height, weight, and various skinfolds as well as physiological measurements, such as diastolic blood pressure, serum cholesterol level, and psychological measurements.

The first National Health and Nutrition Examination Survey and earlier examination studies conducted by the Center are unique in that specially designed and constructed mobile examination centers were moved to the selected sample areas so that standard physical examinations could be given under standard conditions. The team of interviewers and examiners also moved with the examination centers.

Standard physical examinations of a probability sample of the population have several advantages over other means of collecting data about the health of the population:

- The examination can be designed to focus upon specified conditions and furnish more reliable estimates of the total prevalence of the conditions than can be obtained by interview. Cases unknown to the examinee can be identified, and the criteria for diagnoses can be specified carefully.
- The use of mobile examination centers and a small team of specially trained personnel reduces the variability that is found in studies using local facilities and personnel.
- The instruments are recalibrated, and interviewing and examining are monitored so the only variance should be the person examined.
- The probability design reduces the potential bias that might be found in populations selected for other specific purposes.

The first National Health and Nutrition Examination Survey was conducted from April 1971 to June 1974 and included medical, dermatological, and dental examinations; body measurements; dietary interviews; medical histories; and demographic interviews of a national probability sample. A detailed description of the specific content and plan of operation of the survey, including the sample design and forms used to collect the data has been published.[2]

In this report, data from the biochemical determinations were used to determine the prevalence of three categories of iron status—low hemoglobin, low percent transferrin saturation, and low hemoglobin combined with low percent transferrin saturation. The dietary interviews provided data to investigate the iron intake of persons in these categories. Other analyses explored the association between selected demographic, health, and dietary characteristics and the three categories of iron status defined in this report.

Highlights

The analyses of the data from this national survey by various subpopulations showed that:

- Iron-deficiency anemia, measured by the combination of low hemoglobin and low transferrin saturation levels, is not widespread in the United States.
- The prevalence of low hemoglobin is most common in young children, pregnant women, elderly men, and the black population.
- The prevalence of low hemoglobin, low transferrin saturation, and the combination of these two measures is marked among children ages 1–3 years.
- Of the three measures of iron status, low transferrin saturation, which indicates that iron status is less than optimal but has not necessarily deteriorated to the point of causing anemia, is the most prevalent. It is most common in young children and women of childbearing age.

Reported iron intake is below recommended allowances for many subpopulations. The relationship between reported dietary iron intake and the three iron status categories was examined for persons ages 1–74 years and was analyzed by age, race, sex, and pregnancy status.

- Except among young children, there is no strong relationship between reported iron intake and iron status as measured by hemoglobin levels or transferrin saturation levels.
- Among children ages 1–3 years, for whom reported iron intake and iron status are associated, mean iron intake and an estimate adjusted for availability were examined, and the adjustment for availability did not affect the association.
- Failure to find associations between reported iron intake and iron status may be due to problems in the method used to collect dietary information or to problems inherent in the use of reference standards to classify persons into iron status categories. Only a small portion of ingested iron is absorbed, which may compound the problems.

Dietary, health, socioeconomic, and demographic characteristics that may affect iron status in three high-risk groups—children ages 1–3 years, menstruating women ages 12–54 years, and persons ages 65–74 years—were examined in multivariate logistic analyses.

- Two socioeconomic variables, a poverty index and low education of the head of household, are associated with poor iron status.
- Low iron intake is significantly associated with low hemoglobin levels among children ages 1–3 years.
- Previous pregnancy and diagnosis of anemia are associated with poor iron status among menstruating women; the use of oral contraceptives is associated with adequate iron status. None of the variables related to dietary habits is associated with any of the iron status categories for this group.
- Poor general health and trouble eating are the variables most associated with poor iron status among persons ages 65–74 years. However, the association was not consistent in all categories. No variables related to dietary habits are associated with iron status in this population.

Cross-sectional survey data cannot be interpreted as showing cause and effect relationships. However, the analyses between iron status and the selected dietary, socioeconomic, and health variables indicated factors in addition to reported iron intake that should be investigated further.

Background—Review of the literature

Anemia and iron status

Anemia generally is believed to be the major nutritional deficiency problem in the United States today.[3-5] However, estimates of the prevalence of anemia vary widely;[6] for example, estimates of the prevalence of anemia range from 17 to 44 percent among preschool children[7] and from 5 to 25 percent among women ages 15–44 years.[8-11] Problems in assessing anemia as a public health problem arise from two causes: (1) there is no general agreement on a definition of anemia and (2) the commonly used criteria do not necessarily reveal the cause of anemia.

Generally, anemia is a condition in which an inadequate amount of oxygen is delivered to cells throughout the body. Lack of oxygen at the cellular level creates metabolic slowdown, causes muscles (such as the heart) to operate less effectively, and places stress on the circulatory system as it tries to oxygenate tissues. The physiological symptoms of anemia tend to be nonspecific, making the condition difficult to isolate. Mild anemia, for example, may be associated with dizziness, weakness, fatigue, and irritability. A person with iron-deficiency anemia may experience breathlessness, tachycardia, dysphagia, and palpitation on exertion. A diagnosis of anemia usually is based on a biochemical determination of the capacity of an individual's red blood cells to carry oxygen throughout the body and make it available to cells.

The only parts of the red blood cell to which oxygen can be attached and transported are the iron-containing porphyrin complexes within the protein hemoglobin. Thus hemoglobin levels reflect anemia and iron status.

The hemoglobin level represents a relationship between the production of red blood cells and their destruction or loss. Low hemoglobin concentrations may result if red blood cell synthesis is decreased or if destruction or loss increases, and these conditions are influenced in turn by several factors. Dietary components such as iron, folic acid, and vitamin B_{12} affect the rate of synthesis and successful maturation of red blood cells. The most common cause of red blood cell loss is hemorrhage from trauma, surgery, childbirth, or internal bleeding. Genetic diseases such as sickle cell disease, thalassemia, and glucose-6-phosphatase dehydrogenase deficiency can cause red blood cell destruction. A low hemoglobin level may result from any of these factors, but the major cause is iron deficiency.[3,4]

Although determination of low hemoglobin concentration or hematocrit (volume of packed red blood cells) may indicate an anemic condition reflecting a variety of factors involved in the synthesis, destruction, or loss of red blood cells, more specific tests can be used to look at the critical factor of iron status. Free erythrocyte protoporphyrin measures the portion of the hemoglobin molecule to which iron could be attached; thus free erythrocyte protoporphyrin levels will rise proportionally as the amount of iron in hemoglobin declines. Iron is also transported in blood plasma. Serum iron, total iron-binding capacity, and percent transferrin saturation are measures of this "circulating iron."[3,4] Iron stores are found in other body tissues, such as the liver, spleen, and bone marrow. These iron reserves can be measured by determining levels of iron storage proteins—marrow hemosiderin or serum ferritin.

When iron intake satisfies body needs in a healthy individual, circulating iron is maintained at an optimal level. However, when iron needs are not met by dietary iron, the body's iron stores become progressively depleted, circulating iron levels are affected and, ultimately, hemoglobin levels drop because the iron is insufficient to support the proper synthesis of red blood cells. Thus iron status is a point on a continuum that ranges from adequate tissue levels and stores to depleted tissue levels and stores.

Three stages generally are identified in the process of iron depletion. In the first stage, iron stores are reduced, measured by a decrease in marrow hemosiderin and serum ferritin. During this stage, the absorption of dietary iron may become more efficient, as the body tries to compensate for increased iron losses or increased demands for iron.

The second stage involves a severe reduction in iron stores and impaired red blood cell production. Serum iron levels generally decline, and the body compensates by increasing the amount of transferrin, the protein that transports serum iron. Thus the ratio of serum iron to iron-binding capacity, or transferrin saturation, decreases markedly. In this stage, levels of free erythrocyte protoporphyrin increase, but hemoglobin levels are in the normal range.

It is difficult to monitor this second stage of iron depletion because serum iron and total iron-binding capacity are affected by several factors, not just by iron. For example, serum iron levels exhibit diurnal variation, with the highest values usually found in the morning and the lowest in the evening. Infection alters serum iron and total iron-binding capacity levels. Both of these conditions could result in a lower percent transferrin saturation that might be interpreted as iron deficiency.

In the third stage of iron depletion, circulating iron levels decline, and iron stores may be depleted. This is reflected by lower hemoglobin concentrations, lower hematocrit values, and lower percent transferrin saturation.

Iron nutrition in the individual

Each individual's iron nutrition is a state of balance between the body's supplies of iron and needs for iron. Iron supplies are affected by diet and health; iron requirements change with age and physiological conditions such as pregnancy and illness.

Dietary sources of iron include foods, iron supplements, and unintentional sources, such as iron from cast-iron pots. The amount and chemical form of iron ingested as well as the individual's iron needs affect the body's capacity to absorb iron.

The average American diet contains 6 milligrams (mg) of iron per 1,000 kilocalories.[12,13] In general, daily iron intake is about 3 mg in infancy and increases steadily until adolescence. For males, intake remains stable at 18 mg throughout adulthood, but females' intake declines from 15 mg among adolescents to 11 mg among adults. This pattern suggests that total iron intake is related directly to total caloric intake.[14]

These figures for daily iron intake do not indicate how much iron is absorbed. Iron occurs in two forms, which differ in their availability to the body. Readily absorbable "heme iron" comes from animal tissues, such as meat, fish, and poultry. As the name implies, it is the organic iron bound to myoglobin in muscle tissues. "Nonheme iron," which is less available to the body, also is found in animal products, such as eggs, and foods from nonanimal origin such as grains, vegetables, and legumes.

The estimated heme iron intake is only 1–3 mg per day in the United States.[15–17] Nevertheless, heme iron is an important contribution to iron status because 27 to 37 percent of the heme iron ingested is absorbed.[16,18,19] Moreover, heme iron is absorbed directly into the mucosal cells of the small intestine, which take up the entire complex without releasing the iron from its bound form.[20,21] Once inside the mucosal cell, heme iron is released. Other dietary factors are not known to affect heme iron absorption.[5]

Nonheme iron is the more abundant dietary form.[22] Because nonheme iron is bound in inorganic forms and iron-protein compounds, it must be released and reduced from a ferric to the more soluble ferrous form by substances in the intestines before it can be absorbed.[20,23] In addition, the absorption of nonheme iron is affected greatly by other components of the meal in which it is consumed. Thus it is difficult to estimate or predict what portion of ingested nonheme iron is absorbed.[16,24]

At least two factors enhance the uptake of nonheme iron by as much as fourfold. These are the "meat factor" and vitamin C.[12,16,24,25] Iron absorption tests in which adult females ate a typical mixed American meal revealed that beef, lamb, chicken, pork, and fish had identical enhancing effects on iron absorption.[5] Therefore, animal tissue is doubly valuable because it provides highly available heme iron and also contributes an enhancing factor that improves the availability of nonheme iron. This enhancing factor has not been identified specifically, although studies to date have ruled out protein or animal protein.[17,26] There is some evidence that individual amino acids present in larger amounts in animal tissue protein than in vegetable protein may be responsible.[15] Animal protein from eggs and dairy products does not have an enhancing effect and may lower the availability of ingested iron by as much as 60 to 80 percent.[5,12,19]

Vitamin C (ascorbic acid), the other dietary constituent known to enhance nonheme iron absorption, acts by maintaining iron in a reduced, soluble form that is absorbed readily. Vitamin C also enhances iron uptake by forming a chelate with iron that remains soluble (and thus more absorbable), even in the basic environment of the small intestine.[5,26] The enhancing effect of vitamin C appears to be limited to 4 hours after iron ingestion.[5] It has been suggested that the effects of animal tissue and vitamin C consumed together are additive and that 1 gram (g) of meat and 1 mg of ascorbic acid may produce roughly equivalent effects.[16]

Other dietary factors may enhance iron absorption, but most have not been studied sufficiently to permit an assessment of their effects.[5,15–17] On the other hand, there are several known inhibiting factors, including tannic acid in tea, which appears to create insoluble iron complexes.[27] Egg yolk phosvitin,[17] antacids,[16] calcium and phosphate salts,[28] bran,[29] and ethylene diamine tetraacetic acid (EDTA)[30] also have been shown to inhibit iron uptake.

Absorption of heme and nonheme iron also is affected by an individual's iron status. As iron stores become depleted, absorption increases; as more iron is stored, absorption decreases.[16,20,24] Iron status, in turn, varies according to an individual's iron requirements.

Iron requirements are determined primarily by the amount of iron lost in the normal turnover of body cells, the amount lost from normal and abnormal losses of blood, and the amount needed to make new cells and tissues, which may vary during the life cycle. Normal iron loss in the adult male has been estimated to be about 1 mg per day.[31] This loss occurs mainly in the gastrointestinal tract—0.4 mg as red blood cells, 0.2 mg from bile, and less than 0.1 mg through exfoliated cells.[15,32] Daily losses also include about 0.2 mg through skin as exfoliated cells and in sweat and about 0.1 mg in urine.[32]

Females require additional iron to compensate for that lost in menstrual blood and to meet the needs of pregnancy. An average of 0.5 mg per day of additional iron is required to replace that lost in menstrual blood.[12] Full-term pregnancy places an additional demand for 700 to 1,000 mg of iron on the mother, a need that generally cannot be met without supplementation.[12,33,34] Body size and blood volume also contribute to differences in normal iron losses and average iron requirements among individuals and between males and females.[35]

Another factor that affects iron requirements, especially among adults, is blood loss. A blood donation of 450 milliliters entails a loss of 225 mg of iron, the equivalent of a loss of about 0.6 mg per day over 1 year.[33] Surgery, accidents, and chronic illnesses such as ulcers and hemorrhoids also account for sizable iron losses.

Drugs may increase or decrease iron loss, either directly or through their effects on blood loss. Oral contraceptives, for example, reduce menstrual blood loss.[36,37] Other drugs, such as aspirin, act as gastric or enteric irritants and increase blood loss.[38]

The dietary and health factors that affect an individual's iron status often are influenced by social, cultural, and economic conditions. People with limited financial resources may not be able to purchase many iron-rich foods such as meat or foods rich in vitamin C, such as fresh fruits and vegetables. Inadequate medical care, which is at least partially a function of income level, may increase the occurrence or duration of diseases associated with low iron stores or blood loss. People with limited education may have trouble choosing a diet that provides enough iron. Studies have shown, for example, that mothers' educational level is positively correlated with the quality of their children's diets.[39,40] Cultural practices associated with geographic regions or ethnic goups also may affect iron status. Pica, the eating of nonfood items (such as clay or laundry starch), can inhibit iron absorption by binding available iron and forming insoluble complexes, and this practice is more common in some cultural and age groups than in others.

Race is a factor that may be associated with iron nutrition and anemia. Several large surveys have reported a higher prevalence of low hemoglobin among black persons than among white persons.[8,41,42] These differences may be a result of differences in cultural eating patterns or in income. However, there is increasing evidence that differences persist even when iron status measured by percent transferrin saturation[43–48] and socioeconomic status[46–48] are taken into account.

Groups at risk of iron deficiency and anemia

Because so many dietary, health, and socioeconomic factors interact in determining iron intake, iron requirements, and iron loss, there is great individual variation in iron status. Despite this variation, it is reported commonly in the literature that several population groups—preschool children, adolescents, women of childbearing age (including pregnant women), and the elderly—are most likely to develop iron deficiency and anemia.[20,49] The analyses of iron status derived from NHANES I data directed attention to three of these groups: children ages 1–3 years, menstruating women ages 12–54 years, and persons ages 65–74 years.

Preschool children

The level of iron endowment at birth varies widely. It generally is believed that most infants are born with stores sufficient only for the first 4 to 6 months of life, at which time they become dependent upon dietary or supplemental iron to maintain body stores and meet the demands imposed by growth.[50]

Several factors make it difficult for very young children to develop and maintain adequate iron status. Human milk and cow's milk, the major foods in the first year of life, are poor sources of iron, although breast milk at least supplies iron in a form that is absorbed easily and may thus afford some protection against development of iron-deficiency anemia.[3] Iron-fortified formulas and dry cereals have been used increasingly in the past 10 years in an effort to boost the iron in the daily diet of infants. Nonetheless, by the time they reach the age of 1 year, many children may have inadequate iron status.[50]

Children over 1 year old whose diet is composed almost entirely of cow's milk are at particular risk of iron deficiency not only because milk is very low in iron but also because it may be substituted for other foods that are better sources of iron. In addition, milk may interfere with iron absorption through the formation of insoluble iron complexes. It may even promote iron loss by causing gastrointestinal bleeding (often called cow's milk anemia).[3,51]

Women of childbearing age

The combination of menstrual blood loss, increased iron needs in pregnancy, and eating habits, including dieting, place women of childbearing age at a high risk of iron deficiency and anemia.

As a continual cause of blood loss, menstruation is responsible for an average daily iron loss of 0.5 mg, added to the average normal physiological iron loss of 1.0 mg per day. Some women average daily iron losses from menstrual flow of as much as 1.4 mg per day, bringing their total average monthly loss to 2.4 mg per day.[12]

Assuming that only 10 percent of dietary iron is absorbed, women would need to eat 18 mg of iron daily to meet their physiological needs, and many find this difficult to achieve. It would take approximately 3,000 calories to provide a daily intake of 18 mg of iron, far beyond the recommended dietary allowance for calories for women. As a result, even if a woman has adequate iron stores when she attains menarche, the continual additional demand for iron to replace that loss during her reproductive years through menstruation may place her at risk of iron deficiency or anemia.

In addition, pregnancy often exacerbates this cumulative iron loss by increasing the iron needs of a woman who may be bordering on iron deficiency. Increased demands for iron arise from a 25-percent increase in maternal hemoglobin mass and the need to provide tissue iron and develop iron stores in the fetus. Because the iron needs of the fetus will be met before those of the mother, a pregnant woman may experience further drain on her iron stores and may not be able to compensate for this loss after giving birth.[52–54]

The elderly

With increasing age, people are more prone to health problems. Many chronic conditions, such as arthritis, which are more prevalent in the elderly and result in disability or discomfort, may influence eating patterns.[55] Dental and other impairments that may influence diet are also more prevalent among older persons. For example, the percent of persons ages 65–74 years without natural teeth is higher (about 45 percent), than that of persons ages 18–64 years,[56] and the rate of visual and paralytic impairments is much higher among persons ages 65 years and over than among younger people.[57] A study of NHANES I data showed that a higher proportion of persons ages 65–74 years with natural teeth, ingested foods that are sources of iron, vitamin C, and protein at levels at or above the NHANES standards than persons of similar ages without natural teeth or whose teeth were indicated for extraction did.[58]

Studies have reported that many senior citizens have iron intakes below recommended allowances, that iron intake decreases with increasing age, and that protein sources may change from red meats to less expensive nonmeat substitutes.[59,60] Low-cost, high-energy foods such as cereals, pastas, and legumes have lower iron content and less available forms of iron than animal protein foods. A slight decrease in iron intake and lower meat consumption have been documented from the NHANES I data for persons ages 65–74 years.[61,62]

The dietary habits of this group, as with all subpopulations, are influenced by many social, cultural, and economic conditions.[63,64]

Methodology: Sources and limitations of the data

Survey procedure

Medical and demographic data were collected for NHANES I from April 1971 to June 1974. Teams of interviewers and examiners moved with specially designed and constructed mobile examination centers to each of the 65 selected sample areas so that standard physical examinations could be given under standard conditions. Of the 28,043 persons ages 1–74 years who were selected in the national probability sample, 20,749 (74 percent) were examined.[a]

Information available from this sample included information from general medical, dermatological, and dental examinations; medical history questionnaires; dietary interviews consisting of a 24-hour recall and a food frequency questionnaire; and laboratory analyses of blood and urine samples. Body measurements were taken by trained technicians, and demographic data were obtained by interviewers from the U.S. Bureau of the Census. In addition, a detailed component of the survey consisting of a general medical history supplement, supplements for arthritis and for respiratory and cardiovascular conditions, a health care needs questionnaire, a general well-being questionnaire, and more extensive medical and laboratory examinations was administered to a subsample of 3,854 adults ages 25–74 years. The analyses presented in this report are based on the 20,749 examined persons.

Biochemical determinations

Blood specimens were obtained by venipuncture for adults and by venipuncture or fingerstick for children ages 1–3 years.[b] Hemoglobin levels were determined in the mobile examination centers using a Coulter Hemoglobinometer, which employs a beam of light and a photoelectric measuring device to compare a measured reference solution to the blood sample. The hemoglobinometer was checked daily with commercially available hemoglobin reference solutions. Hemoglobin concentration was computed automatically and displayed in grams per deciliter (g/dl). The test was run twice and samples had to agree within 0.2 g/dl. Readings of less than 11.0 g/dl or more than 18.5 g/dl were retested for accuracy and then called to the attention of a physician.

Serum samples were frozen and sent to the Nutrition Biochemistry Laboratory at the Centers for Disease Control, where serum iron and total iron-binding capacity were measured using a modification of the automated Technicon AAII 25 method.[65] The technique involved measuring the intensity of the violet-colored complex formed in the reaction between Ferrozine and Fe(II) in pH 5.0 buffer at 562 nm. Total iron-binding capacity was determined by diluting serum specimens and quality control samples with an iron-saturating solution, removing excess iron, centrifuging, and analyzing the supernatent for iron using the serum iron method. Determinations were repeated for serum iron below 50 and above 250 μg/dl and for total iron-binding capacity below 250 and above 500 μg/dl. Percent transferrin saturation then was calculated. A more detailed description of biochemical methods used to obtain these data has been published.[65]

Assessment of iron status

The biochemical determinations available from NHANES I included three measurements that commonly are used to assess iron status—hemoglobin concentration, serum iron, and total iron-binding capacity.[c] They were used to create three classifications of iron status—low hemoglobin (low Hb),

[a]Appendix I includes a more detailed account of the selection of the national probability sample.

[b]The method used to obtain the blood specimen for each child was not recorded.

[c]Hematocrit was also determined, but it was not used in this study because it is highly correlated with hemoglobin levels.

Table A. Age- and sex-specific hemoglobin reference standards[1]

Age	Sex	Hemoglobin value (g/dl)
1–5 years	Male and female	11.0
6–11 years	Male and female	11.5
12–14 years	Male	12.5
12–14 years	Female	12.0
15–17 years	Male	13.0
15–17 years	Female	12.0
18–74 years	Male	14.0
18–74 years	Female	12.0

[1] See references 66 and 67.

low percent transferrin saturation (low TS), and low hemoglobin combined with low percent transferrin saturation (low Hb/TS) in this report.

Hemoglobin levels are the most widely used measure of anemia. In this study, persons with hemoglobin levels below the reference standard for their age and sex (table A), were classified as *low Hb.* This category describes persons who are below a generally accepted cutoff point for anemia. The hemoglobin levels could reflect the presence of several factors that affect the synthesis, maturation, destruction, and loss of red blood cells.

As serum iron levels decline, the capacity to transport iron, or total iron-binding capacity (TIBC), increases as the body attempts to compensate by creating more iron-carrying transferrin proteins. Thus the ratio of serum iron to TIBC, called percent transferrin saturation (TS), declines markedly. Percent transferrin saturation is widely considered a better indicator of circulating iron status than serum iron or TIBC alone.[68] However, in chronic infections, TS decreases but TIBC does not increase and may even decrease slightly. Thus to exclude from the analyses persons with low TS values due to infection, this study used TS and TIBC to categorize persons with low circulating iron. Persons with a TS below 16 percent *and* a TIBC above 250 µg/dl were classified as *low TS.*

Persons with hemoglobin levels below the standard for their age and sex in conjunction with low circulating iron (defined as transferrin saturation below 16 percent and total iron-binding capacity above 250 µg/dl) were placed into the third category, *low Hb/TS.* Instead of a reading of low hemoglobin alone, this category reflects an anemic condition that can be attributed to lack of iron or iron-deficiency anemia.[68,69]

Persons not in these categories were referred to as having *adequate Hb, adequate TS, or adequate Hb/TS.* However, "adequate" cannot be interpreted as a clinical judgment of iron status. The categories of iron status used in this report are defined according to reference standards, which is only one approach to determining an anemic condition.

Above all, although the measurements used to classify the data were chosen to reflect stages of general anemia, iron deficiency, and iron-deficiency anemia, they do not represent the prevalence of disease but rather the prevalence of biochemical levels that are below the chosen reference standards. Because individual iron requirements vary widely, analyses reporting that a certain number of persons are in the low Hb category do not mean that this number of cases of anemia exist, nor does the statement that a certain number of persons have adequate Hb mean that none of these persons could be diagnosed as anemic. For example, a 30-year-old female with a hemoglobin level of 12.0 g/dl, the reference standard for her age, may not have a sufficient iron supply to meet her body's needs, while another female of the same age with a hemoglobin level of 11.5 g/dl may not need or even be able to absorb additional iron. A further consequence of using this approach to classify iron status is that the prevalence estimates calculated in this study are dependent on the reference standards used. Revising the standards would alter the prevalence estimates, although the conditions measured by the biochemical determinations do not change.

Other approaches—clinical trials (response to iron therapy intervention), multiple iron parameters, and distribution analysis—have been used to estimate the prevalence of anemia in populations. The first approach was not applicable to this survey data, and the second approach was of limited use because only some of the iron-related determinations were done in NHANES I. The third method, distribution analysis, has been used to look at the iron status of women ages 18–44 years.[43] However, the large sample sizes required by this approach made it less desirable for use in this general study. Therefore, the use of cutoff values was the most appropriate method for the study of iron status using NHANES I data.

Calculation of dietary intake and absorbable iron

Dietary intake and food consumption patterns were determined for each examinee using two methods: (1) a 24-hour recall questionnaire and (2) a food frequency questionnaire. Interviews were conducted by trained staff who had bachelor's degrees in food and nutrition or who were registered dietitians.

The recall covered the 24-hour period ending at midnight the day before the examination. Examinations were performed Tuesday through Saturday, so that weekends, when eating patterns may be different, were excluded. The examinee (or parent of a child under age 12) was asked to report all foods, beverages, and supplements consumed on a meal-by-meal basis (breakfast, lunch, supper, snack). To help the examinee estimate portion size, three-dimensional food models were used. The data were coded, edited, and computer analyzed at NCHS for nutrient value per 100-gram portion of food. A computer model to analyze the types of foods consumed in each ingestion period was designed and implemented at Abt Associates, Inc.

The food frequency questionnaire, which was used to collect information on how often different types of foods were consumed during the preceding 3 months, was administered after the 24-hour recall. In addition to providing data about usual food consumption patterns, the food frequency questionnaire helped the interviewer determine whether the foods consumed on the day reported were typical of those consumed over a longer period. The frequency questionnaire also helped the interviewer identify and clarify inconsistent responses.

Both of these instruments have methodological problems. The 24-hour recall is limited to one day; however, intake for any one day may be neither usual nor representative of a person's overall diet. Moreover, the 24-hour recall is designed to provide an estimate of the quantities of food consumed, and individuals vary greatly in their ability to remember what they ate. People also err in estimating the amounts of food they ate. Finally, error is introduced into the 24-hour recall because methods of food preparation vary greatly among respondents, and it is difficult to determine the nutrient content of many commercial or mixed dishes. Thus the available nutrient breakdowns provide only rough estimates of the nutritive value of the foods reported.

The food frequency questionnaire is subject to the same limitations as the 24-hour recall because the respondents must remember and report the wide variety of foods and beverages consumed over a 3-month period, as well as estimate how frequently each item was consumed. Because the quantities consumed are not reported, nutrient intake cannot be calculated accurately from the food frequency questionnaires. Therefore, data from the food frequency questionnaires were not included in the analyses for this report.

Mean iron intake values, which are the most widely used estimates of dietary iron intake, were computed from the 24-hour recall data to examine the relationship between iron intake and the iron status categories investigated in the prevalence analysis. However, mean iron intake does not represent accurately the amount of iron available to or absorbed by the individual. In the relational analyses, which also considered iron intake as one factor contributing to iron status, iron intake from the 24-hour recall data was adjusted according to an experimental method developed by Monsen and Cook.[16,17]

This calculation of absorbable iron took into account the consumption of heme iron, two facilitators (the meat factor and vitamin C), and one inhibitor (tea). Meals were calculated separately and totalled for the 24-hour period. A two-stage classification system was employed.

First, the iron ingested was classified into a low, medium, or high availability category according to enhancing and inhibiting factors in the meal, as follows:

Low availability—Meals that contained less than 24 mg of vitamin C *or* less than 6 g of protein from meat, fish, or poultry.

Medium availability—Meals that contained more than 25 mg but less than 75 mg of vitamin C *or* more than 6 g but less than 18 g of protein from meat, fish, or poultry.

High availability—Meals that contained more than 75 mg of vitamin C *or* more than 18 g of protein from meat, fish, or poultry *or* from 25–75 mg of vitamin C plus from 6–18 g of protein from meat, fish, or poultry.

If more than 225 g of tea was consumed during the ingestion period, the iron intake was dropped one category unless it was classified as low availability.

The Monsen algorithm on which this step is based employed grams of meat, fish, and poultry rather than grams of protein. In this model, it was assumed that lean meat contains approximately 25 percent protein; thus 6 grams of protein corresponds to approximately 25 grams of meat, fish, or poultry.

In the second step, iron intake was divided into its heme and nonheme components. It was assumed that 40 percent of the total iron present in meat, fish, and poultry was heme iron. The availability category determined in step one, according to the enhancing or inhibitory nature of the meal, affected the percent of heme and nonheme iron that would be absorbed. For example, it was assumed that only 3 percent of nonheme iron would be absorbed in a low availability meal, but 8 percent would be absorbed in a high availability meal.[16,17,22]

Low availability meal: Absorbable iron = (heme iron × 0.110) + (nonheme iron × 0.030)

Medium availability meal: Absorbable iron = (heme iron × 0.122) + (nonheme iron × 0.050)

High availability meal: Absorbable iron = (heme iron × 0.14) + (nonheme iron × 0.080)

Relational analyses: Analytical subgroups, independent variables, and tests of statistical significance

The relational analyses were designed to examine associations between iron status and dietary, health, socioeconomic, and demographic variables. Separate but parallel analyses were performed on three groups—children ages 1–3 years, women ages 12–54 years between menarche and menopause, and persons ages 65–74 years. These groups generally are considered to be at risk of iron deficiency and anemia. They also were chosen for closer study because analyses of the NHANES I data revealed a sufficient prevalence of low Hb, low TS, or low Hb/TS to suggest that there might be a public health problem in these groups and because the sample sizes were large enough to draw meaningful statistical conclusions.

The subpopulation of children ages 1–3 years comprised black and white children and both sexes. The group of menstruating women was composed of black and white women who had attained menarche and had not reached menopause (ages 12–54 years), excluding pregnant women and women who had been pregnant within the past year. The elderly subpopulation was defined as persons ages 65–74 years, male and female and black and white. Adults with a history of ulcers, who might be suffering from large blood losses, or have diabetes, were excluded from the analyses. These groups were excluded because of the known association of the condition with iron status or dietary intake status. As noted earlier, the sample sizes within each subgroup varied because of missing data for some of the independent variables.

For each group, relationships between iron status and an extensive set of independent variables were considered. Approximately 200 independent variables, hypothesized to be associated with iron status or iron intake, were selected for study from the available NHANES I data tapes. Preliminary statistical analyses were conducted to collapse these variables into a smaller set of analytical constructs for use in subsequent bivariate and multivariate analyses. Variables that had a high proportion of missing data, did not vary across the sample, or were not easily quantified were set aside. The food frequency questionnaire data, for example, were eliminated for the last reason. In addition, variables that addressed the identical construct were collapsed into a single variable; for example, several questions about aspirin were collapsed into a single measure of regular aspirin use. Many other potential variables were excluded on the basis of low frequency (e.g., leukemia), the expectation of little relationship to iron status (e.g., dermatology exam), or poor measurement properties (e.g., physical activity).

The resulting set of "core variables" to be tested was composed of the 21 variables listed below. The definitions of these variables are presented in appendix II.

