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FROM VITAL &amp; HEALTH STATISTICS OF THE NATIONAL CENTER FOR HEALTH STATISTICS

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE ■ Public Health Service | Number 46 ■ January 26, 1979

## Hemoglobin and Selected Iron-Related Findings of Persons 1-74 Years of Age: United States, 1971-74<sup>a</sup>

This report presents selected findings of the hemoglobin, serum iron, and percent transferrin saturation determinations collected in the Health and Nutrition Examination Survey (HANES). The serum iron and transferrin saturation results supersede all previously published results.<sup>1,2</sup>

HANES is a program of the National Center for Health Statistics in which measures of nutritional status are collected for a scientifically designed sample representative of the civilian noninstitutionalized population of the United States aged 1-74 years.<sup>3</sup>

The data collected from April 1971 through June 1974 are based on the examination of 20,749 persons from a total of 28,043 persons aged 1-74 years who were selected in the national probability sample to represent the 194 million persons in that age group in the civilian noninstitutionalized population. This was a response rate of 74 percent or an effective response rate of 75 percent when adjustment is made for the effect of oversampling among the poor, preschool children, women of childbearing age, and the elderly.

Detailed estimates of the distributions of iron-related measurements and the prevalence and distribution of iron deficiency anemia in the United States will be described in a forthcoming report<sup>4</sup> in Series 11 of the *Vital and Health Statistics*.

Blood specimens were collected primarily by using venipuncture procedures. When these

procedures were unsuccessful, a finger stick technique was used to obtain blood samples from which the hematological determinations could be made. For children aged 1-3 years, a large proportion of the specimens were collected by the finger stick technique. The numbers of blood specimens collected by this technique for persons aged 3 years and over were very small.

All hemoglobin concentrations for HANES were determined on the Coulter Hemoglobino-meter in the mobile examination center. The procedure is based on the hemoglobincyanide (cyanmethemoglobin, HbCN) principle.<sup>5</sup> Serum iron and total iron-binding capacity determinations were made by the Nutritional Biochemistry Section, Clinical Chemistry Division, Bureau of Laboratories, Center for Disease Control, Atlanta, Ga. The analytical method was a modification of the Technicon AutoAnalyzer II-25 method based on the procedures of Giovanniello, *et al.* and Ramsey.<sup>5</sup>

Following the publication of the "Preliminary Findings of the First Health and Nutrition Examination Survey, United States, 1971-1972: Dietary Intake and Biochemical Findings,"<sup>1</sup> a different analytical method for measuring serum iron and total iron-binding capacity<sup>5</sup> was adopted for the remainder of HANES. Although based on the same analytical principles applied in the original method of White and Flaschka,<sup>6</sup> the AutoAnalyzer method includes a dialysis procedure. A comparison study of the original and the AutoAnalyzer methods revealed unacceptable variability in the iron and total iron-binding capacity results obtained with the original method. For persons whose sera were processed using the original method, portions of

<sup>a</sup>This report was prepared by Clifford L. Johnson, M.S.P.H. and Sidney Abraham, Division of Health Examination Statistics.

the same serum specimens were taken from a reserve vial collection stored at  $-20^{\circ}\text{C}$  and were reanalyzed by the AutoAnalyzer method between December 1974 and May 1975. As previously noted, these data for serum iron and transferrin saturation results supersede all previously published results.<sup>1,2</sup>

Except for children aged 1-3 years, a sufficient number of serum iron and percent transferrin measurements are available for presenting results for all persons 4-74 years of age. The number of missing measurements for children aged 1-3 years was large. Although results are presented, no attempt was made to analyze the data on persons of these ages because of possible bias due to the missing values. The number of missing hemoglobin concentrations was small for all age groups, and results are analyzed for all persons aged 1-74 years.

## PRINCIPAL FINDINGS

### Hemoglobin

The mean hemoglobin level for males increased with