Total iron intake (mg)
(log) Total iron intake (log mg)
Total animal tissue iron intake (mg)
Total non-animal tissue iron intake (mg)
Total protein intake (mg)
Total animal tissue protein intake (mg)
Total non-animal tissue protein intake (mg)
Estimated available iron (mg)
Estimated available iron with tea (mg)
Vitamin C intake (mg)
Pica
Regular vitamin use
Regular mineral use
Regular vitamin and mineral use
Regular aspirin use
Age
Poverty income ratio (a poverty index)
Estimated family income
Number of persons in the household
Age of head of household
Years of education of head of household

In addition, a few variables of particular interest within each age group were added to the appropriate subpopulation. For children ages 1–3 years, additional variables included history of breastfeeding and variables related to the child's birth. The analyses for menstruating women and the elderly included variables dealing with general health, reproductive history, and two additional demographic variables, as described below.

Children ages 1–3 years
Ever breast-fed
Mother's age at child's birth
Whether child was the first born
Child's birthweight
Whether child was premature
Whether child is presently ill

Women ages 12–54 and persons ages 65–74 years
Special diet
Age menstruation began
Ever pregnant
Ever diagnosed as anemic
Any trouble eating
General findings on the general medical exam
Ever had abdominal surgery
Married
Education of examinee
Current or recent use of oral contraceptives (women ages 12–54 years only)

For each group, bivariate analyses were conducted to examine the relationship between iron status and each variable in the appropriate core set. Two-tailed Z-tests with a significance level of 0.05 were conducted taking into account the complex survey design (see appendix I).

As a further step to understanding the relationship of these dietary, health, socioeconomic, and demographic variables to iron status, a limited set of variables was placed into a multivariate logistic framework. These multivariate analyses were designed to determine which combination of variables was most associated with the various iron status categories in each subgroup. This approach was concerned with discerning associations that might warrant closer study and does not show cause-and-effect relationships between any variable and iron status.

As a general guideline, the dietary and health variables that were significantly associated with iron status in the bivariate analyses were chosen for the multivariate analyses. As a final test of iron intake, however, (log) mean iron intake and estimated absorbable iron were placed in the multivariate framework, regardless of the results of the bivariate test. In addition, a few variables of special interest—those common in a particular age group or those holding general theoretical interest—were included in the multivariate set.

Furthermore, the socioeconomic and demographic variables included in the core bivariate set could not be examined simultaneously in a single multivariate model because many of them were highly correlated. A series of logistic analyses was conducted to select a smaller set of these variables that were relatively unconfounded and related to iron status. These analyses were designed to assess whether the logarithmic transformation of a poverty index called the poverty income ratio (PIR), was a better variable than PIR itself and whether any additional demographic variables (other than age, race, and sex of the examined person) contributed to the analyses when used in conjunction with PIR. (The poverty index and how it is calculated are discussed in appendix II.) The analyses, conducted simultaneously for all three groups for each iron status category, showed that the logarithmic transformation of PIR did not predict iron status better than PIR. In addition, the only socioeconomic variable that had a significant effect when entered with PIR was years of educaton of the head of the household. Because these results were consistent across all three analytic groups and for all measures of iron status, PIR and years of educaton of the head of household were entered as socioeconomic covariates in all multivariate analyses.

Initially, a simple forward stepwise solution to the logistic model was obtained without taking into account the complex sample design. If any variable was not included because of collinearity between it and the remaining variables in the model, the variable was tested without including its collinear measures. Two-tailed t-tests with a significance level of 0.05 were conducted. Each variable that was significant under this approach ($t > 1.96$) was retained for the final model. If at that point, dietary iron intake was not entered in the model, it was "forced in," to yield a final test of its significance in relation to iron status when controlling for all other significant variables. (A detailed presentation of the statistical approach is included in appendix I.)

Findings

Iron status

The mean values and distribution of the measures of iron status collected in NHANES I (hemoglobin, hematocrit, serum iron, total iron-binding capacity, and percent transferrin saturation) are shown in tables 1–10.

These measures were used as described in the preceding section to calculate prevalence rates for three categories of iron status—low Hb, low TS, and low Hb/TS. Prevalence estimates for various age groups, males and females, and black and white persons are presented in tables 11–13 and summarized in figures 1–9. *Z*-statistics for selected comparisons of prevalences of iron status are presented in table 14. Prevalence rates for pregnant and nonpregnant women and *Z*-statistics are presented in table 15. Differences with a *Z*-value greater than 1.96 ($p < .05$) are noted as "significant" in the text.

Age and sex

The prevalence of low Hb decreased rapidly from infancy through the preschool years, from a peak of 19.3 percent for males and 12.6 percent for females at age 1 to 1.7 percent and 1.9 percent by ages 4–5 years (table 11 and figure 1). A brief rise in prevalence occurred for children entering adolescence (ages 6–11 years), which continued for males into ages 12–14 years. The prevalence was higher for boys ages 12–14 years (7.6 percent) than for girls of similar ages (3.4 percent), although the difference was not statistically significant.

Prevalence rates of low Hb were relatively constant at approximately 5 percent for adults (ages 18–54 years) of both sexes. With advancing age, however, the prevalence rate rose markedly for males, beginning at ages 55–64 years. At ages 65–74 years, males had a prevalence of 14.9 percent and females only 4.3 percent, a difference that is statistically significant.

The prevalence of iron deficiency, as defined by percent transferrin saturation and total iron-binding capacity, generally was higher than that of low hemoglobin, except among adult males. Low TS peaked at age 1 with a prevalence of 50.8 percent for males and 38.3 percent for females (table 12 and figure 4). During the childhood years, the prevalence decreased rapidly for both sexes, dropping to 8.6 percent for boys and 13.1 percent for girls ages 12–14 years. Beginning in adolescence, values for females rose slightly and reached 16.4 percent for ages 18–44 years, while the prevalence rate for males dropped to 3.6 percent. This difference is statistically significant.

Beginning at the age group 45–54 years, prevalence rates for males and females became similar and decreased to approximately 4–7 percent by ages 65–74 years.

The combination of low Hb and low TS showed the lowest prevalence of the three categories. Except at age 1, when it was especially marked (17.7 percent for males and 9.9 percent for females), the prevalence of low Hb/TS for any age and sex group never exceeded 4 percent (table 13 and figure 7). Within this low level, however, the pattern was similar to that observed for the other two categories of iron status.

Race

In many instances, the prevalence of low Hb was significantly higher for black than for white persons among males and females and at all ages. Except at ages 55–64 years among males and ages 4–5 years among females, the prevalence of low Hb was 2 to 10 times as high among black persons. For example, the prevalence among white women ages 18–44 years was 3.4 percent; it was almost five times as high (15.8 percent) among black women of the same ages (table 11 and figures 2 and 3).

Differences between black and white persons generally were not as great for low TS and low Hb/TS nor were the rates for black persons consistently higher (tables 12 and 13, figures 5 and 6, and figures 8 and 9). Furthermore, although black persons tended to have slightly higher prevalence rates in both categories, most differences were not statistically significant.

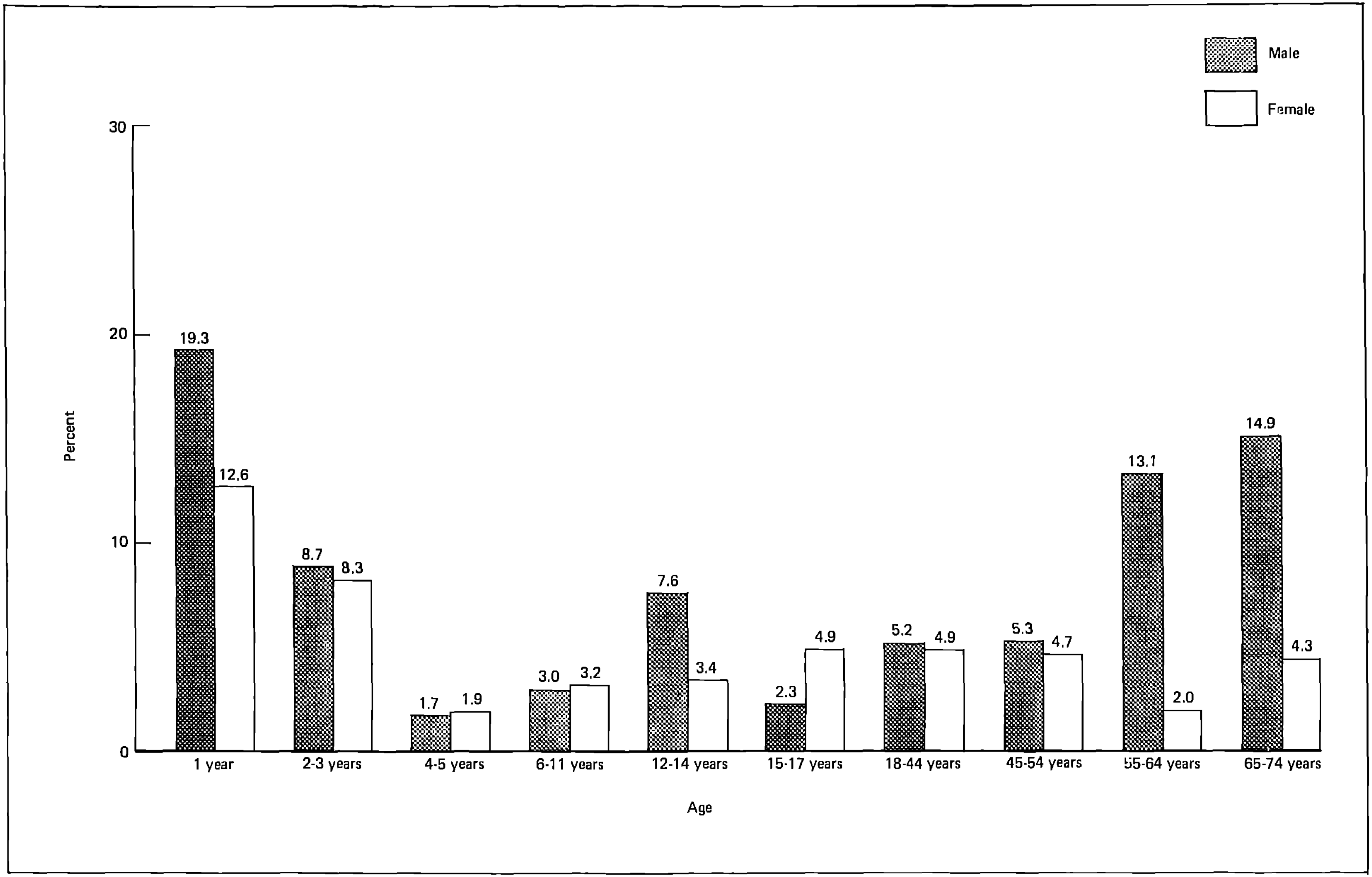

Figure 1. Prevalence of low hemoglobin levels, by sex and age: United States, 1971–74

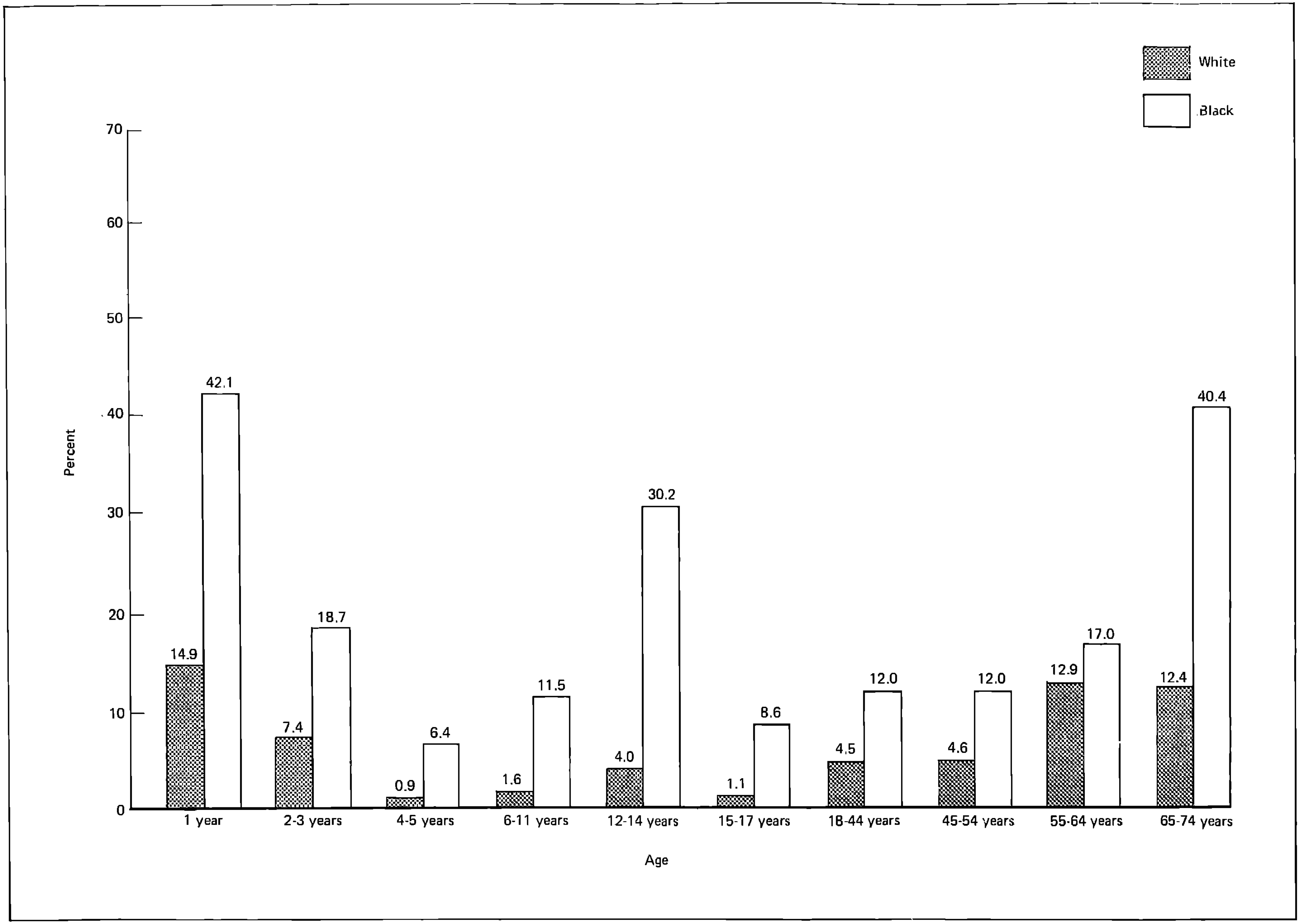

Figure 2. Prevalence of low hemoglobin levels among males, by race and age: United States, 1971–74

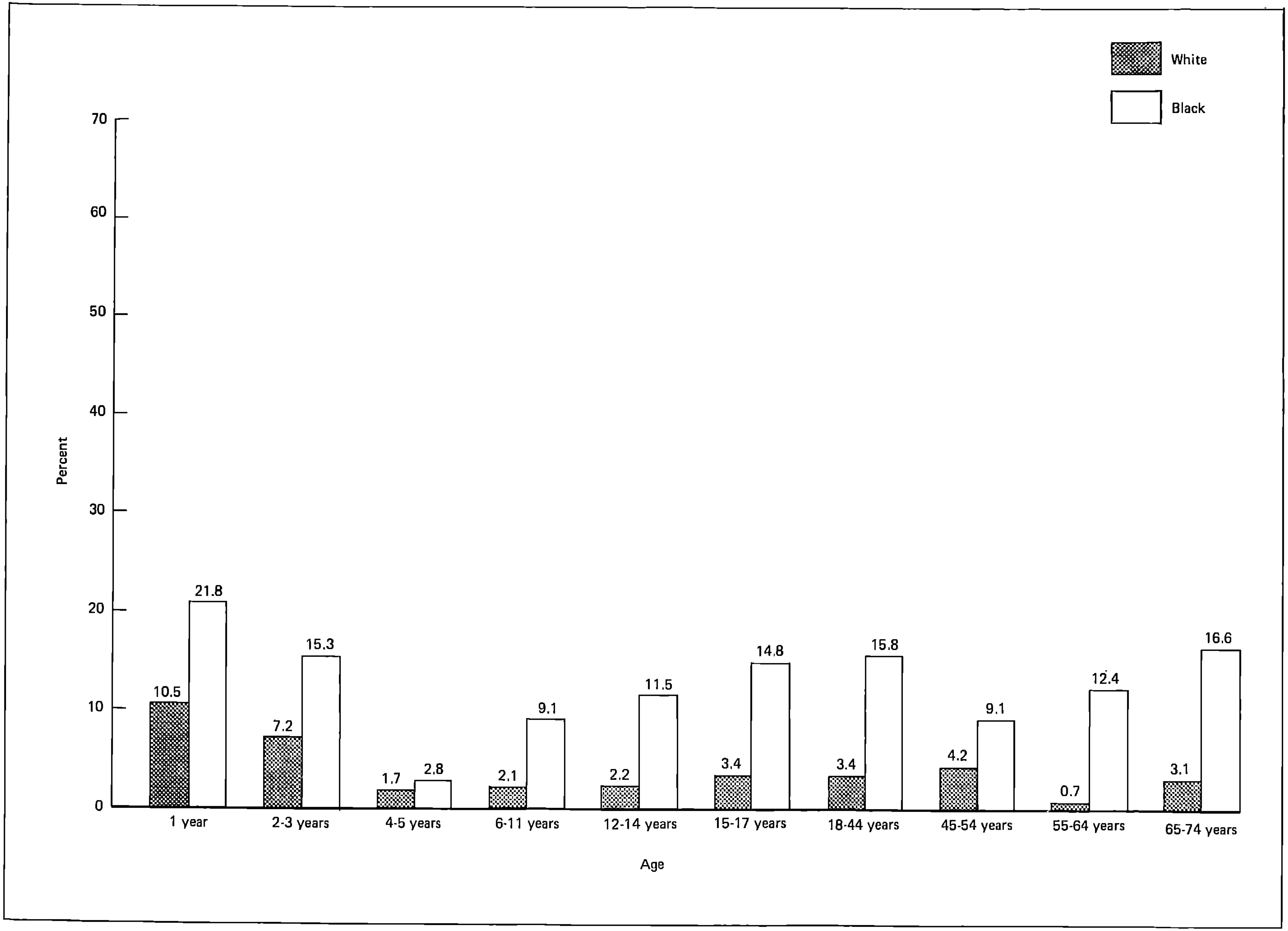

Figure 3. Prevalence of low hemoglobin levels among females, by race and age: United States, 1971–74

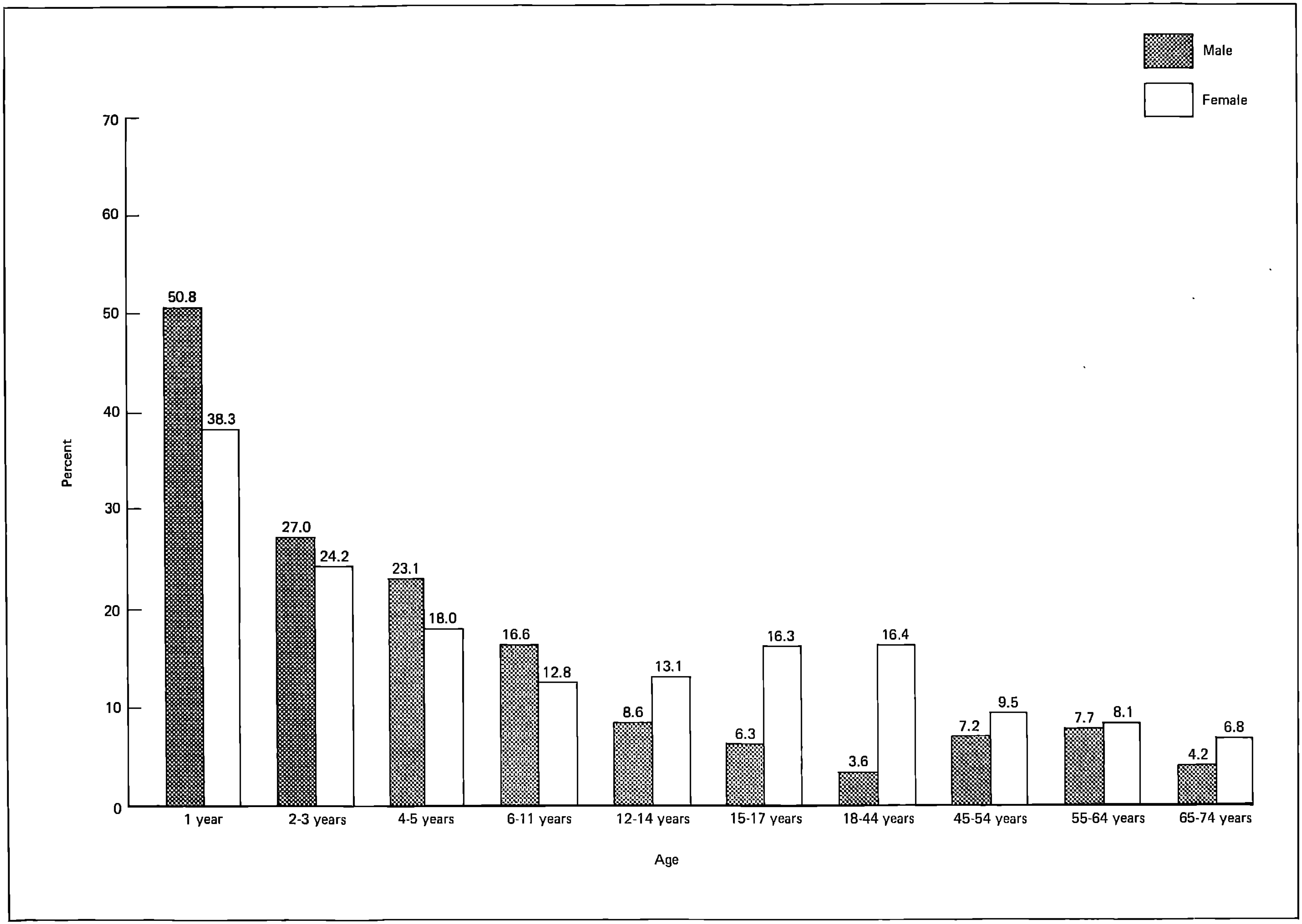

Figure 4. Prevalence of low transferrin saturation levels, by sex and age: United States, 1971–74

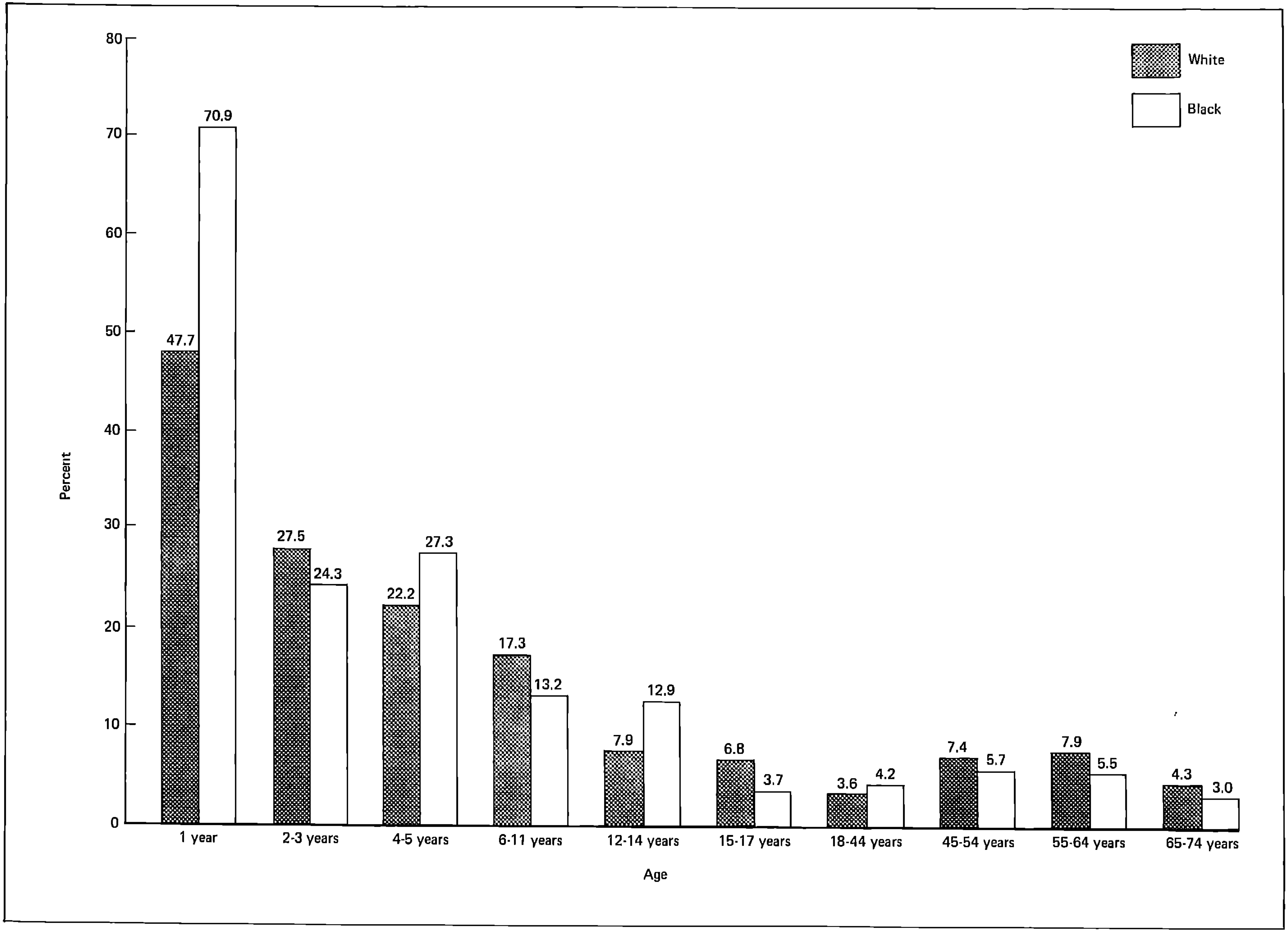

Figure 5. Prevalence of low transferrin saturation levels among males, by race and age: United States, 1971–74

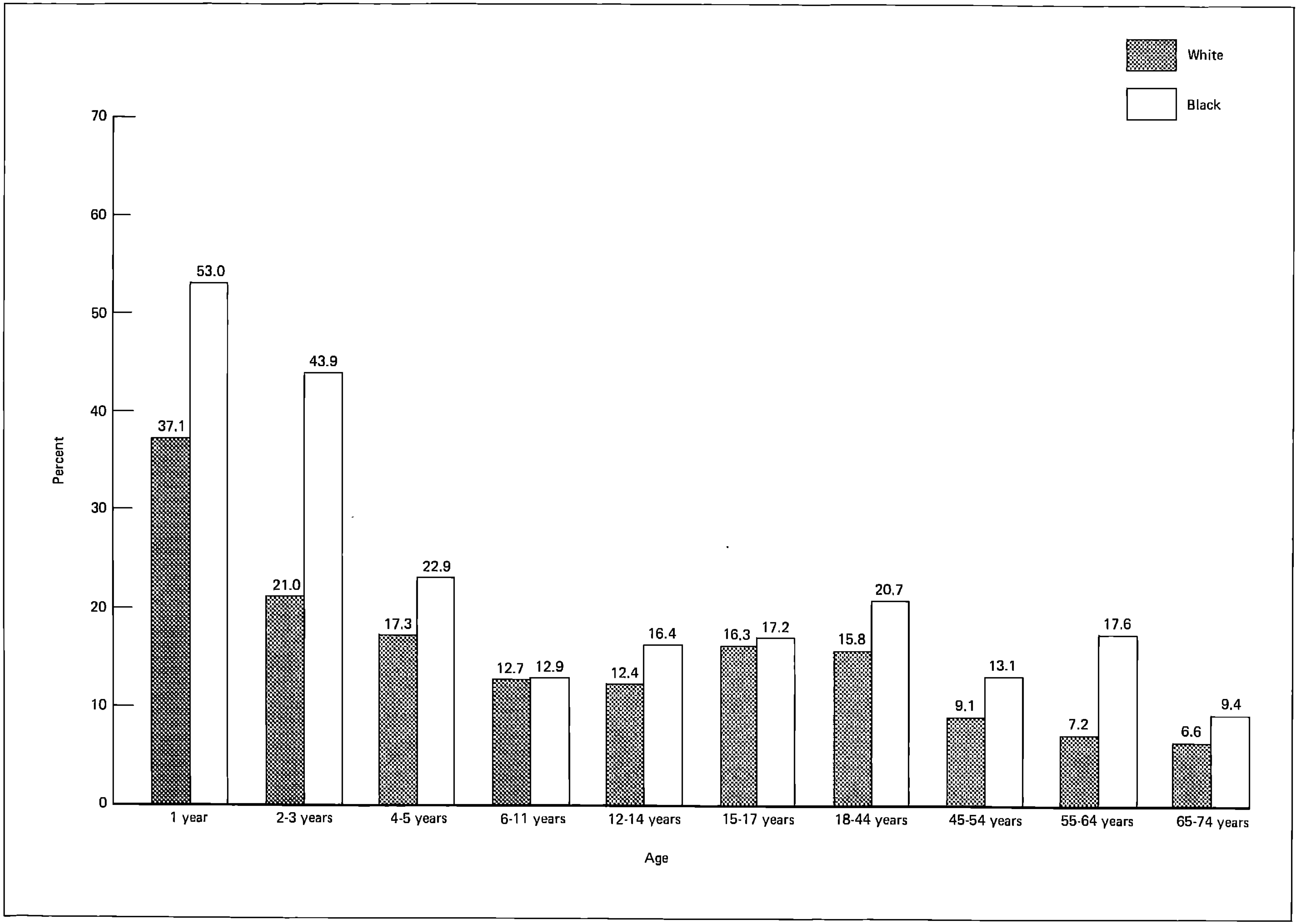

Figure 6. Prevalence of low transferrin saturation levels among females, by race and age: United States, 1971–74

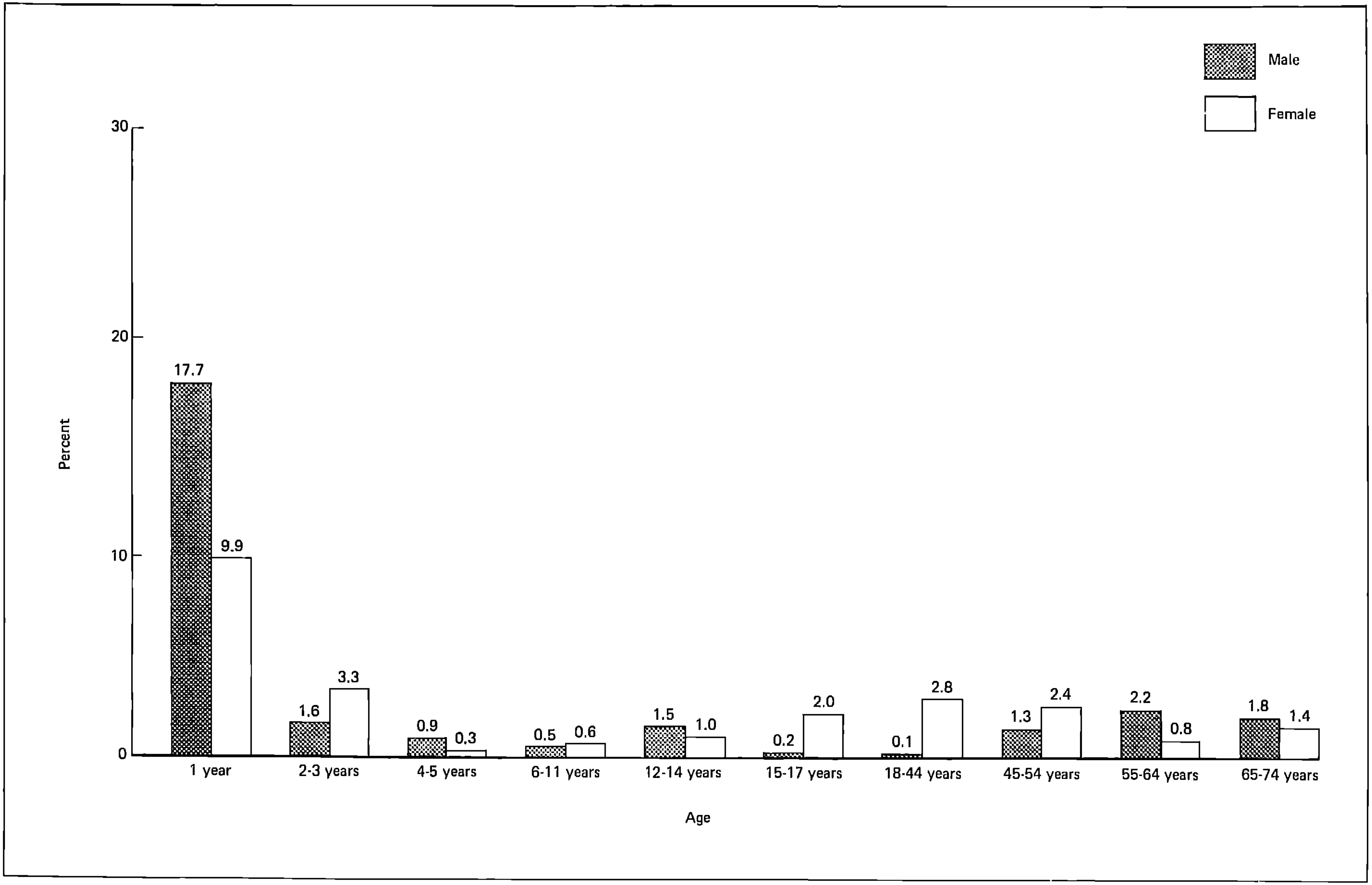

Figure 7. Prevalence of low hemoglobin and low transferrin saturation levels, by sex and age: United States, 1971–74

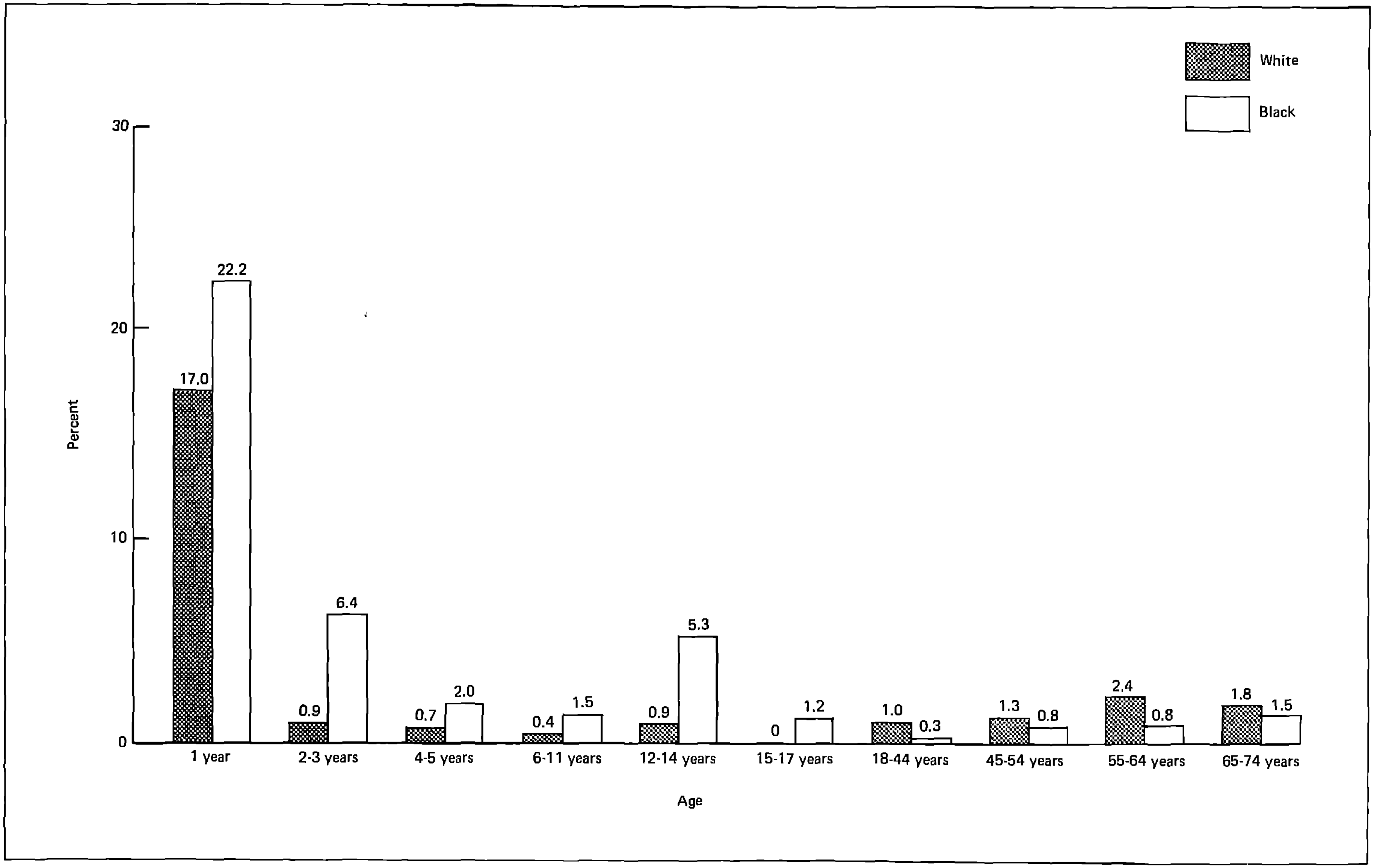

Figure 8. Prevalence of low hemoglobin and low transferrin saturation levels among males, by race and age: United States, 1971–74

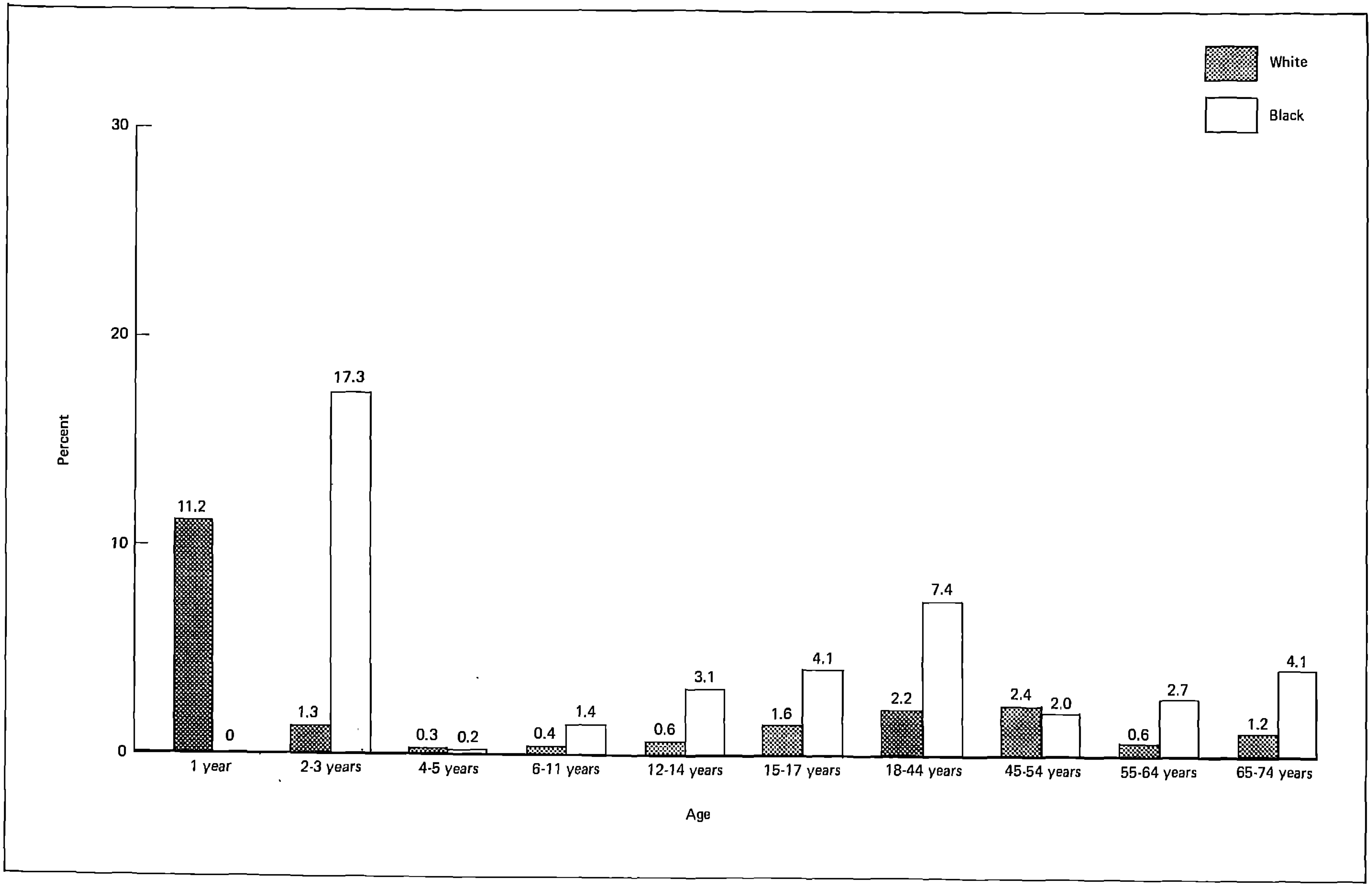

Figure 9. Prevalence of low hemoglobin and low transferrin saturation levels among females, by race and age: United States, 1971–74

These findings are consistent with previous research,[41–45] which indicates that a racial variation in iron status appears to be prominent for low hemoglobin but not for other indicators of iron status.

Pregnancy

Because iron status measures may change during pregnancy, pregnant women were analyzed as a separate sample. Table 15 shows that pregnant women ages 18–44 years were six times as likely to have low hemoglobin as women in this age range who are not pregnant. This significant difference was observed among black women and white women; the prevalence of low hemoglobin for pregnant women was three times and eight times as high. No significant differences between pregnant and nonpregnant women were found for the low TS or low Hb/TS categories.

Iron intake and iron status

Mean iron intakes (mg per day) of persons in two of the iron status categories analyzed by age, sex, and race, are presented in tables 16 and 17. Results for the total sample classified as low or adequate Hb and low or adequate TS are shown in figures 10–13. These figures are presented to show the overall relationship. Selected subgroups have small sample sizes that account for large variability in the mean iron intakes. (Mean iron intakes for pregnant women are presented in table B.) Associations with a *Z*-statistic of greater than 1.96 are noted as "significant" in the text.

Age, sex, and race

In general, males with low hemoglobin levels had mean iron intakes similar to males with adequate hemoglobin levels. Similar findings were observed for females with low and adequate hemoglobin levels.

With one exception, the differences in mean iron intake for males classified as low and adequate TS were nonsignificant. No significant differences were found for females.

One marked difference between the sexes was that females' iron intake decreased between the ages 12 and 17 years, while males' intake increased. This pattern was found in all the low and adequate Hb and TS categories of iron status, although it was most pronounced in the low TS group. Too few individuals were classified as low Hb/TS to present findings about their iron intake.

Similarly, the sample sizes for black persons were too small to substantiate any racial pattern of differences in iron intake. In general, the iron intake of black persons in the various iron status categories was similar to that of the total sample.

Overall, mean daily iron intakes were lower than the recommended allowances for each age and sex.[12]

Pregnancy

As shown in table B, no statistically significant differences were found in the iron intake of pregnant and nonpregnant women for low and adequate hemoglobin levels. Although the difference for black women was larger, the small sample sizes precluded testing the difference for statistical significance.

The difference in iron intake of pregnant and nonpregnant women with low and adequate transferrin saturation levels was significant for all races combined and for white women. For black women, the difference was in the same direction, but small sample sizes again led to unreliable estimates. Too few pregnant women had low hemoglobin combined with low transferrin saturation values to present findings for this iron status indicator.

Relational analyses

For each subpopulation—children ages 1–3 years, menstruating women ages 12–54 years, and persons ages 65–74 years—bivariate analyses were conducted on a core set of dietary, health, socioeconomic and

Table B. *Z*-statistics for comparison of iron intake for low and adequate iron status[1] for pregnant women 18–44 years, with mean, and standard error of the mean, by iron status indicator and race: United States, 1971–74

Iron status indicator and race	*Low*			*Adequate*			*Z-statistic*
	Number of examined persons	*Mean*	*Standard error of mean*	*Number of examined persons*	*Mean*	*Standard error of mean*	
Hemoglobin							
All races[2]	63	11.1	0.67	133	10.9	0.46	0.25
White	39	11.4	0.85	113	10.6	0.49	0.82
Black	22	*10.3	*1.11	14	*13.7	*1.66	...
Transferrin saturation							
All races[2]	40	9.0	0.68	155	11.5	0.43	−3.10
White	30	8.6	0.77	117	11.4	0.48	−3.09
Black	9	*10.4	*1.40	31	12.7	1.13	...

[1] Low and adequate levels as defined in this report.
[2] Includes data for races which are not shown as separate categories.
NOTE: Estimates preceded by an asterisk do not meet this report's standards of reliability (i.e., the number of examined persons is less than 25).

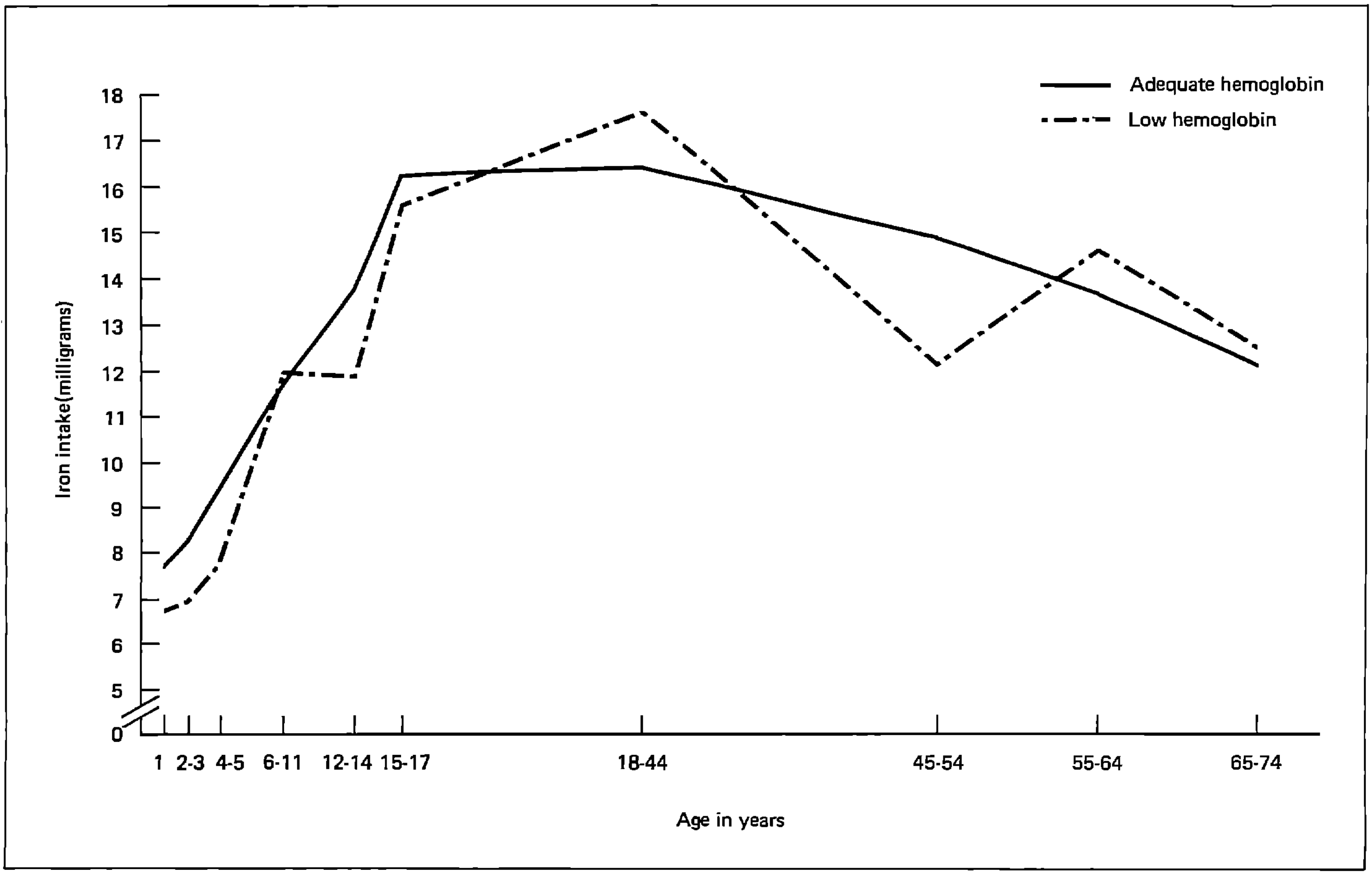

Figure 10. Mean iron intake for males ages 1-74 years, by age and hemoglobin levels: United States, 1971–74

demographic variables. Multivariate logistic analyses also were conducted on a smaller set of these variables. Because data were missing on some of these independent variables for certain sample persons, the sample sizes in the analyses vary within the subgroups. All associations discussed in the text are significant at a value of 1.96 ($p < .05$), unless specifically noted as "not statistically significant."

Children ages 1–3 years

Analyses examining the relationship between iron status and a core set of dietary, health, socioeconomic, and demographic variables were performed only for children classified as having low or adequate hemoglobin, because about 45 percent of the serum iron and total iron-binding capacity data were missing from NHANES I for this age group. Appendix I discusses some of the reasons this large amount of blood data were missing in this survey. Males and females were not analyzed separately because sexual differences in iron status are not noted until adolescence, when menstruation begins in females, and both sexes experience growth spurts.[70]

Bivariate analyses were conducted for 27 variables, and results for the total sample (table 19) showed 16 statistically significant associations. Many of these associations were for dietary variables—most of the iron intake variables, animal protein intake, vitamin C intake, and regular vitamin and mineral use. Two variables related to dietary habits also were significant; 37.5 percent of the children in the low Hb category had a history of pica compared with 18.3 percent of the children in the adequate Hb category. In addition, only 16.9 percent of the children with low Hb had been breastfed, compared with 26.5 percent of those with adequate Hb.

The only health variable for which differences were significant was "presently ill," but there were four significant findings for the socioeconomic and demographic variables. Children with low Hb were younger, with a mean age of 2.19 years compared with 2.58 years for the children with adequate Hb. Low hemoglobin also was associated with a lower poverty index ratio, more people in the household, and lower educational level of the head of household.

Tables 20 and 21 present the results of analyses conducted for black children and white children. Among white children with low compared with adequate Hb, significant differences were found for the

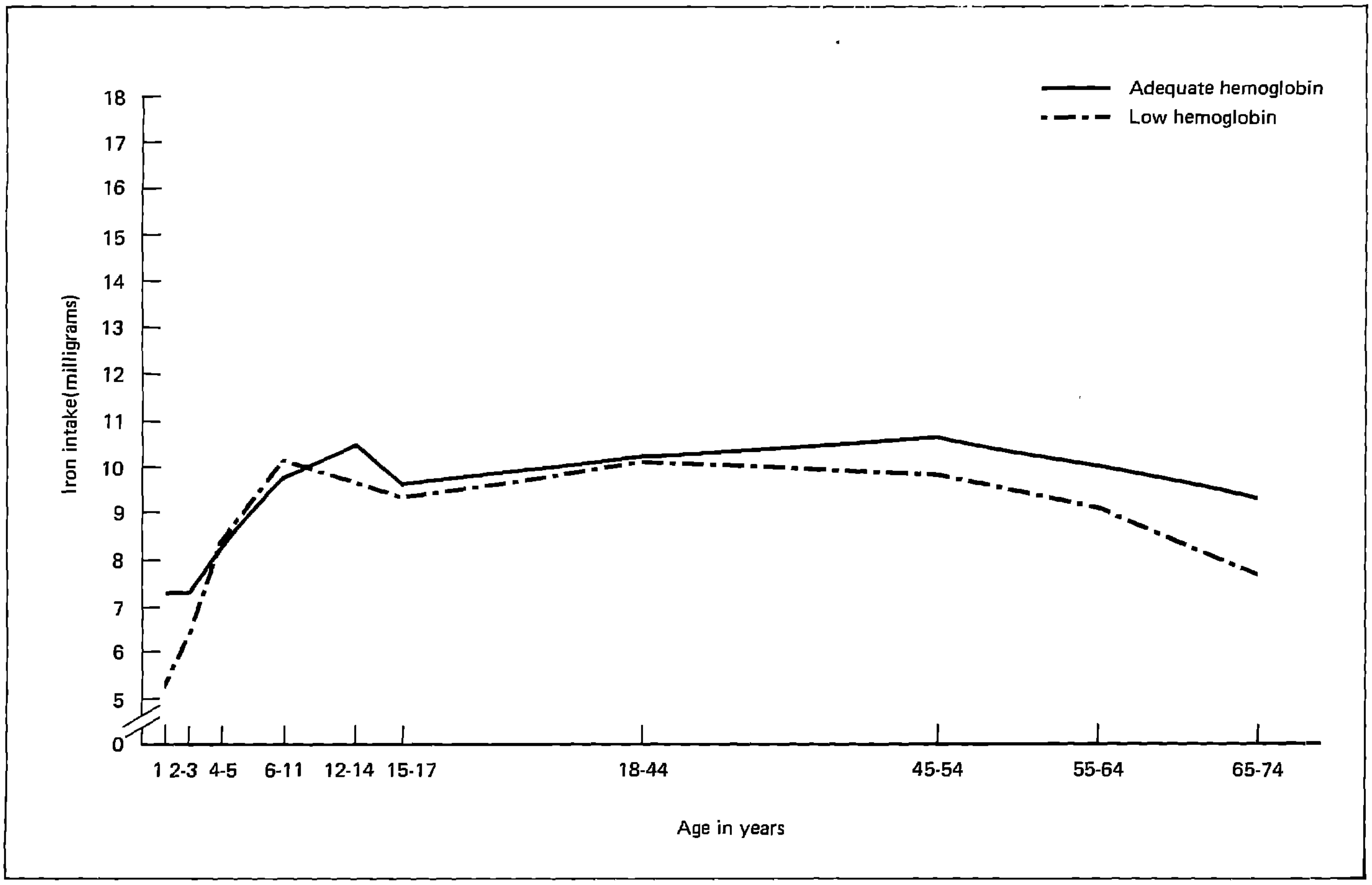

Figure 11. Mean iron intake for females ages 1-74 years, by age and hemoglobin levels: United States, 1971–74

same variables that were significant in the total sample, except for vitamin C intake, breastfeeding, and presently ill, and with the addition of total animal tissue iron intake. The same trends were evident for black children as well, although the only statistically significant difference was for age. This may be due to the small sample sizes for black persons. In the white population, 105 children had low Hb, and 960 children had adequate Hb; in the black population the sample sizes were 72 children with low Hb, and 285 children with adequate Hb. Because standard errors were substantially higher for the estimates for the black population than for the white population, a difference that was statistically significant for white children may not be significant for black children. When results for the sample of black children were examined for each of the seven variables found to be significantly associated with low hemoglobin in the analyses for the total sample and the white sample, the differences between means for each variable were quite consistent. This also suggests that the lack of statistical significance within the analyses of black children was due primarily to higher standard errors associated with the small number in the sample.

Three of the socioeconomic and demographic variables that were significantly associated with hemoglobin status in the bivariate analyses for the total and white samples were chosen for analysis in the multivariate framework—PIR, years of education of the head of household, and age. Most dietary variables that were significant in the bivariate analyses were correlated with iron intake, so (log) total iron intake and estimated available iron were retained for multivariate analysis, with vitamin and mineral use and pica. Race was the eighth variable included in the mutivariate analysis.

The results of the multivariate approach (table 22) showed that age, race, PIR, and education of the head of household still were significantly associated with low hemoglobin. Children who were younger, black, from poorer homes, and from homes in which the head of the household had fewer years of education were more likely to have low hemoglobin.

When these socioeconomic and demographic effects were taken into account, pica and iron intake also were associated with low hemoglobin, indicating that two factors related to diet—adequate iron intake and the absence of pica—make it more likely that a child's iron status will be adequate regardless of socioeconomic situation. The contributions of (log)

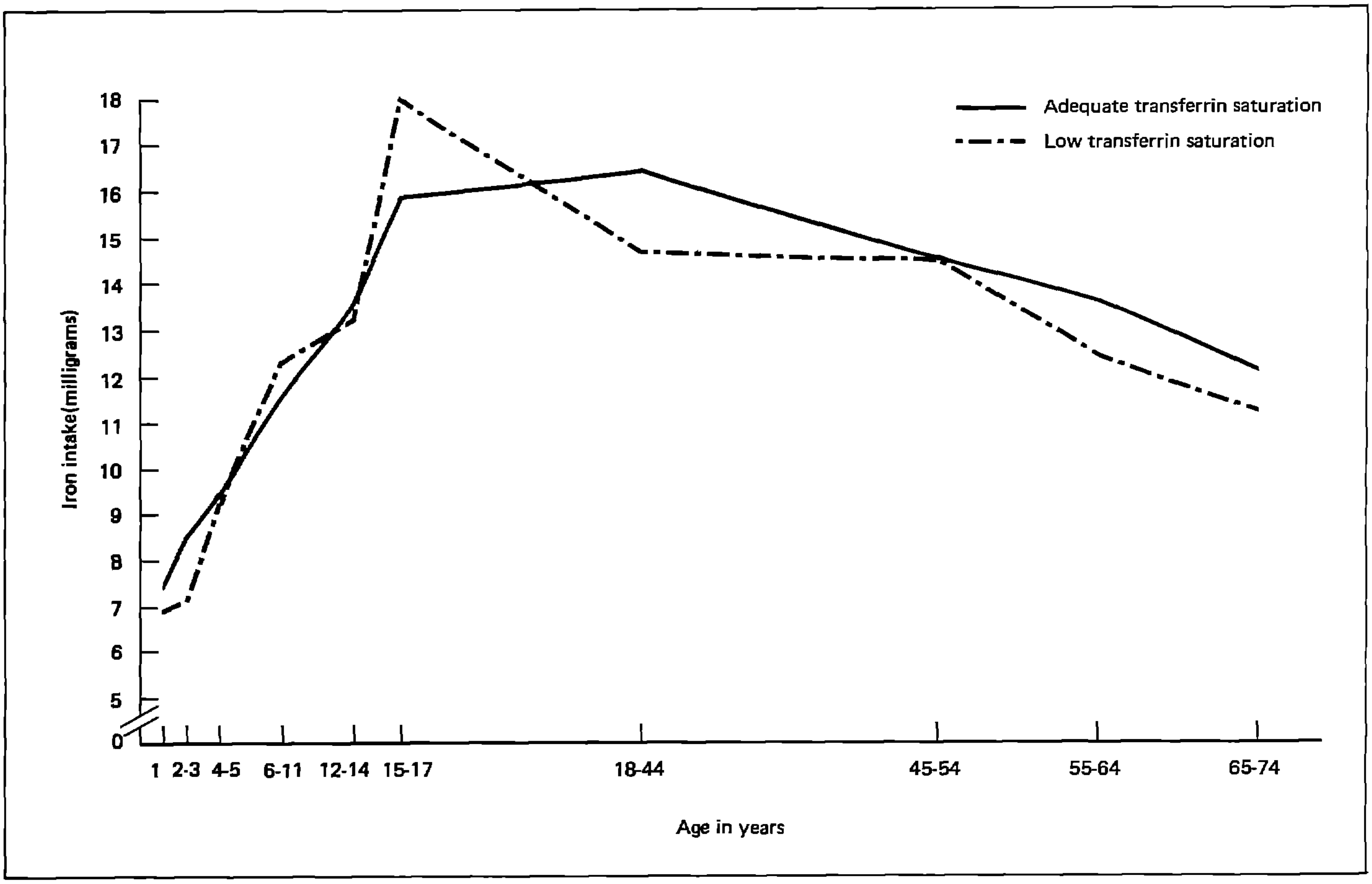

Figure 12. Mean iron intake for males ages 1-74 years, by age and transferrin saturation levels: United States, 1971–74

total iron intake and estimated available iron were about equal in the final logistic equation, suggesting that adjusting iron intake for bioavailability does not offer any advantage in explaining low hemoglobin in children.

Menstruating women ages 12–54 years

Because of cumulative iron losses due to menstruation and pregnancy, women of childbearing age have been considered particularly susceptible to iron deficiency and anemia.[12] The prevalence estimates calculated from NHANES I data suggest that these conditions may not be as widespread as has been postulated; however, they are prevalent enough to warrant closer examination.

A large sample with complete data permitted analyses of possible correlates of all three iron status categories for menstruating women ages 12–54 years. Bivariate analyses of 31 variables were conducted for each category for the total sample of women and for black women and white women separately. Results are presented in tables 23–31.

The bivariate analyses for the total sample (tables 23–25) produced few significant associations. Only age, previous pregnancy, and years of education of the head of household were associated with all three iron status categories. Analyses of the sample of white women (tables 26–28) yielded similar statistical results; analyses of the sample of black women (tables 29–31) showed differences that were similar in magnitude but were not statistically significant, probably because of small sample sizes. Women who were older, had ever been pregnant, and came from homes where the head of the household had less education, were more likely to have poor iron status measured by Hb, TS, or both.

Several other variables were significantly associated with two iron status categories. The dietary variable of vitamin and mineral supplementation was associated with TS or Hb combined with TS for the total sample and for white women. Previous diagnosis of anemia, which often is related to previous pregnancy, was associated with low Hb or low Hb combined with low TS for the same two samples. Women who reported using oral contraceptives, which may reduce iron losses by reducing menstrual blood flow, were more likely to be in the adequate TS and adequate Hb/TS categories; this association was significant for the total, white, and black samples. Of the demographic variables, age of the head of household was

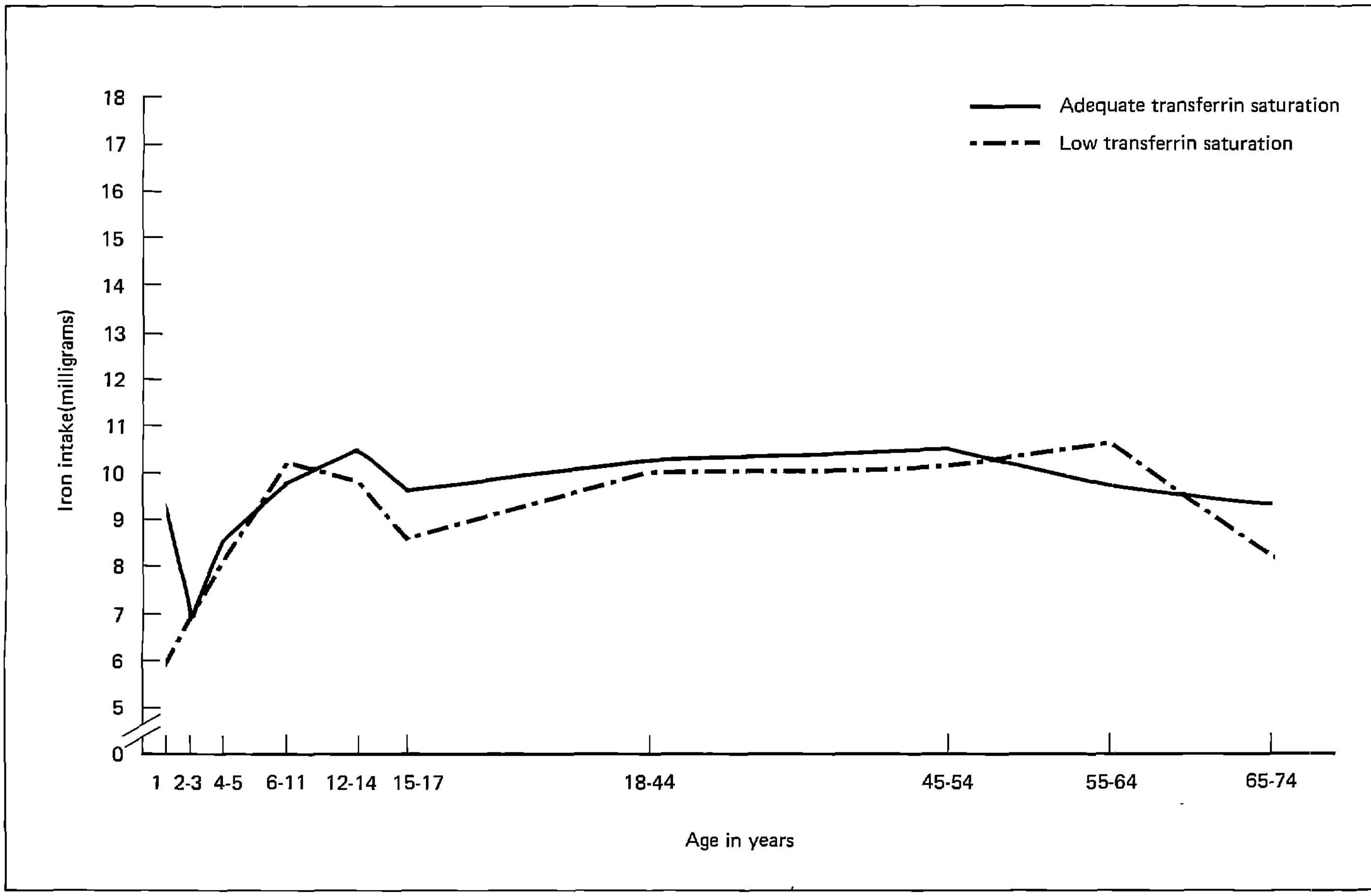

Figure 13. Mean iron intake for females ages 1-74 years, by age and transferrin saturation levels: United States, 1971–74

associated with Hb or Hb combined with TS in the total and white samples. In addition, a few variables showed significant associations with only one iron status category (tables 23–31).

Twelve variables were selected for examination in the multivariate framework. Two demographic variables—age and years of education of the head of household—that were consistently significant in the bivariate analyses were retained for the multivariate analyses. Race also was included, as was PIR. Of the dietary variables, regular vitamin use was a significant correlate in the bivariate analyses; (log) total iron intake and estimated available iron were automatically included; and pica was included for theoretical interest. The health variables chosen were previous pregnancy, previous diagnosis of anemia, and oral contraceptive use, which were significantly associated with iron status in the bivariate analyses, and age of menarche, which showed a high correlation.

Because this set of variables was larger and contained more intercorrelated variables than the set of variables chosen for multivariate analysis for children, the analytic strategy was more complex. First, a series of models was tested to (1) examine the significance of the individual independent variables, (2) ascertain which variables were confounded, and (3) identify the combination of variables that was most associated with iron status. These analyses yielded a final model of seven variables that were consistently and significantly associated with iron status, as shown in tables 32–34.

These seven variables included the four socioeconomic and demographic variables that were significant correlates of iron status in children—PIR, education of the head of household, age, and race. Persons from poorer homes and homes where the household head had less education were more likely to have low Hb. Black women were six times more likely to have low Hb and almost three times more likely to have low Hb/TS than white women. The older a woman was, the more likely she was to have poor iron status as measured by Hb, TS, or both.

The health variables were the other major factors affecting iron status over and above socioeconomic status, age, and race. Women who were using oral contraceptives were only half as likely to have low Hb, low TS, or low Hb/TS as women who did not use oral contraceptives. On the other hand, women who had ever been pregnant were more likely to be in the low Hb or low TS categories, and women who had been diagnosed as anemic were twice as likely to have low Hb or low Hb/TS as women who had never been diagnosed as anemic. Most diagnoses of anemia had been made during or immediately after pregnancy, which further suggests that pregnancy has long-term effects on iron status.

In fact, it is difficult in this approach to separate the effects of previous pregnancy, previous diagnosis of anemia, and age. Women who have been pregnant are more likely to have been diagnosed as anemic, and they also are generally older than women who have never been pregnant. When all three variables are entered in one model, only one or two remain significant. Therefore, it was concluded that the configuration of these variables is associated with iron status.

Elderly persons ages 65–74 years

The sample of the elderly included only a few persons who were classified as low Hb/TS, so the analyses of the relationship between iron status and possible correlates focused on low Hb and low TS.

Bivariate analyses of 30 variables revealed few significant differences between persons in the low or adequate Hb and low or adequate TS categories (tables 35 and 36). Low hemoglobin was significantly associated with lower PIR, more people in the household, and less education for both the examinee and the head of household in the analyses for the total sample. Significant health variables were previous diagnosis of anemia and, for women, previous pregnancy. Use of vitamin and mineral supplements was associated with Hb and vitamin C intake with TS. Low TS also was associated with aspirin use and with age of the head of household.

Separate analyses conducted for white persons and black persons yielded similar results (table 37–40). In most cases, the magnitude of the differences between groups was similar, but the differences usually were not significant within the racial groups because of the small sample sizes.

A set of 12 variables was selected for multivariate analysis. This set included five socioeconomic and demographic varibles (PIR, years of education of the head of household, age, race, and sex) and four dietary and health variables that were significant correlates in the bivariate analyses (regular vitamin use and regular vitamin and/or mineral use, previous diagnosis of anemia, and previous pregnancy). Estimated available iron and (log) total iron intake were included automatically. Two health variables that were reported by many people in the elderly subgroup—findings on the general medical examination and trouble eating—were included in the multivariate analysis, although they were not significant correlates in the bivariate analyses.

In the multivariate approach, six variables were significantly associated with low Hb, including race and sex; black persons were six times more likely to have low Hb than white persons, and men were seven times more likely to have low Hb than females. As was found in the analyses for menstruating women, the health variables were associated with hemoglobin, but dietary factors were not. Elderly persons who had a history of anemia, who said they had trouble eating, and who had health problems noted on their general medical exams were two to three times more likely to have low hemoglobin than persons without these difficulties.

Only one variable, years of education of the head of household, was associated with low TS in the elderly subgroup. However, this association was not significant in the bivariate analyses, nor were the associations between trouble eating and findings on the medical exam and low hemoglobin. Although the multivariate analyses indicated that socioeconomic and health factors are important contributors to iron status among the elderly, this approach did not reveal any clear-cut relationships.

Discussion

Iron-deficiency anemia is believed to be the major nutritional deficiency problem in the United States today.[3–5] Estimates of the prevalence vary, but there is general agreement that the populations at greatest risk are infants, adolescents, females during the reproductive years, and pregnant women.[12,20,49] The primary cause of anemia usually is attributed to nutrition, that is, the increased physiological need for iron either to support growth or to compensate for iron losses that exceed intake and absorption.[33] Small-scale and national nutrition studies have shown that iron intake is below recommended levels for the American population in general and for these high-risk groups in particular.[1,8,41,71]

The results of this study generally support the previous research on iron status and iron intake. Two somewhat unexpected findings emerged, however.

First, the study shows that iron deficiency as measured by low transferrin saturation levels is the most prevalent of the three measures of iron status in the United States. The prevalence of iron-deficiency anemia, in which the condition can be attributed to iron lack based on a combination of low transferrin saturation and low hemoglobin levels, is limited; this iron-deficiency anemia appears to be a problem only among very young children.

Second, although the dietary iron intake of children with low hemoglobin is significantly lower than that of children with adequate hemoglobin, there is no strong relationship between iron intake and iron status in the population as a whole.

Iron status in the United States

Low hemoglobin, perhaps the most widely used indicator of iron status, is most common in young children, pregnant women, older men, and the black population. At age 1, the prevalence of low hemoglobin in the total sample population is 19.3 percent for males and 12.6 percent for females, and at ages 2–3 years, it is approximately 9 percent for both sexes. After early childhood, the prevalence rarely exceeds 5 percent, except for males ages 65–74 years, when it rises to almost 15 percent. At all ages, however, black males and females are 2 to 10 times more likely to have low hemoglobin than white persons. Approximately 32 percent of the pregnant women in NHANES I had low hemoglobin, with a prevalence of 28.4 percent among white women and 52.9 percent among black women.

These findings are in general agreement with the results of other more limited studies. The *Ten-State Nutrition Survey,*[8] the *Preschool Nutrition Survey,*[72] and the *Nutrition Surveillance System* of the Centers for Disease Control[73] all found low hemoglobin in children ages 1–3 years. The presence of low hemoglobin among pregnant women has been reported widely.[52–54]

The high proportion of males ages 55–74 years who have low hemoglobin also has been reported in other studies, notably in the *Ten State Nutrition Survey.*[8] However, although men of this age have a high prevalence of low hemoglobin, no other evidence relates these levels to iron lack. It has been suggested that the phenomenon is attributable to changes in testosterone levels occurring with advancing age,[74] in which case the reference standard used to define hemoglobin status might be inappropriate for elderly men.

A high prevalence of low hemoglobin among black males and females of all ages also has been reported in many recent studies of iron status. In the *Ten-State Nutrition Survey,* a consistent 1 g/dl difference in mean hemoglobin levels between black persons and white persons of both sexes was found regardless of age, income, or region.[8] Mean hemoglobin levels of black children in the *Preschool Nutrition Survey* were 0.5 g/dl lower than mean values for white children, even after controlling for transferrin saturation.[44,47] Other studies, including the collaborative perinatal project,[42] the Bogalusa heart study,[46] and several small-scale studies,[45–48] found persistent differences in mean hemoglobin levels and hence, prevalence rates of low hemoglobin between black persons and white persons, using the same reference standards.

Although it is clear that the true prevalence of anemia is higher in the black population, differences in hemoglobin levels between black persons and white persons are evident among healthy persons.[43] Several researchers have suggested that lower mean hemoglobin values found for black persons are normal healthy iron status.[44] Because little difference in the TS values of black persons and white persons was found in this study and in others, the problem may lie with applying hemoglobin cutoff values traditionally used for white subjects to data obtained from black subjects.

In contrast to low hemoglobin, which was not common throughout the population, low circulating iron measured by transferrin saturation and total iron-binding capacity is widespread and is equally prevalent among black persons and white persons. Groups identified in this study as at the greatest risk of iron deficiency are children ages 1–5 years, adolescents ages 12–14 years, and women ages 18–44 years.

The finding that low TS is more prevalent than low hemoglobin is in agreement with earlier studies. Prasad, for example, cites six studies that reported low TS without low Hb, and he states that iron deficiency is two to three times more common than iron-deficiency anemia.[20]

Despite the high prevalence of low transferrin saturation (iron deficiency), iron-deficiency anemia (low Hb/TS) is not widespread according to NHANES I data. Although the condition seems to be a problem among 1-year-old children, only a small proportion of individuals over age 2 were classified as low Hb/TS. Apparently, iron intake adequately meets the iron needs associated with growth in adolescence and with menstrual blood loss during the female reproductive years, although the low values found for transferrin saturation and total iron-binding capacity indicate that iron nutrition is not optimal.

Diet

The recommended dietary allowances (RDAs) for iron intake are set at 10 mg/day for infants up to 6 months of age, children ages 4–10 years, males ages 19 and over, and post-menopausal women ages 50 and over. A higher intake of 15 mg/day is recommended for children 6 months to 4 years of age. An intake of 18 mg/day is recommended during adolescence (ages 11–18 years) and the female reproductive period (ages 18–50 years).[12]

Previous analyses of NHANES I data showed that iron intakes are well below RDAs for much of the U.S. population.[1,2] Groups whose intakes most often are deficient include those at greatest risk of anemia and iron deficiency—infants and preschoolers, adolescents, and females during their reproductive period. This study shows that low hemoglobin and low circulating iron are common in these groups, which suggests a clear association between iron intake and iron status. However, a comparison of mean dietary iron intake and iron status did not support that hypothesis; there was a significant association between low iron intake and poor iron status only among children ages 1–3 years.

The study did not detect relationships between iron intake and iron status. Although such relationships may not exist or may be confounded by other factors, the 24-hour recall method used to collect dietary intake data may have been inaccurate or unreliable or individuals may have been misclassified as to their iron status.

The 24-hour recall is a method used to collect information about a single day's dietary intake. It may not reliably reflect daily dietary intake[52,73] nor intake over a longer period. The relationship between iron intake and iron status may not lie with dietary iron intake alone, but with a more refined measure (perhaps estimates adjusted for bioavailability). Yet when iron intake was adjusted experimentally in the multivariate analyses, the adjusted estimate was not a better predictor of low hemoglobin in children than (log) total mean iron intake.

Misclassification of persons with adequate iron status into low iron status categories may have affected the ability to uncover a relationship between iron intake and iron status. If, for example, the reference standard for hemoglobin were inappropriate, it would be difficult to differentiate anemic and nonanemic groups. Even if this reference standard did identify correctly the majority of healthy individuals (a highly specific diagnosis), dilution of the anemic group could occur if the prevalence of low hemoglobin was low, as it was in this study. Thus the unreliability of the dependent variable—iron status—may have diminished the power to detect effects.

The measures of iron status also may be too broad. Although hemoglobin and transferrin saturation measurements can reflect the presence of iron deficiency, neither gives any clue to the cause—whether iron deficiency results from decreased iron intake or increased iron requirements. Yet iron loss due to bleeding has different implications from other causes of increased requirements, because bleeding losses often cannot be covered by dietary iron intakes.

Finally, the consistent relationship between reported iron intake and iron status among young children may reflect a greater real association between iron intake and iron status. This may be due to several factors associated with this age group—increased iron needs due to growth, maternal awareness and control over what the child eats, or a more limited diet.

Socioeconomic, demographic, and health factors

The multivariate logistic analyses were designed to point to associations between iron status and selected dietary, socioeconomic, demographic, and health factors. In this approach, race, age, and sex are all correlates of iron status. Race was significantly associated with iron status in three high-risk groups—children ages 1–3 years, menstruating women ages 12–54 years, and persons ages 65–74 years. Age was a significant correlate for children and women, and sex was a significant correlate for the elderly.

Two socioeconomic factors were significant even when dietary and health variables, race, age, and sex were taken into account. Women and children from poor homes, as measured by the poverty income ratio, are most likely to have poor iron status. The education of the head of the household was significantly associated with iron status in all three groups.

Educational attainment generally is regarded as associated with income, and years of education of the head of household was correlated with iron status. However, the relationship of education to iron status is not simply a function of income. Even when PIR was taken into account in multivariate analysis, years of education of the head of household had a distinct significant association with iron status.

Several health variables also were associated with iron status among adults in this study. For menstruating women ages 12–54 years, oral contraceptive use, reproductive history, and prior diagnosis of anemia all were important. Individuals who have ever been diagnosed as anemic were more likely to have poor iron status later in life. Anemia routinely is treated with oral iron preparations, but after the treatment period is over, the dietary or health conditions that contributed to anemia may exert their effect again. The role of oral contraceptives in reducing blood losses and of pregnancy in draining iron stores are well established as factors affecting iron status.[52]

For persons ages 65–74 years, findings on the general medical examination and problems related to eating were associated with iron status in the multivariate approach used in this study. However, these associations did not occur across all analyses, so the conclusions for the elderly are less certain.

These multivariate analyses are only one approach to looking at correlates of iron status in the United States. They are not designed to show any cause-and-effect relationships, but the findings for the socioeconomic, demographic, and health variables did indicate that other factors besides iron intake should be investigated in future studies of iron status.

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List of detailed tables

Table 1. Hemoglobin levels for males 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
			Hemoglobin in grams per deciliter										
All races[1]													
1 year	272	1,692	11.9	0.08	7.9	9.8	10.4	11.2	12.2	13.0	13.3	13.6	13.9
2–3 years	577	3,538	12.4	0.08	10.7	11.0	11.3	11.8	12.5	13.1	13.5	13.8	14.2
4–5 years	549	3,379	12.7	0.07	11.2	11.5	11.7	12.1	12.7	13.3	13.8	14.0	14.4
6–11 years	974	11,913	13.2	0.05	11.7	12.0	12.3	12.6	13.3	13.9	14.2	14.4	14.8
12–14 years	519	6,348	14.1	0.05	12.2	12.6	13.0	13.3	14.1	14.8	15.2	15.5	16.0
15–17 years	487	6,196	15.2	0.09	13.1	13.6	13.9	14.3	15.2	16.0	16.4	16.6	16.8
18–44 years	2,128	35,425	15.7	0.05	13.9	14.3	14.7	15.0	15.8	16.4	16.8	17.1	17.5
45–54 years	740	11,156	15.8	0.05	13.9	14.3	14.6	15.0	15.8	16.6	17.0	17.4	17.9
55–64 years	569	8,993	15.4	0.06	13.2	13.8	14.0	14.7	15.5	16.2	16.7	17.0	17.6
65–74 years	1,581	5,495	15.3	0.04	13.0	13.6	14.0	14.5	15.3	16.2	16.7	16.9	17.4
White													
1 year	199	1,401	12.2	0.09	9.6	10.4	11.0	11.5	12.3	13.1	13.5	13.7	14.0
2–3 years	425	2,991	12.5	0.08	10.8	11.1	11.4	11.9	12.5	13.1	13.5	13.8	14.2
4–5 years	419	2,857	12.8	0.07	11.3	11.6	11.9	12.1	12.7	13.5	13.8	14.1	14.4
6–11 years	734	10,070	13.3	0.06	11.9	12.2	12.4	12.7	13.4	13.9	14.2	14.4	14.8
12–14 years	396	5,434	14.2	0.06	12.5	13.0	13.1	13.5	14.2	14.8	15.3	15.5	16.2
15–17 years	373	5,297	15.2	0.10	13.3	13.7	14.0	14.4	15.3	16.1	16.5	16.6	16.9
18–44 years	1,786	31,376	15.8	0.06	14.0	14.5	14.8	15.1	15.8	16.5	16.8	17.1	17.5
45–54 years	607	10,045	15.8	0.05	14.0	14.4	14.7	15.1	15.8	16.6	17.0	17.4	17.8
55–64 years	484	8,195	15.5	0.06	13.3	13.8	14.0	14.7	15.5	16.3	16.7	17.0	17.6
65–74 years	1,293	4,969	15.4	0.04	13.2	13.8	14.0	14.6	15.5	16.3	16.7	16.9	17.4
Black													
1 year	70	281	10.6	0.21	6.8	7.3	7.3	9.6	11.1	12.4	12.6	12.7	12.8
2–3 years	138	473	12.0	0.07	10.1	10.6	10.7	11.5	12.2	12.9	13.2	13.2	13.6
4–5 years	127	495	12.2	0.11	10.8	11.0	11.0	11.5	12.2	13.0	13.2	13.3	13.6
6–11 years	229	1,732	12.7	0.09	11.1	11.4	11.5	11.9	12.6	13.4	14.0	14.2	14.4
12–14 years	121	877	13.1	0.11	11.7	11.7	11.9	12.3	13.0	13.7	14.3	14.6	14.6
15–17 years	108	809	14.6	0.11	12.6	13.0	13.1	13.8	14.7	15.5	15.9	16.3	16.4
18–44 years	307	3,529	15.3	0.08	13.5	13.9	14.2	14.7	15.3	15.9	16.4	16.5	17.0
45–54 years	126	1,059	15.4	0.09	13.3	13.7	14.0	14.3	15.3	16.0	16.9	18.0	18.2
55–64 years	77	707	14.8	0.12	12.5	13.8	13.8	14.0	14.9	15.4	16.0	16.1	16.8
65–74 years	270	482	14.3	0.10	11.8	12.3	12.7	13.2	14.4	15.1	15.5	15.9	17.0

[1] Includes data for races which are not shown as separate categories.

Table 2. Hemoglobin levels for females[1] 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	Number of examined persons	Estimated population in thousands	Mean	Standard error of the mean	Percentile 5th	10th	15th	25th	50th	75th	85th	90th	95th
					Hemoglobin in grams per deciliter								
All races[2]													
1 year	254	1,625	12.0	0.06	9.5	10.6	11.1	11.4	12.1	12.7	13.1	13.3	13.7
2–3 years	535	3,390	12.4	0.09	10.7	11.0	11.3	11.7	12.4	13.1	13.4	13.6	14.1
4–5 years	571	3,301	12.8	0.07	11.2	11.5	11.8	12.0	12.7	13.5	13.8	14.0	14.6
6–11 years	974	11,455	13.1	0.05	11.6	11.9	12.2	12.5	13.1	13.8	14.1	14.3	14.8
12–14 years	534	6,043	13.5	0.07	12.1	12.3	12.5	12.8	13.5	14.1	14.5	14.7	15.2
15–17 years	457	5,932	13.7	0.07	12.0	12.4	12.6	13.0	13.7	14.5	14.9	15.2	15.6
18–44 years	4,613	36,998	13.7	0.04	12.0	12.4	12.6	13.0	13.7	14.4	14.8	15.1	15.5
45–54 years	788	12,159	14.0	0.06	12.0	12.5	12.8	13.3	14.0	14.7	15.1	15.4	15.9
55–64 years	639	10,054	14.1	0.06	12.5	12.7	13.0	13.4	14.1	14.9	15.3	15.6	15.8
65–74 years	1,728	7,275	14.0	0.05	12.0	12.4	12.8	13.2	14.0	14.8	15.2	15.5	15.8
White													
1 year	179	1,328	12.0	0.06	9.5	10.9	11.3	11.4	12.1	12.7	13.2	13.3	13.6
2–3 years	401	2,857	12.5	0.10	10.8	11.0	11.4	11.8	12.6	13.2	13.5	13.9	14.2
4–5 years	418	2,777	12.8	0.08	11.3	11.7	11.9	12.1	12.8	13.5	13.8	14.0	14.7
6–11 years	734	9,630	13.3	0.05	11.6	12.1	12.3	12.6	13.2	13.8	14.1	14.4	14.8
12–14 years	401	5,146	13.6	0.08	12.3	12.4	12.6	12.9	13.6	14.2	14.5	14.8	15.2
15–17 years	357	5,132	13.9	0.08	12.1	12.5	12.8	13.1	13.8	14.6	15.0	15.3	15.6
18–44 years	3,679	32,243	13.8	0.05	12.2	12.5	12.8	13.1	13.8	14.5	14.9	15.2	15.6
45–54 years	665	10,876	14.0	0.06	12.1	12.6	12.9	13.3	14.1	14.8	15.2	15.4	16.0
55–64 years	531	9,115	14.2	0.06	12.6	12.9	13.2	13.5	14.2	14.9	15.4	15.6	15.8
65–74 years	1,426	6,600	14.1	0.05	12.2	12.6	12.9	13.3	14.0	14.9	15.3	15.6	15.9
Black													
1 year	70	260	11.6	0.17	9.5	9.7	9.8	11.1	11.7	12.5	12.8	13.0	14.0
2–3 years	128	501	11.8	0.11	10.2	10.7	10.9	11.4	11.8	12.3	12.7	12.8	13.2
4–5 years	148	506	12.5	0.10	11.0	11.1	11.3	11.7	12.4	13.1	13.8	13.9	14.1
6–11 years	234	1,745	12.6	0.07	11.2	11.5	11.8	12.0	12.5	13.2	13.6	13.8	14.2
12–14 years	128	831	13.0	0.08	11.7	11.9	12.1	12.5	12.9	13.7	14.0	14.2	14.4
15–17 years	98	775	13.0	0.09	11.3	11.4	12.0	12.2	13.1	13.9	14.0	14.2	14.4
18–44 years	865	4,354	13.1	0.06	11.0	11.6	11.9	12.3	13.1	14.0	14.4	14.6	15.0
45–54 years	118	1,235	13.5	0.12	11.6	12.0	12.3	12.8	13.6	14.2	14.7	14.7	15.1
55–64 years	105	868	13.3	0.15	11.3	11.9	12.2	12.5	13.4	14.1	14.4	14.5	15.2
65–74 years	294	651	13.1	0.07	10.7	11.3	11.9	12.3	13.1	14.0	14.7	14.8	15.1

[1] Does not include data for pregnant women.
[2] Includes data for races which are not shown as separate categories.

Table 3. Hematocrit levels for males 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
All races[1]					Hematocrit in percent								
1 year	272	1,692	36.1	0.19	29.0	31.0	33.0	35.0	36.0	39.0	39.1	40.0	41.0
2–3 years	577	3,538	36.9	0.14	33.0	34.0	34.0	35.0	37.0	38.1	39.1	40.0	41.0
4–5 years	549	3,379	37.6	0.14	34.0	35.0	35.0	36.0	37.1	39.0	40.1	41.0	42.0
6–11 years	974	11,913	38.9	0.14	35.0	36.0	36.1	37.0	39.0	41.0	41.1	42.0	44.0
12–14 years	519	6,348	41.3	0.14	37.0	38.0	38.0	39.0	41.0	43.1	45.0	45.0	46.0
15–17 years	487	6,196	44.4	0.23	39.0	40.0	41.0	42.0	45.0	47.0	48.0	48.0	49.0
18–44 years	2,128	35,425	46.0	0.11	41.0	42.0	43.0	44.0	46.0	48.0	49.0	50.0	51.0
45–54 years	740	11,156	46.1	0.12	41.0	42.0	43.0	44.0	46.0	48.1	49.1	50.0	51.1
55–64 years	569	8,993	45.5	0.15	40.0	41.0	42.0	43.0	45.0	48.0	49.0	50.0	51.0
65–74 years	1,581	5,495	45.3	0.11	39.0	41.0	42.0	43.0	45.1	48.0	49.0	50.0	52.0
White													
1 year	199	1,401	36.5	0.22	30.0	33.0	34.0	35.0	36.1	39.0	40.0	40.0	41.0
2–3 years	425	2,991	37.0	0.16	34.0	34.0	34.0	35.0	37.0	38.1	39.1	40.0	41.0
4–5 years	419	2,857	37.7	0.15	34.0	35.0	35.0	36.0	37.1	39.0	40.1	41.0	42.0
6–11 years	734	10,070	39.1	0.15	35.0	36.0	37.0	37.1	39.0	41.0	41.1	42.0	43.1
12–14 years	396	5,434	41.7	0.15	37.0	38.0	39.0	39.1	42.0	44.0	45.0	45.1	46.1
15–17 years	373	5,297	44.6	0.26	39.1	40.1	41.0	43.0	45.0	47.0	48.0	48.0	49.0
18–44 years	1,786	31,376	46.0	0.11	41.1	42.1	43.0	44.0	46.0	48.0	49.0	50.0	51.0
45–54 years	607	10,045	46.1	0.14	41.0	42.0	43.0	44.0	46.0	48.1	49.1	50.0	51.0
55–64 years	484	8,195	45.6	0.15	40.0	41.0	42.0	43.1	45.1	48.0	49.0	50.0	51.0
65–74 years	1,293	4,969	45.5	0.11	39.1	41.0	42.0	43.0	46.0	48.0	49.0	50.0	52.0
Black													
1 year	70	281	34.2	0.45	26.0	26.0	27.0	32.0	36.0	38.0	39.0	39.0	40.0
2–3 years	138	473	36.7	0.20	29.0	33.0	34.0	35.0	37.1	39.0	39.0	40.0	40.1
4–5 years	127	495	37.1	0.27	33.0	34.0	34.0	35.0	37.0	39.0	40.0	41.0	43.0
6–11 years	229	1,732	38.0	0.17	34.0	35.0	35.0	36.0	38.0	40.0	41.0	42.0	44.0
12–14 years	121	877	39.3	0.29	35.0	36.0	37.0	37.0	39.0	41.0	43.0	43.0	44.0
15–17 years	108	809	43.3	0.28	38.0	39.0	39.1	41.0	43.0	46.0	47.0	48.0	49.0
18–44 years	307	3,529	45.5	0.19	41.0	42.0	43.0	44.0	45.0	47.0	48.1	49.1	51.0
45–54 years	126	1,059	46.3	0.24	39.1	42.0	42.0	43.1	46.0	48.1	50.0	50.1	57.0
55–64 years	77	707	44.0	0.38	37.0	41.0	41.0	42.0	44.0	45.1	48.0	48.0	49.0
65–74 years	270	482	43.2	0.20	37.0	38.0	39.0	41.0	43.1	45.1	47.0	48.0	51.0

[1] Includes data for races which are not shown as separate categories.

Table 4. Hematocrit levels for females[1] 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
					Hematocrit in percent								
All races[2]													
1 year	254	1,625	37.0	0.19	32.0	34.0	34.1	35.0	37.0	39.0	40.0	40.1	42.1
2–3 years	535	3,390	37.0	0.16	33.0	34.0	34.0	35.0	37.0	38.1	39.1	41.0	41.1
4–5 years	571	3,301	37.6	0.17	34.0	35.0	35.0	36.0	37.1	39.1	40.0	41.0	42.0
6–11 years	974	11,455	38.9	0.09	35.0	36.0	36.1	37.0	39.0	40.1	41.1	42.0	43.0
12–14 years	534	6,043	40.0	0.15	36.0	37.0	37.1	38.0	40.0	41.1	43.0	43.1	44.1
15–17 years	457	5,932	40.8	0.14	36.0	37.0	38.0	39.0	41.0	43.0	44.0	45.0	46.0
18–44 years	4,613	36,998	40.9	0.10	37.0	37.1	38.0	39.0	41.0	43.0	44.0	45.0	46.0
45–54 years	788	12,159	41.9	0.15	37.0	38.0	39.0	40.0	42.0	44.0	45.0	46.0	47.1
55–64 years	639	10,054	42.2	0.21	37.0	38.0	39.0	40.0	42.0	44.0	45.1	46.0	48.0
65–74 years	1,728	7,275	41.8	0.14	37.0	38.0	39.0	40.0	42.0	44.0	45.0	46.0	47.0
White													
1 year	179	1,328	37.0	0.24	32.0	34.0	35.0	35.0	37.0	39.0	40.0	41.0	43.0
2–3 years	401	2,857	37.1	0.19	33.0	34.0	34.0	35.0	37.0	39.0	40.0	41.0	41.1
4–5 years	418	2,777	37.7	0.19	34.0	35.0	35.0	36.0	37.1	39.0	40.0	41.0	42.0
6–11 years	734	9,630	39.0	0.11	35.1	36.0	37.0	37.0	39.0	41.0	42.0	42.1	43.1
12–14 years	401	5,146	40.1	0.18	36.1	37.0	38.0	38.1	40.0	42.0	43.0	43.1	45.0
15–17 years	357	5,132	41.0	0.17	36.0	37.1	38.0	39.0	41.0	43.0	44.0	45.0	46.0
18–44 years	3,679	32,243	41.1	0.10	37.0	38.0	38.0	39.0	41.0	43.0	44.0	45.0	46.0
45–54 years	665	10,876	42.0	0.16	37.0	38.0	39.0	40.0	42.0	44.0	45.0	46.0	48.0
55–64 years	531	9,115	42.4	0.23	37.0	39.0	39.1	40.1	42.0	44.1	45.1	46.0	48.0
65–74 years	1,426	6,600	42.0	0.15	37.0	38.0	39.0	40.0	42.0	44.0	45.0	46.0	47.0
Black													
1 year	70	260	36.6	0.42	32.0	33.0	33.1	34.1	36.0	40.0	40.0	40.1	42.0
2–3 years	128	501	36.3	0.25	32.1	34.0	35.0	35.0	36.1	38.0	38.1	39.0	40.0
4–5 years	148	506	37.2	0.25	33.1	34.0	35.0	35.0	37.0	40.0	40.0	40.1	41.0
6–11 years	234	1,745	38.0	0.17	34.0	35.0	36.0	37.0	38.0	40.0	40.1	41.1	42.0
12–14 years	128	831	39.3	0.17	35.0	36.1	37.0	38.0	39.0	41.0	42.0	42.0	44.0
15–17 years	98	775	39.3	0.28	35.0	36.0	36.0	38.0	39.0	41.0	42.0	43.1	45.0
18–44 years	865	4,354	39.7	0.16	34.0	36.0	37.0	38.0	39.1	42.0	43.1	44.0	45.0
45–54 years	118	1,235	41.3	0.34	36.0	37.0	38.0	40.0	41.0	44.0	44.0	44.1	46.0
55–64 years	105	868	40.5	0.37	35.0	35.1	37.0	39.0	40.1	43.0	44.0	45.0	45.1
65–74 years	294	651	40.2	0.19	34.0	36.0	37.0	38.0	41.0	43.0	44.0	44.1	46.0

[1] Does not include data for pregnant women.

[2] Includes data for races which are not shown as separate categories.

Table 5. Serum iron levels for males 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
			Serum iron in micrograms per deciliter										
All races[1]													
1 year	114	729	67.8	2.89	26.0	29.0	32.0	41.1	59.0	88.1	105.1	114.0	143.1
2–3 years	345	2,222	85.8	1.52	35.0	44.1	50.1	57.0	81.0	108.0	122.1	133.1	161.2
4–5 years	552	3,372	86.3	1.44	33.0	42.0	50.0	63.0	84.1	109.0	117.1	133.0	146.2
6–11 years	979	11,925	94.1	1.24	43.0	52.0	60.0	70.0	92.1	113.1	129.1	139.1	154.0
12–14 years	526	6,260	107.0	1.66	53.0	63.0	74.1	84.0	102.1	129.2	140.0	154.1	166.2
15–17 years	485	6,248	119.8	2.22	61.0	71.1	77.0	92.0	114.1	142.2	154.2	165.1	198.0
18–44 years	2,126	35,449	110.7	1.01	60.0	67.1	74.1	85.0	105.1	133.0	145.2	156.1	180.0
45–54 years	715	11,137	105.7	1.79	54.0	64.0	69.1	80.0	99.0	127.0	141.2	151.2	174.2
55–64 years	556	8,990	102.4	1.61	52.0	62.0	69.0	79.1	100.0	121.1	136.2	150.1	170.2
65–74 years	1,545	5,496	107.7	0.94	57.0	66.1	72.1	84.0	105.1	126.1	143.2	154.1	167.2
White													
1 year	88	631	69.7	3.15	26.0	29.0	32.0	45.0	66.0	89.1	105.1	114.0	143.2
2–3 years	253	1,892	84.1	1.62	35.0	44.1	50.0	56.0	79.1	106.1	120.0	130.2	161.1
4–5 years	411	2,859	87.1	1.71	33.0	45.0	51.0	64.0	85.1	109.0	118.0	134.0	146.2
6–11 years	719	10,086	94.5	1.35	42.0	51.0	60.0	70.1	93.0	114.0	130.1	139.2	154.2
12–14 years	393	5,343	108.2	1.83	54.0	65.0	75.0	84.1	103.1	130.2	142.2	155.1	171.0
15–17 years	360	5,354	122.5	2.63	58.0	71.0	78.1	95.0	120.1	144.2	156.2	170.0	200.1
18–44 years	1,753	31,398	111.1	1.07	60.0	67.1	75.0	85.1	105.1	133.1	146.1	157.2	180.2
45–54 years	579	10,026	106.4	2.00	54.0	64.0	70.0	80.0	99.1	127.1	142.2	153.1	175.1
55–64 years	464	8,192	102.3	1.77	51.0	61.0	68.0	79.0	99.1	121.1	136.2	151.2	172.0
65–74 years	1,232	4,969	108.6	1.01	57.1	67.1	74.1	85.0	106.0	128.1	144.1	154.1	167.1
Black													
1 year	26	99	55.6	6.44	25.0	26.0	26.0	28.0	42.1	59.1	100.0	106.1	125.1
2–3 years	83	279	96.1	4.21	25.0	43.0	54.0	64.0	95.0	131.0	139.1	144.2	164.2
4–5 years	138	488	82.3	2.65	32.1	35.0	38.0	61.0	79.0	109.0	116.1	124.0	142.2
6–11 years	250	1,738	91.6	2.27	48.1	53.0	62.0	68.0	91.1	111.0	124.1	136.1	146.2
12–14 years	131	883	98.3	2.36	38.0	53.0	65.1	77.1	98.0	120.0	126.0	137.2	154.0
15–17 years	119	813	103.7	2.05	65.1	72.0	72.1	80.1	101.1	121.0	129.2	134.2	159.1
18–44 years	337	3,519	105.1	2.26	58.0	64.1	72.1	83.0	101.1	124.1	141.2	151.0	169.0
45–54 years	130	1,073	99.1	3.11	60.0	64.1	65.1	77.0	97.1	117.0	128.0	133.1	151.0
55–64 years	85	715	101.0	3.40	59.1	70.1	75.1	79.0	102.0	116.1	134.0	134.2	144.0
65–74 years	294	486	98.0	1.73	51.0	59.0	65.0	75.0	92.0	116.0	131.1	144.2	170.2

[1] Includes data for races which are not shown as separate categories.

Table 6. Serum iron levels for females[1] 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	Number of examined persons	Estimated population in thousands	Mean	Standard error of the mean	Percentile 5th	10th	15th	25th	50th	75th	85th	90th	95th
			Serum iron in micrograms per deciliter										
All races[2]													
1 year	77	505	78.5	4.28	27.0	29.0	41.0	56.0	75.1	96.1	113.1	122.0	157.1
2–3 years	314	2,076	88.8	1.71	34.0	45.0	50.0	65.0	86.0	113.1	124.0	136.2	147.0
4–5 years	571	3,295	89.4	1.81	41.0	53.0	56.0	68.1	86.1	108.1	117.1	130.2	145.0
6–11 years	988	11,433	96.1	1.25	48.1	58.0	64.1	71.1	95.0	117.0	129.1	137.2	148.0
12–14 years	535	6,036	99.2	1.96	46.0	56.0	65.1	76.1	98.1	120.1	133.0	139.2	156.2
15–17 years	462	5,980	101.5	1.42	43.0	53.1	62.0	72.0	100.1	127.0	143.2	153.2	164.2
18–44 years	4,661	37,052	101.5	0.63	43.0	53.1	59.0	72.0	96.1	126.0	143.2	157.0	176.2
45–54 years	789	12,165	99.9	2.31	47.0	59.0	67.1	76.1	94.0	117.0	138.2	152.2	172.2
55–64 years	632	10,037	101.2	2.96	55.0	62.0	67.0	78.0	97.1	118.1	130.0	138.2	166.1
65–74 years	1,701	7,283	97.6	0.63	54.0	60.1	67.1	76.0	95.0	116.1	127.0	135.2	152.1
White													
1 year	56	438	79.0	4.94	27.0	29.0	37.0	56.0	75.1	103.0	113.1	122.0	157.2
2–3 years	234	1,799	91.2	1.94	34.0	45.0	56.0	68.1	87.1	114.0	124.1	140.2	147.1
4–5 years	405	2,758	90.4	2.00	44.0	54.1	58.0	69.0	87.0	108.1	119.0	131.2	145.1
6–11 years	720	9,625	96.8	1.51	48.0	58.0	64.1	73.0	95.1	118.1	131.1	138.2	151.0
12–14 years	389	5,133	99.8	2.20	45.1	56.0	65.1	76.1	98.1	121.0	133.2	139.2	157.2
15–17 years	350	5,160	101.0	1.66	43.0	53.1	62.0	71.1	100.0	124.1	142.0	153.2	165.1
18–44 years	3,637	32,290	102.5	0.68	44.0	55.0	60.0	73.0	97.1	127.0	145.2	158.2	178.2
45–54 years	658	10,880	102.0	2.61	46.1	59.1	69.1	78.1	96.1	120.0	140.1	157.0	175.2
55–64 years	514	9,103	102.2	3.24	55.1	62.0	67.1	79.0	98.0	118.1	130.2	141.1	170.0
65–74 years	1,375	6,606	98.7	0.69	55.0	62.0	68.1	77.1	95.1	117.1	129.0	137.0	154.0
Black													
1 year	20	59	*74.7	*	35.0	43.0	43.0	43.0	59.1	92.1	108.1	123.1	154.1
2–3 years	76	264	73.0	2.79	33.0	35.0	45.0	50.0	73.1	88.1	108.1	113.0	117.1
4–5 years	161	515	84.4	2.34	35.0	45.0	46.0	62.0	85.1	105.1	114.1	124.0	144.1
6–11 years	262	1,735	91.8	2.08	54.0	58.0	63.0	69.1	87.1	114.0	124.1	128.2	139.1
12–14 years	141	818	95.8	2.45	49.0	54.0	60.0	74.1	95.1	115.0	132.0	139.0	153.2
15–17 years	110	796	105.5	3.53	41.1	52.1	62.0	74.0	104.1	139.1	144.2	146.2	164.0
18–44 years	956	4,373	93.8	1.21	38.1	48.0	55.0	66.0	89.1	116.1	135.1	143.2	161.1
45–54 years	126	1,243	81.7	2.33	48.1	56.0	58.1	66.1	76.1	92.1	106.0	112.1	135.1
55–64 years	115	848	92.0	3.44	55.0	60.0	62.1	67.0	84.1	112.1	124.0	126.0	144.2
65–74 years	318	656	86.9	1.14	49.0	54.0	59.1	71.0	82.1	105.0	117.0	124.1	136.1

[1] Does not include data for pregnant women.

[2] Includes data for races which are not shown as separate categories.

NOTE: Asterisks indicate estimates that do not meet this report's standards of reliability.

Table 7. Total iron binding capacity levels for males, 1-74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Number of examined persons	Estimated population in thousands	Mean	Standard error of the mean	Percentile								
					5th	10th	15th	25th	50th	75th	85th	90th	95th
			Total iron binding capacity in micrograms per deciliter										
All races[1]													
1 year	121	755	433.2	7.41	321.4	331.2	355.1	378.4	417.3	482.4	529.2	549.7	593.1
2-3 years	352	2,249	382.2	3.50	302.4	323.2	334.2	347.4	374.2	413.1	444.1	461.5	479.2
4-5 years	552	3,372	373.9	2.63	292.1	316.3	325.1	341.4	369.1	410.2	425.2	438.0	452.3
6-11 years	979	11,925	374.3	2.08	300.2	318.3	330.2	346.4	373.1	404.0	421.3	433.1	443.5
12-14 years	526	6,260	385.5	2.02	304.2	323.4	336.3	353.1	385.0	416.2	441.2	452.4	467.2
15-17 years	485	6,248	380.7	2.29	303.5	317.1	327.4	347.1	380.4	416.2	437.1	450.0	458.3
18-44 years	2,126	35,449	359.9	1.11	292.3	305.1	313.4	328.3	358.2	389.0	406.4	417.5	440.2
45-54 years	715	11,137	360.4	1.90	279.3	293.3	309.2	325.1	358.0	392.0	413.4	428.2	459.2
55-64 years	556	8,990	352.5	2.91	277.2	290.2	303.4	314.4	349.3	386.1	404.4	418.5	452.3
65-74 years	1,545	5,496	337.7	1.30	265.2	279.1	290.1	303.2	333.2	365.3	389.1	405.1	434.5
White													
1 year	90	638	427.9	8.75	321.3	331.4	350.5	373.4	414.4	475.4	517.9	549.3	567.3
2-3 years	256	1,917	380.5	4.07	306.0	323.2	333.5	347.4	373.1	408.0	443.3	457.1	478.2
4-5 years	411	2,859	374.3	2.88	289.5	316.3	327.3	342.0	367.2	410.2	423.2	444.0	453.1
6-11 years	719	10,086	375.5	2.39	300.3	321.2	333.0	349.3	374.0	406.1	421.3	433.2	443.3
12-14 years	393	5,343	386.3	2.35	308.1	329.2	339.4	353.2	385.1	416.3	442.4	453.3	468.2
15-17 years	360	5,354	381.5	2.75	309.1	317.4	331.3	347.4	379.3	416.3	437.1	450.4	461.2
18-44 years	1,753	31,398	360.1	1.12	293.0	305.2	314.1	328.4	358.4	388.4	406.5	418.1	440.4
45-54 years	579	10,026	360.6	2.03	279.3	294.3	310.0	326.2	358.4	391.0	414.0	428.0	449.5
55-64 years	464	8,192	353.3	3.10	277.1	289.4	305.0	316.0	349.5	386.2	405.0	417.5	453.1
65-74 years	1,232	4,969	339.3	1.47	268.3	282.1	292.0	304.1	334.1	367.0	390.3	407.4	436.2
Black													
1 year	31	117	461.6	13.48	325.1	325.5	355.4	415.3	446.3	531.6	553.7	593.4	593.9
2-3 years	87	282	398.0	6.43	296.2	334.0	337.2	358.4	396.3	439.0	463.4	482.0	517.3
4-5 years	138	488	372.7	5.46	293.1	316.1	319.3	330.5	377.4	411.2	430.3	436.2	438.1
6-11 years	250	1,738	368.6	3.43	299.4	317.0	324.1	336.1	365.4	396.3	421.5	430.4	444.4
12-14 years	131	883	379.3	4.40	289.4	303.5	316.0	336.5	381.2	410.3	437.4	444.5	466.2
15-17 years	119	813	374.9	3.71	292.3	306.1	317.1	332.2	381.3	411.4	439.0	446.1	449.4
18-44 years	337	3,519	360.1	3.07	290.2	304.1	311.3	325.3	357.2	394.0	408.2	424.1	441.0
45-54 years	130	1,073	358.1	4.47	281.3	291.3	294.2	314.0	344.3	398.3	412.4	452.1	472.5
55-64 years	85	715	337.5	4.04	280.4	293.2	296.2	307.4	343.0	354.3	372.0	401.1	425.3
65-74 years	294	488	321.5	1.98	235.0	256.1	271.1	286.4	321.0	350.2	368.2	382.1	411.3

[1] Includes data for races which are not shown as separate categories.

Table 8. Total iron binding capacity levels for females[1] 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	Number of examined persons	Estimated population in thousands	Mean	Standard error of the mean	Percentile 5th	10th	15th	25th	50th	75th	85th	90th	95th
			Total iron binding capacity in micrograms per deciliter										
All races[2]													
1 year	81	525	406.8	9.74	312.4	320.4	335.3	349.1	401.0	444.4	467.4	507.2	542.3
2–3 years	321	2,134	384.1	2.90	306.0	316.0	324.4	344.5	385.0	419.1	439.3	457.3	474.4
4–5 years	571	3,295	369.4	2.91	295.2	312.1	320.3	336.2	366.1	396.5	423.2	441.2	455.3
6–11 years	988	11,433	376.9	2.20	303.4	322.1	331.0	344.1	374.0	407.2	421.3	437.3	459.0
12–14 years	535	6,036	397.0	2.44	312.1	327.5	337.3	349.0	383.3	418.3	446.2	458.5	485.2
15–17 years	462	5,980	388.4	2.88	312.3	323.3	333.0	348.4	385.0	422.2	448.0	457.3	482.1
18–44 years	4,661	37,052	386.2	1.69	288.3	307.5	319.3	337.5	378.3	430.4	458.4	477.2	507.3
45–54 years	789	12,165	369.0	2.32	287.2	302.4	315.3	331.2	365.1	401.3	425.5	439.3	473.2
55–64 years	632	10,037	351.5	2.07	283.1	291.4	304.4	320.4	349.4	378.0	396.2	410.3	433.2
65–74 years	1,701	7,283	349.3	1.62	274.4	287.1	297.3	313.0	346.3	380.5	402.1	418.4	446.2
White													
1 year	57	450	403.2	11.61	314.5	320.4	337.2	344.5	401.1	444.1	467.1	488.1	533.5
2–3 years	237	1,838	380.6	3.22	305.4	314.3	324.2	344.0	380.2	418.0	431.2	451.2	469.4
4–5 years	405	2,758	369.9	3.46	292.3	310.4	320.2	336.1	367.0	400.0	430.4	445.2	455.3
6–11 years	720	9,625	376.1	2.49	306.3	323.2	331.5	343.5	372.3	406.2	420.0	436.0	458.2
12–14 years	389	5,133	385.9	2.79	310.4	324.3	337.0	348.1	383.0	418.1	442.4	458.4	485.2
15–17 years	350	5,160	386.4	3.33	309.5	323.2	332.2	347.3	385.3	420.2	445.0	456.3	479.4
18–44 years	3,637	32,290	385.7	1.92	289.3	308.1	319.4	337.3	377.2	428.2	457.1	477.3	510.1
45–54 years	658	10,880	368.8	2.45	287.4	303.1	315.5	330.5	364.3	401.5	423.5	439.3	473.2
55–64 years	514	9,103	351.5	2.32	283.2	291.3	304.3	320.3	349.4	377.4	395.4	408.4	425.4
65–74 years	1,375	6,606	350.6	1.79	274.3	287.2	298.2	313.3	348.1	382.1	403.3	420.2	448.4
Black													
1 year	23	67	*437.9	*	311.2	311.3	311.5	377.0	421.4	510.1	541.8	546.5	664.2
2–3 years	80	283	405.7	5.39	314.3	324.0	342.0	367.0	399.1	441.1	487.1	514.4	531.3
4–5 years	161	515	367.4	4.15	301.2	316.3	333.1	340.3	364.4	392.1	396.3	423.4	455.2
6–11 years	262	1,735	380.1	2.97	300.1	309.2	324.4	343.1	378.0	413.4	437.4	449.3	468.3
12–14 years	141	818	392.4	3.19	316.2	332.5	346.5	361.2	384.4	421.2	456.4	458.5	490.1
15–17 years	110	796	402.3	7.13	314.2	327.1	354.1	368.1	381.4	432.4	468.3	482.3	525.7
18–44 years	956	4,373	391.0	2.15	286.4	308.0	319.0	342.2	388.5	440.1	462.5	475.3	500.1
45–54 years	126	1,243	370.6	5.31	281.3	302.2	311.1	332.2	372.1	400.4	431.2	440.2	466.3
55–64 years	115	848	353.9	5.99	258.4	289.1	305.4	320.4	351.2	388.1	411.2	424.5	458.4
65–74 years	318	656	336.4	2.53	274.1	283.2	292.1	303.2	330.4	361.3	393.2	408.2	432.1

[1] Does not include data for pregnant women.

[2] Includes data for races which are not shown as separate categories.

NOTE: Asterisks indicate estimates that do not meet this report's standards of reliability.

Table 9. Transferrin saturation levels for males 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
			Transferrin saturation in percent										
All races¹													
1 year	113	724	16.6	0.86	5.1	5.9	7.1	8.7	15.6	21.4	25.1	29.3	35.2
2–3 years	342	2,203	23.1	0.52	9.1	11.5	13.1	15.5	20.6	28.8	33.1	36.9	43.7
4–5 years	552	3,372	23.3	0.40	9.0	11.3	13.6	16.7	22.6	29.0	32.8	35.3	38.8
6–11 years	979	11,925	25.5	0.36	11.3	13.8	15.4	18.9	24.7	31.1	35.4	38.2	42.4
12–14 years	526	6,260	28.2	0.49	14.0	16.8	18.4	21.4	27.1	33.8	38.2	41.5	46.1
15–17 years	485	6,248	32.0	0.61	14.9	18.2	20.7	23.9	31.0	37.6	42.0	46.8	55.8
18–44 years	2,126	35,449	31.1	0.31	16.7	19.0	20.5	23.0	29.5	37.0	41.3	44.2	51.4
45–54 years	715	11,137	30.0	0.58	15.4	17.5	19.9	21.8	27.7	35.3	41.0	44.2	51.0
55–64 years	556	8,990	29.8	0.64	15.0	17.3	18.9	22.3	28.3	35.8	40.3	43.9	48.1
65–74 years	1,545	5,496	32.5	0.30	16.9	19.6	21.7	24.7	31.2	39.1	43.2	46.1	52.2
White													
1 year	87	625	17.1	0.94	5.6	6.1	7.1	9.3	16.4	21.7	25.1	29.3	37.9
2–3 years	251	1,877	22.6	0.55	9.4	11.5	13.0	15.3	20.1	27.8	32.6	36.5	43.7
4–5 years	411	2,859	23.5	0.46	9.1	11.4	13.9	16.9	23.0	29.1	32.8	35.4	38.8
6–11 years	719	10,086	25.6	0.39	11.0	13.6	15.2	18.8	24.8	31.3	35.8	38.5	43.5
12–14 years	393	5,343	28.4	0.53	14.4	16.9	18.5	21.5	27.3	34.1	38.3	41.5	46.1
15–17 years	360	5,354	32.7	0.72	14.8	18.4	20.8	23.9	31.2	38.3	43.4	49.6	56.6
18–44 years	1,753	31,398	31.2	0.31	16.7	19.0	20.5	23.1	29.5	37.1	41.3	44.5	51.9
45–54 years	579	10,026	30.1	0.63	15.4	17.6	20.0	21.9	27.7	35.3	41.7	44.4	52.4
55–64 years	464	8,192	29.7	0.70	14.8	17.3	18.9	21.8	28.0	35.6	40.4	44.6	48.1
65–74 years	1,232	4,969	32.7	0.32	16.7	19.6	21.7	24.9	31.4	39.2	43.3	46.3	52.2
Black													
1 year	26	99	13.1	1.56	4.4	4.4	5.0	8.0	9.2	18.5	23.6	29.5	29.5
2–3 years	82	275	25.5	1.30	5.6	9.5	13.5	16.1	24.4	33.3	35.9	41.4	41.6
4–5 years	138	488	22.3	0.63	8.4	8.9	11.9	15.1	21.6	28.5	33.0	35.3	40.1
6–11 years	250	1,738	25.1	0.64	13.4	14.4	16.4	19.1	24.4	31.0	33.7	34.8	39.9
12–14 years	131	883	26.5	0.74	12.2	14.2	17.6	19.9	26.0	30.9	33.9	38.4	44.2
15–17 years	119	813	28.1	0.50	16.0	16.0	17.7	23.3	27.5	31.9	34.7	40.8	40.8
18–44 years	337	3,519	29.5	0.71	16.6	18.0	19.7	21.9	28.4	35.4	39.3	42.4	43.7
45–54 years	130	1,073	28.5	0.95	15.5	16.3	19.2	20.4	26.7	35.6	39.6	40.6	43.2
55–64 years	85	715	30.3	1.01	15.9	19.1	22.2	24.8	29.1	37.2	39.1	39.4	44.5
65–74 years	294	488	30.8	0.52	17.2	19.5	21.1	23.1	28.1	36.7	41.6	45.8	50.4

¹ Includes data for races which are not shown as separate categories.

Table 10. Transferrin saturation levels for females[1] 1–74 years, with mean, standard error of the mean, and selected percentiles, by race and age: United States, 1971–74

Race and age	*Number of examined persons*	*Estimated population in thousands*	*Mean*	*Standard error of the mean*	*Percentile*								
					5th	*10th*	*15th*	*25th*	*50th*	*75th*	*85th*	*90th*	*95th*
			Transferrin saturation in percent										
All races[2]													
1 year	77	505	20.0	1.20	6.9	9.1	9.3	12.7	19.1	26.3	31.1	35.4	36.7
2–3 years	313	2,070	23.7	0.52	8.8	11.0	12.8	16.4	23.1	29.5	33.8	37.3	41.3
4–5 years	571	3,295	24.5	0.53	11.3	13.3	15.2	18.2	23.8	30.2	33.3	35.3	41.1
6–11 years	988	11,433	25.8	0.34	12.6	14.9	16.5	18.8	25.1	30.9	35.3	38.2	41.6
12–14 years	535	6,036	26.0	0.54	12.3	15.0	16.5	19.5	25.3	31.8	35.5	38.3	42.5
15–17 years	462	5,980	26.5	0.38	11.0	14.0	15.2	19.2	25.3	32.8	37.5	40.1	45.4
18–44 years	4,661	37,052	27.0	0.22	10.5	13.4	15.5	18.8	25.6	33.4	38.5	43.0	48.7
45–54 years	789	12,165	27.8	0.78	11.5	16.2	18.3	20.6	25.8	32.7	38.0	42.3	50.7
55–64 years	632	10,037	29.2	1.07	15.2	17.1	19.4	22.5	27.6	34.5	37.8	41.1	47.3
65–74 years	1,701	7,283	28.5	0.23	15.0	17.1	18.7	22.1	27.5	34.4	38.2	40.5	44.7
White													
1 year	56	438	20.0	1.37	6.9	9.1	9.1	12.7	19.1	26.3	32.4	35.4	36.7
2–3 years	233	1,793	24.5	0.58	9.3	12.1	14.9	17.1	23.5	29.8	34.3	37.5	42.1
4–5 years	405	2,758	24.8	0.59	11.5	13.6	15.3	18.7	23.9	30.4	33.6	35.6	41.1
6–11 years	720	9,625	26.1	0.41	12.3	14.9	16.5	18.8	25.4	30.9	35.9	38.7	42.8
12–14 years	389	5,133	26.2	0.62	12.2	15.2	16.6	19.5	25.6	32.5	35.7	38.6	42.7
15–17 years	350	5,160	26.5	0.46	11.0	14.0	15.2	19.0	25.3	32.7	37.2	40.6	45.7
18–44 years	3,637	32,290	27.3	0.25	10.7	13.5	15.6	18.8	25.8	33.8	38.8	43.4	49.2
45–54 years	658	10,880	28.4	0.88	11.3	16.3	18.8	20.8	26.7	33.8	39.2	43.5	51.8
55–64 years	514	9,103	29.5	1.18	15.2	17.9	20.2	22.9	27.8	34.6	37.8	41.3	49.1
65–74 years	1,375	6,606	28.8	0.26	15.0	17.1	18.8	22.1	27.7	34.6	38.6	40.9	45.0
Black													
1 year	20	59	*19.0	*	6.8	8.3	9.3	11.4	13.8	23.9	27.6	30.7	46.0
2–3 years	76	264	18.6	0.89	7.0	8.8	9.0	11.9	18.1	24.3	26.5	30.2	31.0
4–5 years	161	515	23.1	0.63	9.8	12.1	13.0	16.6	22.6	28.4	30.8	32.3	41.3
6–11 years	262	1,735	24.5	0.65	13.4	15.0	16.8	18.7	23.3	30.1	33.6	35.1	39.4
12–14 years	141	818	24.7	0.60	12.4	13.3	15.5	19.5	24.4	29.6	33.4	36.0	39.6
15–17 years	110	796	26.7	0.86	9.4	13.0	15.3	19.6	28.1	36.9	38.3	38.3	38.3
18–44 years	956	4,373	24.7	0.29	9.6	11.9	14.0	17.1	23.8	30.2	34.6	38.0	43.7
45–54 years	126	1,243	22.7	0.62	12.1	14.3	16.6	17.7	21.3	25.8	29.5	31.4	36.8
55–64 years	115	848	26.6	1.15	14.9	15.2	15.4	18.3	25.4	34.5	36.1	38.1	43.4
65–74 years	318	656	26.1	0.37	13.0	16.3	18.1	21.5	25.2	31.4	35.0	35.7	38.7

[1] Does not include data for pregnant women.
[2] Includes data for races which are not shown as separate categories.
NOTE: Asterisks indicate estimates that do not meet this report's standards of reliability.

Table 11. Percent and standard error of percent of persons ages 1–74 years, with low hemoglobin levels,[1] by sex, race, and age: United States, 1971–74

Race and age	Male				Female[2]			
	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent
All races[3]								
1 year	272	1,692	19.3	3.59	254	1,625	12.6	3.12
2–3 years	577	3,538	8.7	1.76	535	3,390	8.3	1.79
4–5 years	549	3,379	1.7	0.83	571	3,301	1.9	0.86
6–11 years	974	11,913	3.0	0.82	974	11,455	3.2	0.85
12–14 years	519	6,348	7.6	1.65	534	6,043	3.4	1.18
15–17 years	487	6,196	2.3	1.02	457	5,932	4.9	1.51
18–44 years	2,128	35,425	5.2	0.72	4,613	36,998	4.9	0.48
45–54 years	740	11,156	5.3	1.24	788	12,159	4.7	1.13
55–64 years	569	8,993	13.1	2.12	639	10,054	2.0	0.83
65–74 years	1,581	5,495	14.9	1.34	1,728	7,275	4.3	0.73
White								
1 year	199	1,401	14.9	3.79	179	1,328	10.5	3.44
2–3 years	425	2,991	7.4	1.91	401	2,857	7.2	1.94
4–5 years	419	2,857	0.9	0.69	418	2,777	1.7	0.95
6–11 years	734	10,070	1.6	0.69	734	9,630	2.1	0.79
12–14 years	396	5,434	4.0	1.48	401	5,146	2.2	1.10
15–17 years	373	5,297	1.1	0.81	357	5,132	3.4	1.44
18–44 years	1,786	31,376	4.5	0.74	3,679	32,243	3.4	0.45
45–54 years	607	10,045	4.6	1.28	665	10,876	4.2	1.17
55–64 years	484	8,195	12.9	2.29	531	9,115	0.7	0.54
65–74 years	1,293	4,969	12.4	1.37	1,426	6,600	3.1	0.69
Black								
1 year	70	281	42.1	8.85	70	260	21.8	7.40
2–3 years	138	473	18.7	4.98	128	501	15.3	4.77
4–5 years	127	495	6.4	3.26	148	506	2.8	2.03
6–11 years	229	1,732	11.5	3.16	234	1,745	9.1	2.82
12–14 years	121	877	30.2	6.26	128	831	11.5	4.23
15–17 years	108	809	8.6	4.05	98	775	14.8	5.38
18–44 years	307	3,529	12.0	2.78	865	4,354	15.8	1.86
45–54 years	126	1,059	12.0	4.34	118	1,235	9.1	3.97
55–64 years	77	707	17.0	6.42	105	868	12.4	4.82
65–74 years	270	482	40.4	4.48	294	651	16.6	3.26

[1] Age- and sex-specific hemoglobin standards are shown in table A.
[2] Does not include data for pregnant women.
[3] Includes data for races which are not shown as separate categories.

Table 12. Percent and standard error of percent of persons ages 1–74 years, with low transferrin saturation levels,[1] by sex, race, and age: United States, 1971–74

Race and age	Male				Female[2]			
	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent
All races[3]								
1 year	113	724	50.8	7.05	77	505	38.3	8.31
2–3 years	342	2,203	27.0	3.60	313	2,070	24.2	3.63
4–5 years	552	3,372	23.1	2.69	571	3,295	18.0	2.41
6–11 years	979	11,925	16.9	1.80	988	11,433	12.8	1.59
12–14 years	526	6,260	8.6	1.83	535	6,036	13.1	2.19
15–17 years	485	6,248	6.3	1.65	462	5,980	16.3	2.58
18–44 years	2,126	35,449	3.6	0.61	4,661	37,052	16.4	0.81
45–54 years	715	11,137	7.2	1.45	789	12,165	9.5	1.57
55–64 years	556	8,990	7.7	1.70	632	10,037	8.1	1.63
65–74 years	1,545	5,496	4.2	0.77	1,701	7,283	7.1	0.93
White								
1 year	87	625	47.7	8.03	56	438	37.1	9.68
2–3 years	251	1,877	27.5	4.23	233	1,793	21.0	4.00
4–5 years	411	2,859	22.2	3.27	405	2,758	17.3	2.82
6–11 years	719	10,086	17.6	2.13	720	9,625	12.7	1.86
12–14 years	393	5,343	7.9	2.04	389	5,133	12.4	2.51
15–17 years	360	5,354	6.8	1.99	350	5,160	16.3	2.96
18–44 years	1,753	31,398	3.6	0.67	3,637	32,290	15.8	0.91
45–54 years	579	10,026	7.4	1.63	658	10,880	9.1	1.68
55–64 years	464	8,192	7.9	1.88	514	9,103	7.2	1.71
65–74 years	1,232	4,969	4.3	0.87	1,375	6,606	6.9	1.03
Black								
1 year	26	99	70.9	13.36	20	59	*53.0	*
2–3 years	82	275	24.3	7.10	76	264	43.9	8.54
4–5 years	138	488	27.3	5.69	161	515	22.9	4.97
6–11 years	250	1,738	13.2	6.87	262	1,735	12.9	3.11
12–14 years	131	883	12.9	4.39	141	818	16.4	4.68
15–17 years	119	813	3.7	2.60	110	796	17.2	5.40
18–44 years	337	3,519	4.2	1.64	956	4,373	20.7	1.97
45–54 years	130	1,073	5.7	3.05	126	1,243	13.1	4.51
55–64 years	85	715	5.5	3.71	115	848	17.6	5.33
65–74 years	294	488	3.0	1.49	318	656	9.4	2.45

[1] Persons with a transferrin saturation below 16.0 percent and a TIBC above 250 μg/dl were classified as low transferrin saturation.
[2] Does not include data for pregnant women.
[3] Includes data for races which are not shown as separate categories.

NOTE: Asterisks indicate estimates that do not meet this report's standards of reliability.

Table 13. Percent and standard error of percent of persons ages 1–74 years, with the combination of low hemoglobin and low transferrin saturation levels,[1] by sex, race, and age: United States, 1971–74

Race and age	Male				Female[2]			
	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent	Number of examined persons	Estimated population in thousands	Percent	Standard error of the percent
All races[3]								
1 year	109	722	17.7	5.49	72	479	9.9	5.28
2–3 years	333	2,177	1.6	1.04	296	2,015	3.3	1.56
4–5 years	524	3,372	0.9	0.61	547	3,303	0.3	0.35
6–11 years	927	11,924	0.5	0.34	931	11,446	0.6	0.38
12–14 years	497	6,295	1.5	0.82	510	6,056	1.0	0.66
15–17 years	456	6,237	0.2	0.31	431	5,947	2.0	1.01
18–44 years	2,013	35,501	0.1	0.10	4,397	36,969	2.8	0.37
45–54 years	690	11,142	1.3	0.65	741	12,161	2.4	0.84
55–64 years	527	9,059	2.2	0.96	602	9,968	0.8	0.54
65–74 years	1,469	5,495	1.8	0.52	1,607	7,279	1.6	0.47
White								
1 year	84	623	17.0	6.15	53	421	11.2	6.50
2–3 years	247	1,864	0.9	0.90	227	1,750	1.3	1.13
4–5 years	394	2,850	0.7	0.63	395	2,780	0.3	0.41
6–11 years	689	10,083	0.4	0.36	691	9,621	0.4	0.36
12–14 years	374	5,379	0.9	0.73	377	5,157	0.6	0.60
15–17 years	342	5,339	0.0	0.00	331	5,152	1.6	1.03
18–44 years	1,672	31,452	0.1	0.12	3,469	32,206	2.2	0.37
45–54 years	558	10,032	1.3	0.72	618	10,876	2.4	0.92
55–64 years	443	8,261	2.4	1.09	494	9,034	0.6	0.52
65–74 years	1,181	4,969	1.8	0.58	1,305	6,601	1.3	0.47
Black								
1 year	25	99	22.2	12.47	18	49	*0.0	*
2–3 years	77	264	6.4	4.18	65	252	17.3	7.04
4–5 years	127	497	2.0	1.86	148	509	0.2	0.55
6–11 years	228	1,745	1.5	1.21	234	1,746	1.4	1.15
12–14 years	121	881	5.3	3.06	128	813	3.1	2.30
15–17 years	108	810	1.2	1.57	98	772	4.1	3.00
18–44 years	306	3,540	0.3	0.47	863	4,401	7.4	1.34
45–54 years	126	1,074	0.8	1.19	118	1,241	2.0	1.93
55–64 years	77	718	0.8	1.52	105	843	2.7	2.37
65–74 years	270	483	1.5	1.11	294	655	4.1	1.73

[1] Age- and sex-specific hemoglobin standards are found in Table A. Persons with a transferrin saturation below 16.0 percent and a TIBC above 250 μg/dl were classified as low transferrin saturation.
[2] Does not include data for pregnant women.
[3] Includes data for races which are not shown as separate categories.
NOTE: Asterisks indicate estimates that do not meet this report's standards of reliability.

Table 14. Z-statistics[1] for comparison of percent of persons with low iron status indicators for sex within age and race within sex and age comparisons: United States, 1971–74

Comparisons	Low hemoglobin	Low transferrin saturation	Low hemoglobin and low transferrin saturation
	Iron status indicator		
		Z-statistics	
Males versus females			
1 year	1.41	1.15	1.02
2–3 years	0.16	0.55	–0.91
4–5 years	–0.17	1.41	0.84
6–11 years	–0.17	1.59	–0.19
12–14 years	2.00	–1.58	0.48
15–17 years	–1.42	–3.26	–1.70
18–44 years	0.35	–12.62	–6.96
45–54 years	0.36	–1.08	–1.03
55–64 years	4.87	–0.17	1.27
65–74 years	6.93	–2.18	0.59
Black males versus white males			
1 year	–2.83	–1.49	–0.37
2–3 years	–0.75	–0.85	–1.29
4–5 years	–1.65	–0.79	–0.66
6–11 years	–3.06	1.07	–0.87
12–14 years	–4.07	–1.03	–1.40
15–17 years	–1.82	0.95	–0.76
18–44 years	–2.61	–0.34	–0.41
45–54 years	–1.63	0.49	0.36
55–64 years	–0.60	0.58	0.85
65–74 years	–5.98	0.75	0.24
Black females versus white females			
1 year	–1.38	*	*
2–3 years	–1.57	–2.43	–2.24
4–5 years	–0.49	–0.98	0.15
6–11 years	–2.39	–0.06	–0.83
12–14 years	–2.13	–0.75	–1.05
15–17 years	–2.05	–0.15	–0.79
18–44 years	–6.48	–2.26	–3.75
45–54 years	–1.18	–0.83	0.19
55–64 years	–2.41	–1.86	–0.86
65–74 years	–4.06	–0.63	–0.78

[1] Significant values are $\geq \pm 1.96$ based on two-tailed test ($p = 0.05$).

NOTE: Asterisks indicate statistics that do not meet this report's standards of reliability.

Table 15. Percent and standard error of the percent for women 18–44 years with low hemoglobin,[1] low transferrin saturation,[2] and the combination of low hemoglobin with low transferrin saturation, with Z-statistic for comparison of pregnancy status, by race: United States, 1971–74

Race and iron status indicators	Pregnant			Non-pregnant			Z-statistic
	Number of examined persons	Percent	Standard error of the percent	Number of examined persons	Percent	Standard error of the percent	
All races[3]							
Low hemoglobin	196	31.9	4.99	4,613	4.9	0.48	5.38
Low transferrin saturation	195	22.1	4.46	4,661	16.4	0.81	1.26
Low hemoglobin and low transferrin saturation	185	6.5	2.72	4,397	2.8	0.37	1.35
White							
Low hemoglobin	152	28.4	5.49	3,679	3.4	0.45	4.54
Low transferrin saturation	147	21.7	5.10	3,637	15.8	0.91	1.14
Low hemoglobin and low transferrin saturation	141	7.0	3.22	3,469	2.2	0.37	1.48
Black							
Low hemoglobin	36	52.9	12.48	865	15.8	1.86	2.94
Low transferrin saturation	40	27.6	10.60	956	20.7	1.97	0.64
Low hemoglobin and low transferrin saturation	36	5.0	5.45	863	7.4	1.34	0.43

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Persons with a transferrin saturation below 16.0 percent and a TIBC above 250 μg/dl were classified as having low transferrin saturation.
[3] Includes data for races which are not shown as separate categories.

Table 16. Iron intake for persons 1–74 years, with mean, and standard error of the mean, by sex, hemoglobin status,[1] race, and age: United States, 1971–74

Race and age	Male						Female[2]					
	Low hemoglobin			Adequate hemoglobin			Low hemoglobin			Adequate hemoglobin		
	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean
All races[3]												
1 year	57	6.8	1.07	215	7.7	0.65	39	5.2	0.91	215	7.3	0.61
2–3 years	48	7.0	0.67	529	8.3	0.30	59	6.4	0.80	476	7.3	0.25
4–5 years	14	*7.8	*	535	9.5	0.31	18	*8.4	*	553	8.3	0.24
6–11 years	36	12.0	1.32	938	11.8	0.29	44	10.1	0.99	930	9.8	0.23
12–14 years	52	11.9	0.97	467	13.8	0.49	24	*9.7	*	510	10.5	0.32
15–17 years	17	*15.6	*	470	16.2	0.60	32	9.3	1.29	425	9.6	0.36
18–44 years	110	17.6	1.08	2,018	16.4	0.25	305	10.1	0.46	4,308	10.2	0.11
45–54 years	55	12.1	1.01	685	14.9	0.37	48	9.8	1.10	740	10.6	0.26
55–64 years	65	14.6	1.36	504	13.7	0.43	22	*9.1	*	617	10.0	0.31
65–74 years	278	12.5	0.70	1,303	12.1	0.23	100	7.7	0.60	1,628	9.3	0.16
White												
1 year	28	6.0	0.68	171	7.8	0.77	23	*4.9	*	156	7.5	0.77
2–3 years	28	6.9	0.62	397	8.2	0.35	56	6.6	1.12	365	7.2	0.27
4–5 years	5	*8.9	*	414	9.5	0.35	12	*6.9	*	406	8.3	0.28
6–11 years	14	*12.4	*	720	11.9	0.34	18	*9.7	*	716	9.9	0.26
12–14 years	20	*10.7	*	376	13.8	0.47	10	*9.1	*	391	10.4	0.35
15–17 years	5	*17.6	*	368	16.6	0.70	15	*6.6	*	342	9.6	0.40
18–44 years	75	18.0	1.40	1,711	16.7	0.27	143	10.8	0.66	3,536	10.3	0.13
45–54 years	28	12.9	1.36	579	15.0	0.41	31	10.6	1.32	634	10.7	0.29
55–64 years	53	14.9	1.55	431	13.5	0.44	6	*10.4	*	525	10.1	0.34
65–74 years	165	12.2	0.61	1,128	12.2	0.25	53	7.8	0.86	1,373	9.4	0.18
Black												
1 year	29	8.2	2.28	41	6.8	0.82	15	*5.6	*	55	6.7	0.69
2–3 years	20	*7.2	*	118	8.6	0.62	23	*6.0	*	105	7.5	0.66
4–5 years	9	*6.9	*	118	9.5	0.66	6	*13.6	*	142	8.6	0.45
6–11 years	22	*11.7	*	207	10.5	0.47	25	10.4	1.35	209	9.5	0.46
12–14 years	32	12.9	1.22	89	14.0	1.91	14	*10.3	*	114	10.6	0.77
15–17 years	11	*14.5	*	97	13.8	1.08	17	*13.4	*	81	9.1	1.00
18–44 years	34	16.6	1.44	273	14.3	0.59	157	8.9	0.66	708	9.4	0.28
45–54 years	26	9.3	1.38	100	13.4	0.89	17	*6.6	*	101	9.0	0.60
55–64 years	12	*11.4	*	65	14.7	1.73	15	*7.4	*	90	8.4	0.66
65–74 years	109	13.5	1.85	161	9.7	0.52	47	7.6	0.77	247	8.2	0.41

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Does not include data for pregnant women.
[3] Includes data for races which are not shown as separate categories.
NOTE: Estimates preceded by an asterisk do not meet this report's standards of reliability.

Table 17. Iron intake for persons 1–74 years, with mean, and standard error of the mean, by sex, transferrin saturation status,[1] race, and age: United States, 1971–74

Race and age	Male						Female[2]					
	Low hemoglobin			Adequate hemoglobin			Low hemoglobin			Adequate hemoglobin		
	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean	Number of examined persons	Mean	Standard error of the mean
All races[3]												
1 year	61	6.9	0.61	52	7.4	0.79	30	5.9	1.07	47	9.2	1.75
2–3 years	99	7.1	0.50	243	8.5	0.45	91	7.0	0.49	222	7.0	0.33
4–5 years	120	9.2	0.77	432	9.4	0.32	117	8.1	0.54	454	8.5	0.25
6–11 years	152	12.3	0.71	827	11.6	0.29	135	10.2	0.88	853	9.8	0.21
12–14 years	50	13.2	1.08	476	13.5	0.48	79	9.8	0.73	456	10.5	0.34
15–17 years	35	18.0	2.03	450	15.9	0.59	86	8.6	0.61	376	9.6	0.39
18–44 years	102	14.7	1.29	2,024	16.4	0.24	801	10.0	0.26	3,860	10.2	0.12
45–54 years	40	14.5	1.38	675	14.5	0.36	84	10.1	0.59	705	10.5	0.27
55–64 years	36	12.4	0.72	520	13.6	0.41	52	10.6	1.46	580	9.7	0.29
65–74 years	71	11.2	0.96	1,474	12.1	0.22	129	8.2	0.63	1,572	9.3	0.17
White												
1 year	44	7.0	0.75	43	7.5	0.87	21	*5.8	*	35	9.5	2.13
2–3 years	70	7.3	0.56	181	8.5	0.55	57	6.8	0.64	176	7.0	0.37
4–5 years	87	9.6	0.96	324	9.4	0.37	74	8.1	0.68	331	8.4	0.30
6–11 years	114	12.5	0.76	605	11.7	0.35	104	10.2	1.07	616	9.9	0.24
12–14 years	32	13.1	1.25	361	13.6	0.50	52	9.4	8.9	337	10.4	0.37
15–17 years	27	18.4	2.31	333	16.4	0.71	59	8.4	0.70	291	9.6	0.42
18–44 years	81	15.0	1.48	1,672	16.6	0.27	585	10.1	0.30	3,052	10.3	0.14
45–54 years	35	14.8	1.50	544	14.6	0.41	70	10.1	0.65	588	10.8	0.30
55–64 years	31	12.4	1.59	433	13.6	0.43	37	11.0	1.82	477	9.8	0.32
65–74 years	59	11.5	1.04	1,173	12.2	0.24	102	8.1	0.65	1,273	9.4	0.18
Black												
1 year	17	*6.6	*	9	*6.5	*	9	*6.3	*	11	*6.5	*
2–3 years	27	6.2	1.21	55	8.9	0.77	32	7.5	0.72	44	7.0	0.77
4–5 years	32	7.8	0.85	106	9.6	0.68	43	8.3	0.91	118	9.1	0.50
6–11 years	37	9.4	0.91	213	10.9	0.47	30	9.9	0.99	232	9.5	0.43
12–14 years	18	*13.3	*	113	13.4	1.48	26	11.2	1.09	115	10.3	0.78
15–17 years	8	*12.7	*	111	13.4	0.97	27	10.3	1.36	83	9.8	0.95
18–44 years	21	*12.5	*	316	14.7	0.55	206	9.3	0.59	750	9.2	0.26
45–54 years	5	*11.3	*	125	13.1	0.82	14	*10.4	*	112	8.6	0.60
55–64 years	4	*11.8	*	81	12.4	1.23	15	*8.9	*	100	8.1	0.60
65–74 years	11	*6.0	*	283	10.7	0.68	26	9.1	1.94	292	8.0	0.34

[1] Persons with a transferrin saturation level below 16.0 percent and a TIBC value above 250 µg/dl were classified as having low transferrin saturation.

[2] Does not include data for pregnant women.

[3] Includes data for races which are not shown as separate categories.

NOTE: Estimates preceded by an asterisk do not meet this report's standards of reliability.

Table 18. *Z*-statistics for comparison of iron intake for persons with low or adequate hemoglobin and for persons with low or adequate transferrin saturation, by specified age and sex-race categories: United States, 1971–74

Iron status indicator and sex-race category	*Age*									
	1 year	*2–3 years*	*4–5 years*	*6–11 years*	*12–14 years*	*15–17 years*	*18–44 years*	*45–54 years*	*55–64 years*	*65–74 years*
Low versus adequate hemoglobin										
Male										
All races	–0.72	–1.77	*	0.15	–1.75	*	1.08	–2.60	0.63	0.54
White	–1.75	–1.83	*	*	*	*	0.91	–1.48	0.87	0.00
Black	0.58	*	*	*	–0.49	*	1.47	–2.50	*	1.98
Female										
All races	–1.92	–1.07	*	0.30	*	–0.22	–0.21	–0.71	*	–2.58
White	*	–0.52	*	*	*	*	0.74	–0.07	*	–1.82
Black	*	*	*	0.63	*	*	–0.70	*	*	–0.69
Low versus adequate transferrin saturation										
Male										
All races	–0.50	–2.08	–0.24	0.91	–0.25	0.99	–1.30	0.00	–1.45	–0.91
White	–0.44	–1.53	0.19	0.96	–0.37	0.83	–1.06	0.13	–0.73	–0.66
Black	*	–1.88	–1.65	–1.46	*	*	*	*	*	*
Female										
All races	–1.61	0.00	–0.67	0.44	–0.87	–1.38	–0.70	–0.62	0.60	–1.69
White	*	–0.27	–0.40	0.27	–1.04	–0.47	–0.60	–0.98	0.65	–1.93
Black	*	0.47	–0.77	0.37	0.67	0.30	0.16	*	*	0.56

NOTE: Asterisks indicate statistics that did not meet this report's standards of reliability.

Table 19. Z-statistics for comparison of low and adequate hemoglobin status[1] for children 1–3 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	177	6.20	0.49	1,245	7.47	0.21	–2.39
Log total iron intake (log mg)	177	73.63	2.78	1,245	82.55	0.94	–3.05
Total animal tissue iron intake (mg)	177	1.50	0.19	1,245	1.85	0.08	–1.73
Total nonanimal tissue iron intake (mg)	177	4.70	0.41	1,245	5.61	0.20	–2.02
Total protein intake (mg)	177	49.13	2.23	1,245	52.51	0.93	–1.40
Total animal tissue protein intake (mg)	177	11.95	1.20	1,245	14.68	0.55	–2.06
Total nonanimal tissue protein intake (mg)	177	37.18	1.82	1,245	37.82	0.68	–0.33
Estimated available iron (mg)	177	0.65	0.06	1,245	0.82	0.03	–2.63
Estimated available iron with tea (mg)	177	0.65	0.06	1,245	0.82	0.03	–2.66
Vitamin C (mg)	177	60.04	7.49	1,245	76.93	3.47	–2.05
Socioeconomic							
Age of mother at child's birth (years)	173	24.01	0.56	1,232	25.23	0.24	–1.94
Birth weight (pounds)	175	7.17	0.13	1,229	7.31	0.05	–0.10
Age (years)	177	2.19	0.09	1,245	2.58	0.04	–4.15
Poverty income ratio (index)	173	1.57	0.11	1,227	2.22	0.06	–5.21
Estimated family income (dollars)	173	4,253.93	297.53	1,228	3,877.03	111.17	1.19
Number of persons in household (units)	177	5.74	0.29	1,245	4.76	0.08	3.25
Age of head of household (years)	177	32.42	1.02	1,244	31.77	0.37	0.60
Education of head of household (years)	173	10.72	0.37	1,201	11.94	0.14	–3.12
Other[2]		Percent			Percent		
Pica	177	37.49	5.46	1,245	18.27	1.64	3.37
Regular vitamin use	177	30.26	5.18	1,245	44.56	2.11	–2.56
Regular mineral use	177	10.15	3.42	1,245	20.71	1.72	–2.76
Regular vitamin and mineral use	177	42.46	5.57	1,245	52.93	2.12	–1.81
Ever breastfed	177	16.90	4.23	1,241	26.50	1.88	–2.08
Is child the first born	142	16.43	4.67	936	17.70	1.87	–0.25
Premature birth	175	7.67	3.02	1,241	7.16	1.10	0.16
Present illness	159	45.44	5.92	1,072	32.95	2.15	1.98
Regular aspirin use	177	41.00	5.55	1,245	32.07	1.98	1.52

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 20. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for white children 1–3 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	*Low hemoglobin*			*Adequate hemoglobin*			*Z-statistic*
	Number of examined persons	*Statistic*	*Standard error of the statistic*	*Number of examined persons*	*Statistic*	*Standard error of the statistic*	
Dietary intake		Mean			Mean		
Total iron intake (mg)	105	5.91	0.45	960	7.49	0.25	–3.10
Log total iron intake (log mg)	105	73.14	3.20	960	82.77	1.06	–2.86
Total animal tissue iron intake (mg)	105	1.30	0.20	960	1.80	0.08	–2.36
Total nonanimal tissue iron intake (mg)	105	4.61	0.37	960	5.69	0.23	–2.46
Total protein intake (mg)	105	49.65	2.89	960	52.87	1.06	–1.05
Total animal tissue protein intake (mg)	105	10.95	1.46	960	14.36	0.61	–2.16
Total nonanimal tissue protein intake (mg)	105	38.70	2.38	960	38.51	0.76	0.08
Estimated available iron (mg)	105	0.60	0.06	960	0.81	0.03	–3.00
Estimated available iron with tea (mg)	105	0.59	0.06	960	0.81	0.03	–3.33
Vitamin C (mg)	105	61.86	10.52	960	78.77	4.06	–1.50
Socioeconomic							
Age of mother at child's birth (years)	102	24.11	0.69	951	25.44	0.27	–1.80
Birth weight (pounds)	105	7.40	0.14	951	7.39	0.06	0.07
Age (years)	105	2.19	0.11	960	2.59	0.04	–3.42
Poverty income ratio (index)	103	1.73	0.15	948	2.36	0.06	–3.87
Estimated family income (dollars)	103	4,268.04	391.63	949	3,909.25	128.74	0.87
Number of persons in household (units)	105	5.62	0.36	960	4.63	0.08	2.70
Age of head of household (years)	105	31.78	1.24	960	31.38	0.39	0.31
Education of head of household (years)	102	10.92	0.49	925	12.22	0.16	–2.51
Other[2]		Percent			Percent		
Pica	105	37.63	7.09	960	18.06	1.86	2.67
Regular vitamin use	105	30.87	6.76	960	45.82	2.41	–2.08
Regular mineral use	105	9.79	4.35	960	21.39	1.99	–2.43
Regular vitamin and mineral use	105	45.76	7.29	960	56.07	1.97	–1.37
Ever breastfed	105	18.00	5.62	957	28.20	2.18	–1.69
Is child the first born	84	13.52	5.60	719	18.04	2.15	–0.75
Premature birth	105	4.75	3.11	951	5.72	1.13	–0.29
Present illness	93	43.35	7.71	815	31.74	2.45	1.44
Regular aspirin use	105	45.41	7.29	960	32.16	2.26	1.16

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 21. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for black children 1–3 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	72	7.04	1.19	285	7.32	0.39	-0.22
Log total iron intake (log mg)	72	75.02	5.52	285	81.14	2.12	-1.03
Total animal tissue iron intake (mg)	72	2.10	0.39	285	2.18	0.18	-0.18
Total nonanimal tissue iron intake (mg)	72	4.94	1.00	285	5.14	0.28	-0.19
Total protein intake (mg)	72	47.65	3.51	285	50.18	2.18	-0.61
Total animal tissue protein intake (mg)	72	14.88	2.12	285	16.78	1.25	-0.78
Total nonanimal tissue protein intake (mg)	72	32.77	2.63	285	33.41	1.49	-0.21
Estimated available iron (mg)	72	0.82	0.12	285	0.86	0.07	-0.28
Estimated available iron with tea (mg)	72	0.82	0.12	285	0.86	0.07	-0.28
Vitamin C (mg)	72	54.76	8.29	285	65.13	5.78	-1.03
Socioeconomic							
Age of mother at child's birth (years)	71	23.74	1.02	281	23.87	0.58	-0.11
Birth weight (pounds)	70	6.50	0.24	278	6.80	0.13	-1.09
Age (years)	72	2.19	0.15	285	2.52	0.07	-2.01
Poverty income ratio (index)	70	1.13	0.12	279	1.31	0.10	-1.14
Estimated family income (dollars)	70	4,212.49	445.46	279	3,664.61	202.35	1.12
Number of persons in household (units)	72	6.10	0.52	285	5.61	0.23	0.87
Age of head of household (years)	72	34.27	1.83	284	34.27	0.98	0.00
Education of head of household (years)	71	10.10	0.48	276	10.18	0.28	-0.14
Other[2]		Percent			Percent		
Pica	72	37.09	8.54	285	19.67	3.53	1.88
Regular vitamin use	72	28.51	7.98	285	36.52	4.28	-0.88
Regular mineral use	72	11.18	5.57	285	16.30	3.28	-0.79
Regular vitamin and mineral use	72	32.89	8.31	285	39.24	4.34	-0.68
Ever breastfed	72	13.90	6.12	284	15.30	3.20	-0.20
Is child the first born	58	24.76	8.50	217	15.50	3.69	1.00
Premature birth	70	16.26	6.61	278	16.56	3.35	-0.04
Present illness	66	51.58	9.23	257	40.07	4.59	1.12
Regular aspirin use	72	28.23	7.96	285	31.46	4.13	-0.36

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 22. Logit analysis statistics showing the relationship between selected characteristics and hemoglobin status for children 1–3 years: United States, 1971–74

Characteristics	Logit analysis statistics			
	Coefficient	*Standard error*	*t-test statistic*[1]	*Odds ratio*[2]
Constant	1.494	0.672	...	...
Race	0.891	0.249	3.580	2.45
Age	–0.505	0.097	–5.216	0.60
Poverty income ratio	–0.243	0.104	–2.336	0.78
Education of head of household (years)	–0.036	0.018	–2.018	0.96
Pica	0.712	0.211	3.376	2.05
Log total iron intake	–0.015	0.004	–3.664	0.98

[1] Only characteristics with a *t*-test statistic $\geq$ 1.96 ($p < .05$) are shown.
[2] See appendix I for discussion of odds ratios.

Table 23. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	*Low hemoglobin*			*Adequate hemoglobin*			*Z-statistic*
	Number of examined persons	*Statistic*	*Standard error of the statistic*	*Number of examined persons*	*Statistic*	*Standard error of the statistic*	
Dietary intake		Mean			Mean		
Total iron intake (mg)	259	9.50	0.42	3,646	9.99	0.12	–1.12
Log total iron intake (log mg)	259	95.16	1.87	3,646	96.09	0.52	–0.48
Total animal tissue iron intake (mg)	259	3.59	0.29	3,646	3.75	0.08	–0.54
Total nonanimal tissue iron intake (mg)	259	5.91	0.27	3,646	6.23	0.08	–1.12
Total protein intake (mg)	259	63.26	2.88	3,646	65.09	0.78	–0.62
Total animal tissue protein intake (mg)	259	31.19	2.17	3,646	31.02	0.63	0.08
Total nonanimal tissue protein intake (mg)	259	32.07	1.58	3,646	34.06	0.45	–1.21
Estimated available iron (mg)	259	1.34	0.08	3,646	1.41	0.02	–0.86
Estimated available iron with tea (mg)	259	1.30	0.08	3,646	1.38	0.02	–1.00
Vitamin C (mg)	259	68.15	6.88	3,646	80.27	2.22	–1.68
Socioeconomic							
Age (years)	259	31.10	1.10	3,646	27.72	0.27	2.98
Poverty income ratio (index)	248	2.30	0.13	3,542	2.67	0.04	–2.83
Estimated family income (dollars)	248	3,908.12	248.43	3,542	3,687.13	65.34	0.86
Number of persons in household (units)	259	4.64	0.23	3,646	4.28	0.05	1.56
Age of head of household (years)	259	4,234	1.12	3,645	39.39	0.29	2.56
Education of head of household (years)	253	10.18	0.35	3,569	11.87	0.08	–4.72
Education of examinee (years)	258	11.01	0.27	3,627	11.55	0.07	–1.94
		Percent			Percent		
Married[2]	228	65.30	4.69	3,117	65.70	1.28	–0.08
Other[2]							
Pica	259	1.85	1.26	3,646	1.23	0.27	0.48
Regular vitamin use	259	21.73	3.84	3,646	28.91	1.13	–1.79
Regular mineral use	259	13.43	3.18	3,646	19.98	0.99	–1.97
Regular vitamin and mineral use	259	36.94	6.06	3,646	48.99	1.78	–1.91
Regular aspirin use	259	49.38	4.66	3,646	46.37	1.24	0.62
Special diet	259	5.76	2.17	3,646	7.85	0.67	–0.92
Oral contraceptive usage in past 6 months	259	15.60	3.38	3,646	22.41	1.04	–1.93
Ever been pregnant	259	63.70	4.48	3,646	53.98	1.24	2.09
Ever been anemic	259	37.70	4.52	3,646	25.72	1.09	2.58
Any trouble eating	259	29.10	4.23	3,646	33.08	1.17	–0.91
General findings	258	0.83	0.85	3,639	0.89	0.23	–0.07
Abdominal operations	259	24.50	4.01	3,646	20.73	1.01	0.91
		Mean			Mean		
Age began menstruating (years)	259	12.85	0.13	3,646	12.61	0.04	1.73

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 24. *Z*-statistics for comparison of low and adequate transferrin saturation status[1] for menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low transferrin saturation			Adequate transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	664	9.51	0.27	3,241	9.99	0.13	−1.62
Log total iron intake (log mg)	664	94.57	1.19	3,241	96.11	0.55	−1.17
Total animal tissue iron intake (mg)	664	3.55	0.17	3,241	3.76	0.09	−1.07
Total nonanimal tissue iron intake (mg)	664	5.96	0.20	3,241	6.24	0.09	−1.26
Total protein intake (mg)	664	61.80	1.68	3,241	65.58	0.84	−2.01
Total animal tissue protein intake (mg)	664	2,940	1.33	3,241	31.07	0.68	−1.12
Total nonanimal tissue protein intake (mg)	664	32.40	1.03	3,241	34.51	0.48	−1.86
Estimated available iron (mg)	664	1.33	0.05	3,241	1.41	0.02	−1.49
Estimated available iron with tea (mg)	664	1.30	0.05	3,241	1.38	0.02	−1.51
Vitamin C (mg)	664	73.75	5.07	3,241	80.81	2.34	−1.26
Socioeconomic							
Age (years)	664	29.24	0.65	3,241	27.70	0.29	2.14
Poverty income ratio (index)	648	2.45	0.09	3,142	2.67	0.04	−2.28
Estimated family income (dollars)	648	3,727.55	152.99	3,142	3,670.17	69.34	0.34
Number of persons in household (units)	664	4.61	0.12	3,241	4.23	0.05	2.81
Age of head of household (years)	663	40.42	0.67	3,241	39.40	0.30	1.39
Education of head of household (years)	648	11.05	0.20	3,174	11.96	0.08	−4.17
Education of examinee (years)	662	11.23	0.15	3,223	11.59	0.07	−2.22
		Percent			Percent		
Married[2]	571	64.00	3.01	2,774	65.60	1.35	−0.48
Other[2]							
Pica	664	2.11	0.84	3,241	1.07	0.27	1.18
Regular vitamin use	664	21.36	2.39	3,241	30.51	1.21	−3.42
Regular mineral use	664	15.68	2.12	3,241	20.79	1.07	−2.15
Regular vitamin and mineral use	664	39.23	4.02	3,241	50.67	1.89	−2.57
Regular aspirin use	664	46.38	2.90	3,241	47.22	1.32	−0.26
Special diet	664	8.53	1.63	3,241	7.76	0.70	0.43
Oral contraceptive usage in past 6 months	664	14.08	2.03	3,241	23.10	1.11	−3.91
Ever been pregnant	664	60.85	2.84	3,241	53.17	1.31	2.45
Ever been anemic	664	30.72	2.69	3,241	25.64	1.15	1.74
Any trouble eating	664	34.08	2.76	3,241	33.03	1.24	0.35
General findings	662	5.39	1.32	3,235	1.57	0.33	2.82
Abdominal operations	664	23.55	2.47	3,241	20.71	1.07	1.06
		Mean			Mean		
Age began menstruating (years)	664	12.61	0.08	3,241	12.63	0.04	−0.23

[1] Persons with a transferrin saturation below 16.0 percent and a TIBC value above 250 µg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 25. Z-statistics for comparison of low and adequate hemoglobin combined with transferrin saturation status[1] for menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin/ transferrin saturation			Adequate hemoglobin/ transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	143	9.73	0.61	3,762	9.95	0.12	-0.35
Log total iron intake (log mg)	143	96.55	2.57	3,762	95.97	0.51	0.22
Total animal tissue iron intake (mg)	143	3.69	0.44	3,762	3.74	0.08	-0.11
Total nonanimal tissue iron intake (mg)	143	6.04	0.39	3,762	6.21	0.09	-0.42
Total protein intake (mg)	143	61.74	4.15	3,762	65.17	0.76	-0.80
Total animal tissue protein intake (mg)	143	31.01	3.35	3,762	31.04	0.61	-0.01
Total nonanimal tissue protein intake (mg)	143	30.78	1.90	3,762	34.14	0.44	-1.72
Estimated available iron (mg)	143	1.37	0.12	3,762	1.41	0.02	-0.34
Estimated available iron with tea (mg)	143	1.31	0.11	3,762	1.37	0.02	-0.52
Vitamin C (mg)	143	62.02	7.50	3,762	79.85	2.18	-2.28
Socioeconomic							
Age (years)	143	34.41	1.44	3,762	27.67	0.27	4.59
Poverty income ratio (index)	139	2.33	0.17	3,651	2.66	0.04	-1.91
Estimated family income (dollars)	139	3,903.79	339.39	3,651	3,678.21	64.25	0.65
Number of persons in household (units)	143	4.84	0.31	3,762	4.28	0.05	1.81
Age of head of household (years)	143	44.54	1.44	3,761	39.44	0.28	3.46
Education of head of household (years)	139	9.11	0.50	3,683	11.85	0.08	-5.47
Education of examinee (years)	143	10.75	0.37	3,742	11.54	0.06	-2.10
		Percent			Percent		
Married[2]	133	47.60	6.49	3,212	62.40	1.28	-2.24
Other[2]							
Pica	143	2.30	18.69	3,762	1.20	0.27	0.06
Regular vitamin use	143	14.60	4.43	3,762	28.90	1.11	-3.13
Regular mineral use	143	11.00	3.93	3,762	19.80	0.98	-2.18
Regular vitamin and mineral use	143	27.00	7.35	3,762	48.90	1.75	-2.90
Regular aspirin use	143	47.90	6.27	3,762	47.20	1.22	0.11
Special diet	143	7.50	3.30	3,762	7.80	0.65	-0.09
Oral contraceptive usage in past 6 months	143	9.10	3.61	3,755	22.40	1.02	-3.54
Ever been pregnant	143	72.30	5.61	3,762	53.80	1.22	3.22
Ever been anemic	143	38.70	6.11	3,762	25.90	1.07	2.06
Any trouble eating	143	34.00	5.95	3,762	32.80	1.15	0.20
General findings	142	0.00	0.00	3,755	0.90	0.23	-3.91
Abdominal operations	143	23.40	5.32	3,762	20.90	0.99	0.46
		Mean			Mean		
Age began menstruating (years)	143	13.08	0.18	3,762	12.61	0.03	2.54

[1] Age- and sex-specific hemoglobin standards are found in table A; persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low transferrin saturation.

[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 26. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for white menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	133	9.88	0.59	3,024	10.06	0.13	–0.30
Log total iron intake (log mg)	133	97.70	2.50	3,024	96.56	0.56	0.44
Total animal tissue iron intake (mg)	133	3.84	0.45	3,024	3.76	0.09	0.18
Total nonanimal tissue iron intake (mg)	133	6.04	0.34	3,024	6.29	0.10	–0.71
Total protein intake (mg)	133	66.85	4.16	3,024	65.69	0.85	0.27
Total animal tissue protein intake (mg)	133	32.44	3.37	3,024	30.98	0.69	0.42
Total nonanimal tissue protein intake (mg)	133	34.41	2.07	3,024	34.72	0.50	–0.14
Estimated available iron (mg)	133	1.41	0.12	3,024	1.42	0.03	–0.08
Estimated available iron with tea (mg)	133	1.35	0.11	3,024	1.38	0.03	–0.26
Vitamin C (mg)	133	70.88	10.07	3,024	81.12	2.44	–0.99
Socioeconomic							
Age (years)	133	33.28	1.55	3,024	27.86	0.30	3.44
Poverty income ratio (index)	125	2.68	0.17	2,939	2.77	0.04	–0.52
Estimated family income (dollars)	125	3,939.53	362.92	2,939	3,636.44	71.98	0.82
Number of persons in household (units)	133	4.35	0.27	3,024	4.18	0.05	0.62
Age of head of household (years)	133	42.40	1.54	3,024	39.32	0.31	1.96
Education of head of household (years)	131	10.42	0.50	2,963	12.05	0.09	-3.20
Education of examinee (years)	132	11.12	0.38	3,010	11.65	0.07	-1.36
		Percent			Percent		
Married[2]	119	76.10	5.86	2,615	67.60	1.37	1.41
Other[2]							
Pica	133	0.00	0.00	3,024	0.60	0.21	-2.85
Regular vitamin use	133	22.92	5.47	3,024	30.50	1.26	-1.35
Regular mineral use	133	14.76	4.61	3,024	20.89	1.11	-1.29
Regular vitamin and mineral use	133	37.23	8.44	3,024	50.69	1.97	-1.55
Regular aspirin use	133	50.49	6.50	3,024	47.40	1.36	0.47
Special diet	133	5.35	2.93	3,024	8.14	0.75	–0.92
Oral contraceptive usage in past 6 months	133	15.73	4.74	3,024	22.28	1.14	-1.35
Ever been pregnant	133	67.10	6.11	3,024	53.38	1.36	2.19
Ever been anemic	133	45.13	6.47	3,024	25.81	1.19	2.94
Any trouble eating	133	29.63	5.94	3,024	32.69	1.28	–0.50
General findings	133	0.00	0.00	3,024	0.90	0.26	-3.51
Abdominal operations	133	26.96	5.77	3,024	21.39	1.12	0.95
		Mean			Mean		
Age began menstruating (years)	133	12.86	0.17	3,024	12.60	0.04	1.55

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 27. Z-statistics for comparison of low and adequate hemoglobin status[1] for black menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	126	8.74	0.57	622	9.34	0.30	-0.94
Log total iron intake (log mg)	126	90.06	2.76	622	92.18	1.41	-0.68
Total animal tissue iron intake (mg)	126	3.08	0.28	622	3.61	0.19	-1.58
Total nonanimal tissue iron intake (mg)	126	5.66	0.46	622	5.73	0.21	-0.14
Total protein intake (mg)	126	56.03	3.63	622	59.99	1.90	-0.97
Total animal tissue protein intake (mg)	126	28.68	2.24	622	31.37	1.49	-1.00
Total nonanimal tissue protein intake (mg)	126	27.35	2.40	622	28.62	0.96	-0.49
Estimated available iron (mg)	126	1.21	0.09	622	1.34	0.05	-1.26
Estimated available iron with tea (mg)	126	1.19	0.09	622	1.33	0.05	-1.34
Vitamin C (mg)	126	62.65	8.75	622	73.04	5.33	-1.01
Socioeconomic							
Age (years)	126	26.70	1.38	622	26.52	0.65	0.12
Poverty income ratio (index)	123	1.58	0.15	603	1.78	0.09	-1.13
Estimated family income (dollars)	123	3,847.99	326.07	603	4,105.14	151.28	-0.72
Number of persons in household (units)	126	5.25	0.39	621	5.15	0.16	0.26
Age of head of household (years)	126	42.22	1.63	621	39.98	0.73	1.25
Education of head of household (years)	122	9.68	0.46	606	10.34	0.18	-1.34
Education of examinee (years)	126	10.78	0.37	617	10.70	0.16	0.20
		Percent			Percent		
Married[2]	109	43.60	7.13	502	48.80	3.35	-0.66
Other[2]							
Pica	126	5.57	3.06	622	6.47	1.48	-0.26
Regular vitamin use	126	19.33	5.28	622	15.58	2.18	0.66
Regular mineral use	126	10.76	4.14	622	12.33	1.98	-0.34
Regular vitamin and mineral use	126	36.36	8.72	622	34.75	4.00	0.17
Regular aspirin use	126	47.15	6.67	622	41.17	2.96	0.82
Special diet	126	6.59	3.31	622	5.16	1.33	0.40
Oral contraceptive usage in past 6 months	126	15.33	4.82	622	23.45	2.55	-1.49
Ever been pregnant	126	56.86	6.62	622	58.97	2.96	-0.29
Ever been anemic	126	22.77	5.60	622	24.93	2.60	-0.35
Any trouble eating	126	28.04	6.00	622	41.17	2.96	-1.96
General findings	125	2.50	2.09	621	0.60	0.47	0.89
Abdominal operations	126	19.54	5.30	622	15.20	2.16	0.76
		Mean			Mean		
Age began menstruating (years)	126	12.84	0.22	622	12.74	0.10	0.41

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 28. Z-statistics for comparison of low and adequate transferrin saturation status[1] for white menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low transferrin saturation			Adequate transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	505	9.52	0.31	2,652	10.11	0.14	–1.73
Log total iron intake (log mg)	505	94.67	1.36	2,652	96.74	0.60	–1.39
Total animal tissue iron intake (mg)	505	3.58	0.20	2,652	3.79	0.10	–0.92
Total nonanimal tissue iron intake (mg)	505	5.94	0.23	2,652	6.32	0.10	–1.50
Total protein intake (mg)	505	62.55	1.95	2,652	66.34	0.93	–1.76
Total animal tissue protein intake (mg)	505	29.45	1.54	2,652	31.14	0.75	–0.99
Total nonanimal tissue protein intake (mg)	505	33.10	1.19	2,652	35.20	0.53	–1.61
Estimated available iron (mg)	505	1.33	0.06	2,652	1.43	0.03	–1.44
Estimated available iron with tea (mg)	505	1.29	0.06	2,652	1.39	0.03	–1.62
Vitamin C (mg)	505	73.09	5.70	2,652	82.19	2.61	–1.45
Socioeconomic							
Age (years)	505	29.34	0.75	2,652	27.85	0.32	1.83
Poverty income ratio (index)	492	2.58	0.10	2,572	2.79	0.05	–1.91
Estimated family income (dollars)	492	3,696.64	177.41	2,572	3,625.26	76.92	0.37
Number of persons in household (units)	505	4.46	0.14	2,652	4.13	0.06	2.26
Age of head of household (years)	505	40.17	0.77	2,652	39.29	0.33	1.05
Education of head of household (years)	497	11.22	0.23	2,597	12.18	0.09	–3.88
Education of examinee (years)	504	11.34	0.17	2,638	11.69	0.08	–1.91
		Percent			Percent		
Married[2]	437	67.30	3.37	2,297	67.70	1.46	–0.11
Other[2]							
Pica	505	1.28	0.75	2,652	0.40	0.18	1.14
Regular vitamin use	505	22.85	2.80	2,652	32.16	1.36	–2.99
Regular mineral use	505	16.25	2.46	2,652	21.88	1.20	–2.05
Regular vitamin and mineral use	505	39.78	4.63	2,652	52.41	2.09	–2.48
Regular aspirin use	505	46.47	3.33	2,652	47.90	1.46	–0.39
Special diet	505	9.04	1.91	2,652	7.94	0.79	0.53
Oral contraceptive usage in past 6 months	505	14.41	2.34	2,652	23.04	1.23	–3.26
Ever been pregnant	505	59.79	3.27	2,652	52.62	1.45	2.00
Ever been anemic	505	30.93	3.09	2,652	25.68	1.27	1.57
Any trouble eating	505	34.44	3.17	2,652	32.50	1.36	0.56
General findings	504	2.78	1.10	2,647	1.64	0.37	0.98
Abdominal operations	505	24.14	2.86	2,652	21.30	1.19	0.92
		Mean			Mean		
Age began menstruating (years)	505	12.60	0.09	2,652	12.62	0.04	–0.21

[1] Persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 29. *Z*-statistics for comparison of low and adequate transferrin saturation status[1] for black menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low transferrin saturation			Adequate transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	159	9.46	0.50	589	9.13	0.31	0.56
Log total iron intake (log mg)	159	93.96	2.48	589	90.89	1.47	1.07
Total animal tissue iron intake (mg)	159	3.40	0.31	589	3.51	0.19	–0.31
Total nonanimal tissue iron intake (mg)	159	6.06	0.41	589	5.62	0.22	0.95
Total protein intake (mg)	159	57.12	3.14	589	59.40	1.95	–0.62
Total animal tissue protein intake (mg)	159	29.10	2.53	589	30.50	1.47	–0.48
Total nonanimal tissue protein intake (mg)	159	28.02	1.93	589	28.90	1.03	–0.40
Estimated available iron (mg)	159	1.34	0.08	589	1.30	0.06	0.40
Estimated available iron with tea (mg)	159	1.31	0.08	589	1.29	0.06	0.20
Vitamin C (mg)	159	77.93	11.53	589	69.55	5.08	0.67
Socioeconomic							
Age (years)	159	28.56	1.30	589	26.40	0.67	1.48
Poverty income ratio (index)	156	1.63	0.14	570	1.69	0.09	–0.36
Estimated family income (dollars)	156	3,921.41	289.41	570	4,032.33	156.19	–0.34
Number of persons in household (units)	159	5.55	0.30	589	5.50	0.17	0.14
Age of head of household (years)	158	41.95	1.34	589	40.26	0.76	1.10
Education of head of household (years)	151	9.92	0.37	577	10.16	0.19	–0.57
Education of examinee (years)	158	10.52	0.30	585	10.75	0.17	–0.67
		Percent			Percent		
Married[2]	134	43.50	6.43	477	47.00	3.43	–0.48
Other[2]							
Pica	159	7.33	3.10	589	6.57	1.53	0.22
Regular vitamin use	159	12.05	3.87	589	17.04	2.32	–1.10
Regular mineral use	159	12.05	3.87	589	11.90	2.00	0.03
Regular vitamin and mineral use	159	35.79	8.01	589	36.39	4.19	–0.07
Regular aspirin use	159	45.79	5.93	589	41.64	3.05	0.62
Special diet	159	5.36	2.68	589	6.32	1.50	–0.31
Oral contraceptive usage in past 6 months	159	11.97	3.86	589	23.59	2.62	–2.49
Ever been pregnant	159	67.53	5.57	589	57.63	3.05	1.56
Ever been anemic	159	29.38	1.85	589	25.28	2.69	1.26
Any trouble eating	159	31.83	5.54	589	37.33	3.00	–0.87
General findings	158	0.20	0.54	588	1.07	0.64	–1.04
Abdominal operations	159	19.82	4.74	589	15.84	2.26	0.76
		Mean			Mean		
Age began menstruating (years)	159	12.73	0.18	589	12.73	0.10	0.00

[1] Persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 30. Z-statistics for comparison of low and adequate hemoglobin combined with transferrin saturation status[1] for white menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin/ transferrin saturation			Adequate hemoglobin/ transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	88	10.20	0.78	3,069	10.03	0.13	0.21
Log total iron intake (log mg)	88	99.45	3.14	3,069	96.46	0.55	0.94
Total animal tissue iron intake (mg)	88	4.06	0.60	3,069	3.76	0.09	0.46
Total nonanimal tissue iron intake (mg)	88	6.14	0.44	3,069	6.27	0.10	–0.29
Total protein intake (mg)	88	65.76	5.53	3,069	65.77	0.84	–0.00
Total animal tissue protein intake (mg)	88	33.36	4.59	3,069	30.97	0.68	0.52
Total nonanimal tissue protein intake (mg)	88	32.40	2.30	3,069	34.80	0.49	–1.02
Estimated available iron (mg)	88	1.46	0.16	3,069	1.42	0.02	0.25
Estimated available iron with tea (mg)	88	1.40	0.03	3,069	1.38	0.02	0.53
Vitamin C (mg)	88	59.92	9.19	3,069	81.02	2.42	–2.22
Socioeconomic							
Age (years)	88	35.75	1.82	3,069	27.82	0.30	4.29
Poverty income ratio (index)	84	2.56	0.21	2,980	2.78	0.04	–1.01
Estimated family income (dollars)	84	4,054.37	451.19	2,980	3,629.19	71.40	0.93
Number of persons in household (units)	88	4.61	0.36	3,069	4.28	0.05	0.90
Age of head of household (years)	88	44.73	1.90	3,069	39.35	0.31	2.80
Education of head of household (years)	87	9.21	0.64	3,007	12.05	0.09	–4.43
Education of examinee (years)	88	10.68	47.81	3,054	11.65	0.07	–0.02
		Percent			Percent		
Married[2]	82	56.90	8.20	2,652	63.10	1.41	–0.75
Other[2]							
Pica	88	0.00	0.00	3,069	0.58	0.21	–2.83
Regular vitamin use	88	15.30	5.76	3,069	30.60	1.25	–2.60
Regular mineral use	88	11.00	5.01	3,069	20.80	1.10	–1.91
Regular vitamin and mineral use	88	25.80	9.19	3,069	50.60	1.95	–2.64
Regular aspirin use	88	45.00	7.96	3,069	47.80	1.35	–0.35
Special diet	88	6.80	4.03	3,069	8.00	0.74	–0.29
Oral contraceptive usage in past 6 months	88	10.50	4.89	3,069	22.30	1.13	–2.35
Ever been pregnant	88	72.20	7.16	3,069	53.30	1.35	2.59
Ever been anemic	88	44.80	7.96	3,069	25.90	1.19	2.35
Any trouble eating	88	34.10	7.58	3,069	32.40	1.27	0.22
General findings	88	0.00	0.00	3,063	0.90	0.26	–3.53
Abdominal operations	88	24.30	6.86	3,069	21.50	1.11	0.40
		Mean			Mean		
Age began menstruating (years)	88	13.04	0.20	3,069	12.60	0.04	2.15

[1] Age- and sex-specific hemoglobin standards are found in table A; persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 31. Z-statistics for comparison of low and adequate hemoglobin combined with transferrin saturation status[1] for black menstruating women ages 12–54 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin/ transferrin saturation			Adequate hemoglobin/ transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	55	8.18	0.91	693	9.30	0.28	–1.17
Log total iron intake (log mg)	55	86.90	4.11	693	92.06	1.33	–1.19
Total animal tissue iron intake (mg)	55	2.48	0.39	693	3.61	0.17	–2.62
Total nonanimal tissue iron intake (mg)	55	5.71	0.84	693	5.70	0.20	0.01
Total protein intake (mg)	55	48.61	4.65	693	60.44	1.79	–2.37
Total animal tissue protein intake (mg)	55	23.23	3.36	693	31.55	1.37	–2.29
Total nonanimal tissue protein intake (mg)	55	25.38	3.30	693	28.89	0.93	–1.02
Estimated available iron (mg)	55	1.06	0.13	693	1.34	0.05	–2.02
Estimated available iron with tea (mg)	55	1.03	0.13	693	1.32	0.05	–2.06
Vitamin C (mg)	55	69.03	13.43	693	70.73	4.87	–0.12
Socioeconomic							
Age (years)	55	29.98	2.17	693	26.48	0.62	1.55
Poverty income ratio (index)	55	1.61	0.23	671	1.74	0.08	–0.53
Estimated family income (dollars)	55	3,424.23	464.43	671	4,058.45	143.27	–1.30
Number of persons in household (units)	55	5.58	0.56	693	5.09	0.15	0.84
Age of head of household (years)	55	43.89	2.09	692	40.17	0.70	1.69
Education of head of household (years)	52	8.76	0.76	676	10.24	0.17	–1.90
Education of examinee (years)	55	11.01	0.56	688	10.72	0.15	0.50
		Percent			Percent		
Married[2]	51	14.90	7.48	560	55.80	3.15	–5.04
Other[2]							
Pica	55	9.80	6.01	693	6.00	1.36	0.62
Regular vitamin use	55	12.50	6.70	693	16.00	2.09	–0.50
Regular mineral use	55	11.00	6.33	693	12.10	1.86	–0.17
Regular vitamin and mineral use	55	30.80	12.52	693	35.90	3.83	–0.39
Regular aspirin use	55	57.40	10.01	693	42.10	2.82	1.47
Special diet	55	9.70	5.97	693	5.60	1.31	0.67
Oral contraceptive usage in past 6 months	55	4.50	4.19	693	23.30	2.41	–3.89
Ever been pregnant	55	72.60	9.02	693	57.90	2.82	1.56
Ever been anemic	55	18.40	7.77	693	25.40	2.48	0.86
Any trouble eating	55	33.60	9.55	693	36.00	2.74	–0.24
General findings	54	0.10	0.06	692	0.90	0.54	–1.48
Abdominal operations	55	20.60	8.19	693	15.70	2.07	0.58
		Mean			Mean		
Age began menstruating (years)	55	13.22	0.39	693	12.71	0.09	1.27

[1] Age- and sex-specific hemoglobin standards are found in table A; persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 32. Logit analysis statistics showing the relationship between selected characteristics and hemoglobin status for menstruating women ages 12–54 years: United States, 1971–74

Characteristics	Logit analysis statistics			
	Coefficient	Standard error	t-test statistic[1]	Odds ratio[2]
Constant	–1.901	0.674	...	...
Poverty income ratio	–0.164	0.057	–2.878	0.85
Race	1.818	0.179	10.148	6.34
Education of head of household	–0.060	0.016	–3.891	0.94
Oral contraceptive usage in past 6 months	–0.548	0.284	–1.930	0.56
Age	0.023	0.018	2.269	1.02
Ever been anemic	0.561	0.188	2.986	1.76
Ever been pregnant	0.025	0.301	0.083	1.03

[1] Only characteristics with a *t*-test statistic $\geq$ 1.96 ($p < .05$) are shown.
[2] See appendix I for discussion of odds ratios.

Table 33. Logit analysis statistics showing the relationship between selected characteristics and transferrin saturation status for menstruating women ages 12–54 years: United States, 1971–74

Characteristics	Logit analysis statistics			
	Coefficient	Standard error	t-test statistic[1]	Odds ratio[2]
Constant	0.535	0.427	...	...
Poverty income ratio	–0.175	0.040	–4.325	0.84
Race	0.495	0.171	2.896	1.65
Education of head of household	–0.032	0.010	–3.304	0.97
Oral contraceptive usage in past 6 months	–0.379	0.142	–2.663	0.68
Age	0.003	0.007	0.424	1.00
Ever been anemic	0.059	0.143	0.416	1.06
Ever been pregnant	0.609	0.177	3.436	1.84

[1] Only characteristics with a *t*-test statistic $\geq$ 1.96 ($p < .05$) are shown.
[2] See appendix I for discussion of odds ratios.

Table 34. Logit analysis statistics showing the relationship between selected characteristics and hemoglobin and transferrin saturation status for menstruating women ages 12–54 years: United States, 1971–74

Characteristics	Logit analysis statistics			
	Coefficient	Standard error	t-test statistic[1]	Odds ratio[2]
Constant	0.977	0.886	...	...
Poverty income ratio	0.205	0.079	–2.592	0.81
Race	1.017	0.236	4.307	2.78
Education of head of household	0.073	0.020	–3.655	0.93
Oral contraceptive usage in past 6 months	0.929	0.404	–2.297	0.38
Age	0.033	0.013	2.510	1.04
Ever been anemic	0.595	0.280	2.129	1.81
Ever been pregnant	0.437	0.427	1.023	1.57

[1] Only characteristics with a *t*-test statistic $\geq$ 1.96 ($p < .05$) are shown.
[2] See appendix I for discussion of odds ratios.

Table 35. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for persons ages 65–74 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	249	11.20	0.77	1,987	10.26	0.17	1.20
Log total iron intake (log mg)	249	99.42	2.30	1,987	97.47	0.68	0.81
Total animal tissue iron intake (mg)	249	3.73	0.43	1,987	3.19	0.11	1.21
Total nonanimal tissue iron intake (mg)	249	7.47	0.56	1,987	7.08	0.12	0.68
Total protein intake (mg)	249	64.81	3.01	1,987	60.64	0.99	1.32
Total animal tissue protein intake (mg)	249	30.21	2.23	1,987	26.86	0.77	1.42
Total nonanimal tissue protein intake (mg)	249	34.60	1.69	1,987	33.78	0.59	0.46
Estimated available iron (mg)	249	1.59	0.14	1,987	1.38	0.03	1.44
Estimated available iron with tea (mg)	249	1.54	0.14	1,987	1.34	0.03	1.38
Vitamin C (mg)	249	86.47	9.05	1,987	94.34	2.81	–0.83
Socioeconomic							
Age (years)	249	69.29	0.28	1,987	68.89	0.10	1.34
Poverty income ratio (index)	237	2.20	0.18	1,898	2.58	0.07	–2.01
Estimated family income (dollars)	237	3,534.00	210.95	1,898	3,915.00	78.54	–1.69
Number of persons in household (units)	249	2.45	0.17	1,987	2.02	0.04	2.49
Age of head of household (years)	249	67.46	0.83	1,987	68.54	0.22	–1.26
Education of head of household (years)	235	8.58	0.41	1,840	9.85	0.13	–2.92
Education of examinee (years)	245	8.41	0.40	1,966	9.90	0.13	–3.53
		Percent			Percent		
Married[2]	249	65.50	4.52	1,982	61.70	1.64	0.79
Other[2]							
Pica	247	0.85	0.88	1,986	0.41	0.22	0.49
Regular vitamin use	249	25.78	4.16	1,987	34.57	1.60	–1.97
Regular mineral use	249	19.19	3.74	1,987	17.97	1.29	0.31
Regular vitamin and mineral use	249	30.81	5.15	1,987	48.11	2.22	–3.09
Regular aspirin use	249	45.02	4.73	1,987	41.74	1.66	0.65
Special diet	247	17.91	3.66	1,986	14.29	1.18	0.94
Ever been pregnant	63	21.90	7.82	1,123	47.63	2.24	–3.16
Ever been anemic	249	25.25	4.12	1,987	16.64	1.25	2.00
Any trouble eating	249	68.91	4.40	1,987	61.80	1.63	1.51
General findings	247	2.53	1.50	1,975	1.72	0.44	0.52
Abdominal operations	247	48.96	4.77	1,986	51.33	1.68	–0.47
		Mean			Mean		
Age began menstruating (years)	57	13.44	0.33	1,081	13.64	0.08	–0.59

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 36. *Z*-statistics for comparison of low and adequate transferrin saturation status[1] for persons ages 65–74 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low transferrin saturation			Adequate transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	126	9.93	0.77	2,110	10.36	0.17	–0.55
Log total iron intake (log mg)	126	93.94	3.17	2,110	97.83	0.67	–1.20
Total animal tissue iron intake (mg)	126	2.99	0.44	2,110	3.27	0.11	–0.62
Total nonanimal tissue iron intake (mg)	126	6.93	0.58	2,110	7.09	0.13	–0.27
Total protein intake (mg)	126	59.52	4.28	2,110	61.27	0.96	–0.40
Total animal tissue protein intake (mg)	126	26.71	3.48	2,110	27.33	0.75	–0.17
Total nonanimal tissue protein intake (mg)	126	32.81	2.44	2,110	33.93	0.57	–0.45
Estimated available iron (mg)	126	1.27	0.12	2,110	1.40	0.03	0.55
Estimated available iron with tea (mg)	126	1.22	0.12	2,110	1.36	0.03	–1.24
Vitamin C (mg)	126	72.24	9.33	2,110	93.02	2.72	–2.14
Socioeconomic							
Age (years)	126	68.86	0.40	2,110	68.90	0.09	–0.10
Poverty income ratio (index)	121	2.13	0.21	2,014	2.52	0.06	–1.78
Estimated family income (dollars)	121	3,429.00	307.36	2,014	3,906.00	76.31	–1.51
Number of persons in household (units)	126	2.44	0.26	2,110	2.03	0.03	1.54
Age of head of household (years)	126	66.94	0.88	2,110	68.47	0.22	–2.19
Education of head of household (years)	120	9.01	0.50	1,995	9.73	0.13	–1.42
Education of examinee (years)	124	8.91	0.48	2,087	9.75	0.13	–1.69
		Percent			Percent		
Married[2]	126	56.40	6.63	2,106	62.60	1.59	–0.91
Other[2]							
Pica	125	1.47	1.62	2,108	0.24	0.16	0.76
Regular vitamin use	126	35.10	6.39	2.110	34.20	1.55	0.14
Regular mineral use	126	20.30	5.37	2,110	18.30	1.26	0.36
Regular vitamin and mineral use	126	40.00	8.34	2,110	46.90	2.13	–0.80
Regular aspirin use	126	59.10	6.58	2,110	42.10	1.61	2.51
Special diet	125	21.50	5.51	2,108	14.10	1.14	1.31
Ever been pregnant	79	55.30	8.39	1,107	44.60	2.24	1.23
Ever been anemic	126	23.60	5.67	2,110	17.20	1.23	1.10
Any trouble eating	126	64.10	6.68	2,110	63.00	1.58	0.16
General findings	126	5.40	3.02	2,096	1.60	0.41	1.25
Abdominal operations	125	57.30	6.64	2,108	50.90	1.63	0.94
		Mean			Mean		
Age began menstruating (years)	74	13.54	0.36	1,064	13.64	0.09	–0.27

[1] Persons with a transferrin saturation below 16.0 percent and TIBC value above 250 μg/dl were classified as having a low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 37. Z-statistics for comparison of low and adequate hemoglobin status[1] for white persons ages 65–74 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	145	10.61	0.67	1,683	10.38	0.18	0.33
Log total iron intake (log mg)	145	99.45	2.72	1,683	98.06	0.73	0.49
Total animal tissue iron intake (mg)	145	3.48	0.40	1,683	3.22	0.11	0.63
Total nonanimal tissue iron intake (mg)	145	7.13	0.46	1,683	7.16	0.14	–0.06
Total protein intake (mg)	145	63.92	3.55	1,683	61.09	1.07	0.76
Total animal tissue protein intake (mg)	145	29.11	2.58	1,683	26.87	0.83	0.83
Total nonanimal tissue protein intake (mg)	145	34.82	2.06	1,683	34.22	0.64	0.28
Estimated available iron (mg)	145	1.48	0.12	1,683	1.39	0.03	0.71
Estimated available iron with tea (mg)	145	1.43	0.12	1,683	1.35	0.03	0.64
Vitamin C (mg)	145	89.20	9.74	1,683	94.61	2.98	–0.53
Socioeconomic							
Age (years)	145	69.33	0.36	1,683	68.91	0.11	1.12
Poverty income ratio (index)	140	2.59	0.25	1,611	2.67	0.07	–0.31
Estimated family income (dollars)	140	3,780.00	285.75	1,611	3,966.00	85.62	–0.62
Number of persons in household (units)	145	2.38	0.21	1,683	1.99	0.04	1.87
Age of head of household (years)	145	67.10	1.20	1,683	68.57	0.23	–1.20
Education of head of household (years)	136	10.00	0.45	1,565	10.11	0.14	–0.23
Education of examinee (years)	143	9.77	0.44	1,670	10.12	0.14	–0.76
		Percent			Percent		
Married[2]	145	73.80	5.48	1,680	62.00	1.77	2.05
Other[2]							
Pica	144	1.03	1.27	1,682	0.38	0.23	0.51
Regular vitamin use	145	30.08	5.71	1,683	35.38	1.75	–0.89
Regular mineral use	145	21.00	5.07	1,683	18.59	1.42	0.46
Regular vitamin and mineral use	145	33.89	6.83	1,683	48.63	2.41	–2.04
Regular aspirin use	145	45.45	6.20	1,683	41.27	1.80	0.65
Special diet	144	20.95	5.09	1,682	14.38	1.28	1.25
Ever been pregnant	35	22.17	10.62	941	47.43	2.44	–2.31
Ever been anemic	145	28.83	5.61	1,683	16.69	1.36	2.10
Any trouble eating	145	69.17	5.75	1,683	61.25	1.78	1.32
General findings	143	2.30	1.88	1,673	1.69	0.47	0.31
Abdominal operations	144	52.10	6.25	1,682	52.59	1.83	–0.08
		Mean			Mean		
Age began menstruating (years)	34	13.48	0.44	919	13.67	0.09	–0.43

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 38. *Z*-statistics for comparison of low and adequate hemoglobin status[1] for black persons ages 65–74 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low hemoglobin			Adequate hemoglobin			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	104	12.66	1.80	304	8.90	0.38	2.04
Log total iron intake (log mg)	104	99.33	4.29	304	90.45	1.91	1.89
Total animal tissue iron intake (mg)	104	4.35	1.00	304	2.76	0.26	1.54
Total nonanimal tissue iron intake (mg)	104	8.31	1.37	304	6.13	0.27	1.56
Total protein intake (mg)	104	67.00	5.62	304	55.34	2.65	1.88
Total animal tissue protein intake (mg)	104	32.94	4.26	304	26.74	2.34	1.27
Total nonanimal tissue protein intake (mg)	104	34.06	3.01	304	28.61	1.30	1.66
Estimated available iron (mg)	104	1.85	0.34	304	1.20	0.07	1.89
Estimated available iron with tea (mg)	104	1.83	0.34	304	1.17	0.07	1.92
Vitamin C (mg)	104	79.72	18.78	304	91.06	9.01	–0.54
Socioeconomic							
Age (years)	104	69.20	0.47	304	68.57	0.23	1.21
Poverty income ratio (index)	97	1.16	0.12	287	1.54	0.10	–2.49
Estimated family income (dollars)	97	2,874.00	265.62	287	3,302.00	182.22	–1.33
Number of persons in household (units)	104	2.64	0.30	304	2.32	0.12	0.99
Age of head of household (years)	104	68.35	0.87	304	68.19	0.60	0.15
Education of head of household (years)	99	5.23	0.59	275	6.86	0.36	–2.36
Education of examinee (years)	102	5.00	0.58	296	7.15	0.35	–3.17
		Percent			Percent		
Married[2]	104	45.20	7.33	302	57.20	4.27	–1.42
Other[2]							
Pica	103	0.37	0.89	304	0.74	0.74	–0.32
Regular vitamin use	104	15.17	5.28	304	24.91	3.72	–1.51
Regular mineral use	104	14.71	5.21	304	10.65	2.65	0.69
Regular vitamin and mineral use	104	23.21	7.60	304	41.95	5.86	–1.95
Regular aspirin use	104	43.96	7.30	304	47.40	4.30	–0.41
Special diet	103	10.13	4.46	304	13.23	2.92	–0.58
Ever been pregnant	28	19.90	11.32	182	49.99	5.56	–2.39
Ever been anemic	104	17.67	5.61	304	16.11	3.16	0.24
Any trouble eating	104	68.24	6.85	304	69.34	3.97	–0.14
General findings	104	3.10	2.55	302	2.10	1.24	0.35
Abdominal operations	103	40.92	7.27	304	36.26	4.14	0.56
		Mean			Mean		
Age began menstruating (years)	23	*13.34	*	162	13.35	0.19	0.02

[1] Age- and sex-specific hemoglobin standards are found in table A.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 39. *Z*-statistics for comparison of low and adequate transferrin saturation status[1] for white persons ages 65–74 years, with statistic and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	*Low hemoglobin*			*Adequate hemoglobin*			*Z-statistic*
	Number of examined persons	*Statistic*	*Standard error of the statistic*	*Number of examined persons*	*Statistic*	*Standard error of the statistic*	
Dietary intake		Mean			Mean		
Total iron intake (mg)	101	9.93	0.85	1,727	10.44	0.18	–0.59
Log total iron intake (log mg)	101	94.22	3.47	1,727	98.38	0.72	–1.17
Total animal tissue iron intake (mg)	101	2.71	0.39	1,727	3.29	0.11	–1.41
Total nonanimal tissue iron intake (mg)	101	7.23	0.67	1,727	7.15	0.13	0.12
Total protein intake (mg)	101	58.24	4.38	1,727	61.66	1.06	–0.76
Total animal tissue protein intake (mg)	101	24.55	3.28	1,727	27.32	0.81	–0.82
Total nonanimal tissue protein intake (mg)	101	33.69	2.80	1,727	34.34	0.64	–0.23
Estimated available iron (mg)	101	1.23	0.12	1,727	1.41	0.03	–1.40
Estimated available iron with tea (mg)	101	1.19	0.12	1,727	1.37	0.03	–1.42
Vitamin C (mg)	101	76.70	10.78	1,727	93.60	2.92	–1.51
Socioeconomic							
Age (years)	101	68.79	0.43	1,727	68.92	0.10	–0.30
Poverty income ratio (index)	97	2.19	0.24	1,654	2.63	0.07	–1.78
Estimated family income (dollars)	97	3,408.00	334.46	1,654	3,979.00	84.68	–1.66
Number of persons in household (units)	101	2.36	0.28	1,727	2.01	0.04	1.24
Age of head of household (years)	101	66.99	1.26	1,727	68.49	0.24	–1.17
Education of head of household (years)	97	9.17	0.54	1,604	10.06	0.14	–1.59
Education of examinee (years)	101	9.11	0.52	1,712	10.06	0.13	–1.77
		Percent			Percent		
Married[2]	101	60.90	7.28	1,725	63.30	1.74	–0.32
Other[2]							
Pica	101	1.50	1.79	1,725	0.23	0.17	0.71
Regular vitamin use	101	38.40	7.25	1,727	35.20	1.73	0.43
Regular mineral use	101	22.20	6.21	1,727	18.90	1.41	0.52
Regular vitamin and mineral use	101	37.80	8.76	1,727	48.10	2.36	–1.14
Regular aspirin use	101	60.10	7.31	1.727	41.60	1.78	2.46
Special diet	101	23.60	6.34	1,725	14.10	1.26	1.47
Ever been pregnant	63	58.10	9.32	913	45.00	2.47	1.36
Ever been anemic	101	25.30	6.49	1,727	17.30	1.36	1.21
Any trouble eating	101	63.60	7.18	1,727	62.30	1.75	0.18
General findings	101	2.80	2.46	1,715	1.60	0.46	0.48
Abdominal operations	101	56.20	7.40	1,725	52.50	1.81	0.49
		Mean			Mean		
Age began menstruating (years)	61	13.53	0.40	892	13.67	0.09	–0.34

[1] Persons with a transferrin saturation below 16.0 percent and TIBC value above 250 µg/dl were classified as having a low tranferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 40. *Z*-statistics for comparison of low and adequate transferrin saturation status[1] for black persons ages 65–74 years, with statistic, and standard error of the statistic, by selected characteristics: United States, 1971–74

Characteristics	Low transferrin saturation			Adequate transferrin saturation			Z-statistic
	Number of examined persons	Statistic	Standard error of the statistic	Number of examined persons	Statistic	Standard error of the statistic	
Dietary intake		Mean			Mean		
Total iron intake (mg)	25	9.88	1.87	383	9.57	0.50	0.16
Log total iron intake (log mg)	25	91.91	8.12	383	92.06	1.84	–0.02
Total animal tissue iron intake (mg)	25	5.09	1.74	383	3.07	0.33	1.14
Total nonanimal tissue iron intake (mg)	25	4.79	0.62	383	6.50	0.36	–2.38
Total protein intake (mg)	25	68.85	13.80	383	57.16	2.41	0.83
Total animal tissue protein intake (mg)	25	42.42	12.74	383	27.47	1.99	1.16
Total nonanimal tissue protein intake (mg)	25	26.43	3.58	383	29.69	1.24	–0.86
Estimated available iron (mg)	25	1.53	0.41	383	1.31	0.10	0.52
Estimated available iron with tea (mg)	25	1.40	0.35	383	1.30	0.10	0.28
Vitamin C (mg)	25	39.57	10.50	383	87.20	8.17	–3.58
Socioeconomic							
Age (years)	25	69.41	1.11	383	68.63	0.21	0.69
Poverty income ratio (index)	24	*1.57	*	360	1.40	0.08	0.46
Estimated family income (dollars)	24	*3,607.00	*	360	3,128.00	156.06	0.57
Number of persons in household (units)	25	3.08	0.73	383	2.33	0.11	1.01
Age of head of household (years)	25	66.62	2.74	383	68.28	0.50	–0.60
Education of head of household (years)	23	*7.79	*	351	6.35	0.33	1.13
Education of examinee (years)	23	*6.98	*	375	6.52	0.32	0.38
		Percent			Percent		
Married[2]	25	23.30	12.69	381	55.30	3.82	–2.41
Other[2]							
Pica	24	*1.60	*	383	0.04	0.49	0.41
Regular vitamin use	25	10.60	9.24	383	23.70	3.26	–1.34
Regular mineral use	25	6.70	7.53	383	12.10	2.50	–0.68
Regular vitamin and mineral use	25	56.60	24.93	383	34.60	4.73	0.87
Regular aspirin use	25	52.30	15.00	383	47.20	3.83	0.33
Special diet	24	*3.70	*	383	13.20	2.60	–1.50
Ever been pregnant	16	*34.70	*	194	41.00	5.30	–0.34
Ever been anemic	25	10.70	9.27	383	15.80	2.80	–0.53
Any trouble eating	25	68.20	13.98	383	69.50	3.53	–0.09
General findings	25	24.40	12.87	381	0.80	0.68	1.83
Abdominal operations	24	*66.70	*	383	34.50	3.64	2.16
		Mean			Mean		
Age began menstruating (years)	13	*13.66	*	172	13.29	0.18	0.51

[1] Persons with a transferrin saturation below 16.0 percent and a TIBC above 250 μg/dl were classified as having low transferrin saturation.
[2] Statistics for these characteristics represent only those persons who answered yes on the questionnaire.

Table 41. Logit analysis statistics showing the relationship between selected characteristics and hemoglobin status for persons ages 65–74 years: United States, 1971–74

Characteristics	*Logit analysis statistics*			
	Coefficient	*Standard error*	*t-test statistic*[1]	*Odds ratio*[2]
Constant	–0.159	0.778	...	...
Race	1.903	0.301	6.317	6.33
Sex	–1.939	0.236	–8.220	0.14
Education of head of household	–0.042	0.018	–2.350	0.96
General findings	1.269	0.645	1.966	3.53
Ever been ânemic	0.901	0.205	4.395	2.64
Any trouble eating	0.484	0.161	3.011	1.58

[1] Only characteristics with a *t*-test statistic ≥ 1.96 ($p < .05$) are shown.
[2] See appendix I for discussion of odds ratios.

Table 42. Logit analysis statistics showing the relationship between selected characteristics and transferrin saturation status for persons ages 65–74 years: United States, 1971–74

Characteristics	*Logit analysis statistics*			
	Coefficient	*Standard error*	*t-test statistic*[1]	*Odds ratio*[2]
Constant	–0.637	0.993	...	...
Race	0.364	0.311	1.168	1.44
Sex	0.438	0.300	1.461	1.57
Education of head of household	–0.057	0.020	–2.894	0.94
General findings	1.406	0.865	1.625	3.84
Ever been anemic	0.108	0.255	0.425	1.13
Any trouble eating	–0.083	0.194	–0.429	0.92

[1] Only characteristics with a *t*-test statistic ≥ 1.96 ($p < .05$) are shown.
[2] [2]See appendix I for discussion of odds ratios.

Appendixes

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Appendix I. Statistical notes

Survey design

Individuals examined during NHANES I were selected in a three-stage, stratified probability sample of loose clusters of persons by geographic location. The sample was designed to be representative of the civilian noninstitutionalized population ages 1–74 years living within the coterminous United States; however, all persons residing upon reservation lands set aside for use of American Indians were excluded.

In the first stage of the design, the 1960 decennial census lists of addresses and the nearly 1,900 primary sampling units (PSU's) into which the coterminous United States is divided were examined. (Each PSU is either a standard metropolitan statistical area, a single county or two or three contiguous counties.) These PSU's were grouped into 40 strata on the basis of geographic region and population density to select target PSU's for NHANES I.

Of the 40 strata, 15 were composed of single large metropolitan areas with more than 2 million persons. These 15 metropolitan areas were chosen for the sample with certainty. A modified Goodman-Kish controlled selection technique was then used to choose two PSU's from each of the remaining 25 noncertainty strata with probability proportionate to its 1960 population. In this manner, a total first-stage sample of 65 (15 + (2 × 25)) PSU's or "stands" were selected for study.

Within each PSU, a systematic sample of segments (loose clusters of households) was chosen. Selection was made using the most up-to-date information on census enumeration districts (ED's) at the time of the visit—1960 census data for the first 44 stands and 1970 data for the remaining 21 stands. To make the sample representative of the current U.S. population, lists were supplemented by a sample of housing units that had been constructed since the most recent decennial census.

ED's having addresses that could be used (the majority of the areas visited) were divided into segments containing an average of six households each (in the first 44 stands) or eight households each (in the remaining 21 stands). The change was made primarily for operational advantages and was supported by research by the U.S. Bureau of the Census, indicating that the precision of estimates would not be affected appreciably. For ED's without addresses that could be used (generally located in rural areas), area sampling was employed.

Enumeration districts were divided into two economic classes. The first class, identified as the "poverty stratum," was composed of "Current Poverty Areas" that had been identified by the Census Bureau in the 1960 or 1970 census and 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," comprised all ED's not designated as belonging to the poverty stratum.

Target segments were selected from each of the two strata. All sample segments classified into the poverty stratum were sampled with probability 1. For the first 42 stands, sample segments in nonpoverty stratum ED's were divided into eight random subgroups, and one of the subgroups was chosen to remain in the NHANES I sample. Ongoing research then indicated that the efficiency of estimates could be increased by changing the ratio of poverty to nonpoverty segments from 8:1 to 2:1. Therefore, in the remaining 23 stands, the selected segments in the nonpoverty ED's were divided into two random subgroups, and one of the subgroups was chosen to remain in the sample.

After identifying the sample segments, a list of all current addresses within the segment boundaries was made, and a person in the household was interviewed to determine the age and sex of each person as well as 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 neighbors.

To select the persons in sample segments to be examined in NHANES I and at the same time to oversample certain groups at high risk of malnutrition, all household members ages 1–74 in each segment first were listed on a sample selection worksheet with each household in the segment listed serially. The number of household members in each of the six age-sex groups shown below were then listed on the worksheet under the appropriate age-sex group column. The sample selection worksheets were put in segment-number order, and a systematic random sample of persons in each age-sex group was selected to be examined using the following sampling rates.

Age and Sex	*Rate*
1–5 years (males and females)	1/2
6–19 years (males and females)	1/4
20–44 years (males)	1/4
20–44 years (females)	1/2
46–64 years (males and females)	1/4
65–74 years (males and females)	1

The persons selected in the 65-stand sample of NHANES I constituted a representative sample of the target population and included 28,043 persons ages 1–74 years, of whom 20,749 (74 percent) were examined. When adjustments were made for differential sampling for high-risk groups, the response rate was 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 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 a poststratified ratio adjustment that increases precision by bringing survey results into close alignment with U.S. Bureau of the Census population figures for 20 age, race, and sex groups in the United States as of November 1, 1972, the approximate midpoint of NHANES I.

A more detailed description of the survey design and selection technique has been published.[2]

Nonresponse

In any survey, after the sample is identified and the persons are requested to participate, the survey meets one of its more severe problems—nonresponse. The problem is more severe in a health examination survey, because often many persons will not participate in the examination. A potential for bias results if the persons in the sample who do not participate differ from the persons in the sample examined with respect to the characteristics under investigation. Intensive efforts were made in NHANES I to develop and implement procedures and inducements that would reduce the number of nonrespondents and thereby reduce the potential bias due to nonresponse.[2]

Despite these intensive efforts, 25 percent of the persons in the sample were not examined, compared with previous surveys conducted by the Division of Health Examination Statistics that had response rates of more than 86 percent. Consequently, the potential for a sizable bias does exist in the estimates in this publication. Because the response rate for the medical questionnaire was more than 95 percent of the persons in the sample, however, it was possible to examine the characteristics of the nonrespondents and the nature of nonresponse.

An analysis of data on examined and nonexamined (but interviewed) persons was conducted using data from the first 35 stands of NHANES I.[75] The two groups were quite similar with respect to the health characteristics that were compared. For example, 11 percent of persons examined reported having an illness or condition that interfered with their eating, compared with 9 percent of persons not examined but who had a medical history.

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 that mutiplied the reciprocal of the probability of selection of sample persons who were examined by a factor to bring 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 (1) under $3,000, (2) $3,000–6,999, (3) $7,000–9,999, (4) $10,000–14,999, and (5) $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 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 bias due to nonresponse. The percent distribution of the nonresponse adjustment factors computed for the 65-stand sample of NHANES I is shown in table I.

Missing data

Examination surveys are subject to the loss of information not only through the failure to examine all persons in the sample, but also from the failure to obtain and record all items of information for examined persons. For several examinees, one or more of the hematological and biochemical measurements

NOTE: A list of references follows the text.

and/or one or more of the dietary interviews were not available. The extent of these missing measurements is indicated in table II.

The number of missing hemoglobin concentrations was small for all age groups. Total iron-binding capacity and percent transferrin saturation were available for most persons ages 4–74 years; the number of missing measurements for these two variables for children under 4 years of age, however, was large. (Most missing biochemical determinations were a result of refusal to give blood (especially young children), loss of blood specimens in shipping to the laboratory, and results that did not meet laboratory quality control specifications.) Nutrient intake values were missing for 479 persons due to unsatisfactory dietary interview results.

For the descriptive information on persons ages 4–74 years, presented in tables 1–18 and figures 1–13, imputed hematological, biochemical, and nutrient intake measurements were used. These estimates were made on the basis of multiple regression type decisions, substituting for the missing measurements those of an individual who was of the same age, sex, race, and geographic location. (For approximately one-fourth of the missing records, a further adjustment of the nutrient intake values was made on the basis of the person's body weight.) For children under 4 years of age, the number of missing hematological values was too great to use such an imputation procedure. Therefore, data on persons ages 1–3 years with missing hematological and biochemical measurements are omitted from all detailed tables.

For the relational analyses presented in tables 19–42, no imputed hematological values were used. In this manner, no individual was assigned a particular iron status without full and complete knowledge of that individual's measured status at the time of examination. Imputed nutrient intake measurements were retained for this sample.

Table I. Percent distribution of nonresponse adjustment factors: 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.

Table II. Number and percent of examined persons in NHANES I with missing hematological, biochemical, and nutrient intake measurements, by age

Measurement and age	*Number*	*Percent*
Hemoglobin		
1–3 years	18	1.0
4–74 years	2,019	10.6
Total iron-binding capacity		
1–3 years	784	45.5
4–74 years	5,431	28.5
Percent transferrin saturation		
1–3 years	784	45.5
4–74 years	5,786	30.4
Nutrient intake		
1–74 years	479	2.3

Small numbers

In some tables, estimates are shown for cells for which the sample size is so small that the estimates shown, including those of variability, may not be reliable. In such instances, the numbers, if shown, have been included only to convey an impression of the overall table.

Significance tests of mean differences were conducted only if there were at least 25 persons in each group. Logit analyses were conducted only if there were at least 50 individuals in each group.

Reliability of estimates of means and prevalences

Because the statistics presented in this report are based on a sample, they differ somewhat from the figures that would have been obtained if the survey had been conducted on the complete population using precisely the same procedures. In other words, the statistics are subject to sampling variability.

The standard error is primarily a measure of sampling variability, but also may include part of the variation that arises in the measurement process. The standard errors used to calculate the significance of differences shown in tables 1–10 were calculated by a technique referred to as "balanced repeated replication." The need for this specialized technique for estimating standard errors arose because of the complexity of the sample design of NHANES I. This complexity made it inappropriate to calculate standard errors by a technique that did not account for the multistage cluster sample design. (Estimates of standard errors are subject to errors that may be large if the number of cases upon which the estimates are based is small, or the number of PSU's used in the variance calculations is small.)

However, to reduce the complexity of the effort required to produce standard error estimates for all of the means and proportions in this report, a "variance smoothing" approach was used to calculate all other standard errors.

Under this approach, a standard error estimate for a sample mean ($\bar{X}_i$) is produced in two steps. First, the simple random sample (SRS) estimate of the standard error (s.e.) is calculated with the usual formula,

$$\text{s.e.}_{SRS}(\bar{X}_i) = S_{x_i}/(n_i)^{1/2}$$

where S_{x_i} is the sample standard deviation and n_i is the size of the sample. Second, the simple random sample estimate of the standard error is multiplied by a design effect (defined as the effect that the complex sampling design has on the magnitude of the standard errors) to produce the standard error estimate of $\bar{X}_i$.

All standard errors of means presented in tables 11–42 were computed using this technique. The design effects were estimated by the method of least squares. The replicated half-sample variance estimates for a subset of the variables presented in this report were used as the dependent variables, and the corresponding simple random sample variance estimates were used as the independent variables in the model

$$\text{s.e. }(\bar{X}_i) = (\text{design effect}) \times \text{s.e.}_{SRS}(\bar{X}_i) + \epsilon$$

to produce estimates of the design effects.

The estimated design effects and the correlations between the half-sample variance estimates and the "smoothed" or predicted variance estimates (giving a measure of the strength of the relationship between the two, that is, the effectiveness of the fitting process) are given in table III. For all eight variables examined, the design effect never exceeded 1.50. In this report, the generally conservative strategy of assuming a design effect of 1.50 for all variables was used.

The usual test for the difference between two means (denoted by $\bar{X}_A$ and $\bar{X}_{\bar{A}}$), in which the estimated standard errors are treated as constants and the covariance is assumed to be zero, may then be used to determine the significance of a difference as follows:

$$Z = \frac{(\bar{X}_A - \bar{X}_{\bar{A}})}{[(\text{s.e. }\bar{X}_A)^2 + (\text{s.e. }\bar{X}_{\bar{A}})^2]^{1/2}}$$

where s.e. $(\bar{X}_A)$ and s.e. $(\bar{X}_{\bar{A}})$ are the standard errors for the two groups reported in the detailed table.

Table III. Estimated design effects and correlations of selected health, demographic, and nutrient intake variables: NHANES I

Variable	Design effect	Correlation
Have you ever had anemia?	1.09	0.81
Are you or have you ever been pregnant?	1.10	0.84
Do you have trouble eating?	0.98	0.76
Have you used oral contraceptive in past 6 months?	1.49	0.97
Age at exam	0.88	0.81
Poverty income ratio	1.14	0.71
Iron intake	1.25	0.81
Protein intake	1.32	0.85

For example, from table 19, the mean age of children ages 1–3 years with low hemoglobin is 2.19, and the standard error is 0.09; the corresponding statistics for the adequate hemoglobin group are 2.58 and 0.04, respectively. The significance test is, therefore:

$$Z = \frac{(2.19 - 2.58)}{[(0.09)^2 + (0.04)^2]^{1/2}}$$

$$Z = -3.96^{d}$$

This Z-statistic, if looked up in a table, is found to have a probability of less than 0.001.

Standard error estimates for sample proportions were similarly calculated in two steps. First, the simple random sample estimate of the standard error was calculated with the usual formula,

$$\text{s.e.}_{SRS}(p_{ij}) = (p_{ij}(1 - p_{ij})/n_i)^{1/2}$$

where p_{ij} is the estimated proportion, and n_i is the size of the sample. Second, the simple random sample estimate of the standard error was multiplied by the design effect to produce the standard error estimate of p_{ij}.

The following example may be illustrative. From table 11, 14.9 percent of males ages 65–74 years are estimated to have low hemoglobin; for females, the percentage is 4.3. The proportions denoted by p_m and p_f are, therefore, 0.149 and 0.043. The standard errors under simple random sampling were estimated through the following calculation:

$$\text{s.e.}_{SRS}(p_m) = (0.149 \times 0.851/1581)^{1/2} = .0089555$$

$$\text{s.e.}_{SRS}(p_f) = (0.043 \times 0.957/1728)^{1/2} = .0048799$$

The standard errors with design effects are, therefore:

$$\text{s.e.}(p_m) = 1.5 \times .0089555 = .0134332$$

$$\text{s.e.}(p_f) = 1.5 \times .0048799 = .0073199$$

All standard errors of proportions presented in tables 11–13, 15, and 19–42 were computed using this technique.

The usual test for the difference between two proportions may then be used to determine significance:

$$Z = \frac{p_m - p_f}{[(\text{s.e.}(p_m))^2 + (\text{s.e.}(p_f))^2]^{1/2}}$$

[d]The Z-statistics presented in the detailed tables were calculated with standard error values calculated to three or four decimal places. The standard errors presented in the tables are rounded to two decimals. Therefore, Z-statistics calculated using these values may differ slightly from the values presented in the detailed tables.

NOTE: A list of references follows the text.

For the example described in the previous paragraph,

$$Z = \frac{0.149 - 0.043}{[(.0134332)^2 + (.0073199)^2]^{½}}$$

$$Z = \frac{.106}{.0152981}$$

$$Z = 6.93$$

This Z-statistic, if looked up in a table, is found to have a probability of less than 0.001.

Analytic approach for relational analyses

Logistic models were used to study the relationship between iron status (as measured by a dichotomous variable) and the dietary, health, socioeconomic and demographic factors under study. These models were developed to estimate the probability (or odds) that an individual will have, for example, low transferrin saturation (TS), given a set of independent variables. Akin to multiple regression, logistic analysis assumes that although only a discrete outcome can be observed, an increase (or decrease) in each relevant independent variable increases (or decreases) the likelihood that an individual has a low TS level.[76,77] The particular advantage of logistic models is that they overcome the well-known problems of inefficiency and possible misspecification associated with alternative classification schemes, such as discriminant analysis.[78-81]

Under a logistic model, the natural logarithm of the odds that an individual is iron deficient is expressed as a linear combination of independent variables. Mathematically, this relationship is expressed as:

$$\ln \frac{p}{1-p} = b_0 + b_1x_1 + b_2x_2 + \ldots + b_mx_m + e$$

where: p = the probability of having a low transferrin saturation level.

$x_1 \ldots x_m$ = the independent variables under study.

$b_1 \ldots b_m$ = the logistic coefficients associated with these independent variables.

e = random error.

Estimated logistic coefficients (the b's) represent the change in the natural logarithm of the odds of a person's having a low TS that would be produced by a unit change in the particular independent variable. As the equation above cannot be solved explicitly, an iterative procedure is used to solve for the b's. In the present study, a Fletcher minimization procedure was used.[82]

Although such an iterative solution is satisfactory for estimating the logistic coefficients, the complexity of the NHANES I sample design necessitated use of an innovative approach to the estimation of the standard errors of these coefficients. Jackknifing, an all-purpose technique for determining the variance of any statistical parameter, is one approach. In essence, the technique involves estimating the parameter of interest (here, a logistic coefficient) on the full sample, then systematically setting aside portions of the sample and estimating the logistic coefficient on each of the so-generated subsamples and finally, computing the standard error of the logistic coefficient by studying the variability of the deviations of the statistics in the subsamples from the full sample estimate.[83,84] Although it would be possible to employ this technique to estimate the requisite standard errors, such an approach would be prohibitively expensive, as there were over 5,000 subjects in some analytic groups.

Incorporating a second technique—sampling by the dependent variable—into this strategy greatly reduces the cost burden involved. This technique was developed for estimating logit coefficients on large data sets in which the prevalence of the particular health condition under study is extremely low.[85-87] The rationale is based upon the fact that the relative amount of information contained in two samples of sizes n_1 and n_2, where we wish to compare the means in the two groups, is a function of the harmonic mean of the sample sizes $[2n_1n_2/(n_1 + n_2)]$. Thus if one group is by nature very small (here, for example, the number of persons classified as having low TS), very little is gained by retaining all the individuals in the second group to estimate their mean value (here, the adequate TS group) because it does little to increase the harmonic mean of the sample sizes. Hence a sample can be drawn from the overall data set, taking all those individuals with low TS and only a small fraction of those who have adequate TS levels with small (if any) loss of information. Logit coefficients estimated on a subsample so drawn will be unbiased estimates of the true logit coefficients.[85] The jackknife technique may then be used on this substantially reduced subsample to produce an estimate of the standard error.

This strategy was used for all logit analyses presented in this report. Subsamples were selected separately for persons with low and adequate iron status. All persons with low values for the iron status indicators were chosen with certainty. The sample of persons with adequate levels was chosen so that the rate of increase in the effective n, which determines the power to detect effects, was small and constant across groups (an additional adequate iron status individual

NOTE: A list of references follows the text.

Table IV. Number of persons classified as "low" and "adequate" iron status in the original and logistic samples, by iron status indicator and selected population group: NHANES I, 1971–74

Iron status indicator and population group	Original sample			Logit sample		
	Total	Low	Adequate	Total	Low	Adequate
Hemoglobin	Number					
Children, 1–3 years	1,353	170	1,183	760	170	590
Adult women, 12–54 years	3,707	242	3,465	1,083	240	841
Elderly, 65–74 years	1,967	222	1,745	993	222	770
Transferrin saturation						
Adult women, 12–54 years[1]	3,707	632	3,075	1,264	632	632
Elderly, 65–74 years	1,967	114	1,853	510	114	396
Hemoglobin and transferrin saturation						
Adult women, 12–54 years	3,707	134	3,573	600	134	466

[1] For adult women, the number with low TS levels was sufficiently large (632 persons) so that only an equal number of women with adequate TS were chosen.

in the sample would have increased the effective *n* by only one-tenth). This has the effect of keeping the prevalence constant across groups at 288 per 1,000 persons. Table IV presents the sizes of the sample so drawn.

The odds ratios presented in the logit analysis tables are "overall" odds ratios. For the dichotomous characteristics (e.g., by sex, ever been anemic), the odds ratio presented in the table represents the increase or decrease in the likelihood that an individual has low iron status for the given indicator with a unit change in the value of the characteristic under study. A unit change for continuous variables may not be the most appropriate comparison to make for any analysis of the effects on iron status for that characteristic. The overall odds ratios are presented in the tables for these variables, but must be interpreted appropriately.

Appendix II. Definitions of terms

Demographic and socioeconomic terms

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

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. Twenty of those who were 74 years old at the time of interview became 75 years old by the time of the examination. In the adjustiment and weighting procedures used to produce national estimates, these persons were included in the 74 year old group.

For analyses on children ages 1–3 years, an additional age variable was computed. This variable represents the child's age, in decimal form, computed from her or his date of birth.

Race

For each individual, race was determined by observation and recorded 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 incuded with white unless definitely known to be American Indian or of another race other than white.

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, e.g., 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 she or 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[88] were based on the poverty index developed by the Social Security Administration (SSA) in 1965. (For a detailed discussion of the SSA poverty standards, see references 89 and 90.) Modifications in the definition of poverty were adopted in 1969.[91] The standard data series on poverty for statistical use by all executive departments and establishments was used to determine the poverty level.[92]

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[90] (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."

As shown in table V, 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 that 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 povert

NOTE: A list of references follows the text.

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

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, p. 18.

ratios greater than 1.0 are described as "above poverty."

Poverty thresholds are computed on a national basis only. These thresholds have not been adjusted for regional, state, or other local variation in the cost of living (except for the farm and nonfarm difference). None of the noncash public welfare benefits such as food stamps or free food commodities are included in the income of the low-income families receiving these benefits.

The threshold income values in 1971 for the combinations listed above are shown in table V.

Other terms used in relational analyses

The following terms used in this report are abbreviations of the data items or questions listed under description. These characteristics are listed on the various NHANES I questionnaires or derived from data collected on them.[2]

Term	*Description*
Number of persons in household	Total number of persons reported on NHANES household questionnaire.
Married	Are you married? (yes or no)
Education of examinee	What is the highest grade or year of regular school the examinee has ever attended?
Age of head of household	How old was the head of the household on his or her last birthday?
Education of head of household	What is the highest grade or year of regular school the head of the household has ever attended?
Total iron intake	Milligrams of iron from all sources, consumed during a 24-hour period.
Log total iron intake	Logarithm (base 10) of total iron intake.
Total animal tissue iron intake	Milligrams of animal tissue (i.e., from meat, fish, and poultry) consumed during a 24-hour period.
Total nonanimal tissue iron intake	Milligrams of nonanimal tissue (i.e., from eggs, dairy products, and all plant sources) consumed during a 24-hour period.
Total protein intake	Grams of protein from all sources consumed during a 24-hour period.
Total animal tissue protein intake	Grams of protein from meat, fish, poultry consumed during a 24-hour period.
Total nonanimal tissue protein intake	Grams of protein from all plant sources (grains, fruits, vegetables, etc.); eggs and all dairy products consumed during a 24-hour period.
Estimated available iron	Milligrams of iron from all sources, modified by vitamin C and animal tissue protein intake consumed during a 24-hour period.
Estimated available iron with tea	Milligrams of iron from all sources, modified by vitamin C, animal tissue protein and tea intake consumed during a 24-hour period.
Vitamin C	Milligrams of vitamin C consumed during a 24-hour period.
Pica	Yes answers to "does person ever eat dirt or clay, starch, paint or plaster, or any material that might be considered unusual?"
Regular vitamin use	Has person taken vitamins within the last 30 days *and* within the last week?
Regular mineral use	Has person taken minerals within the last 30 days *and* within the last week?
Regular vitamin and mineral use	Does person report that he or she has taken vitamins and/or minerals within the last 30 days *and* within the last week?
Special diet	Are you on a special diet?
Ever breastfed	Was child breastfed at any time?
Age of mother at child's birth	How old was child's mother when (child) was born? ______ years

NOTE: A list of references follows the text.

Term—Con.	*Description—Con.*
Is child the first born?	How many children were born before this child?
Birth weight (pounds)	How much did child weigh when he was born? _____ pounds _____ ounces
Premature birth	Was child born prematurely? (That is, early or not carried the full nine months.)
Oral contraceptive usage in past 6 months	Have you taken birth control pills during the past 6 months?
Age began menstruating	How old were you when your periods or menstrual cycle started?
Ever been pregnant?	Are you or have you ever been pregnant?
Ever been anemic?	Have you ever had anemia, sometimes called "low blood?"
Any trouble eating?	Do you have any illness or condition which interferes with your eating?
General findings	Any findings on the general medical exam.
Present illness	Is child presently ill?
Regular aspirin use	Has person taken aspirin within last 30 days *and* within the last week?
Abdominal operations	Have you had an abdominal operation?

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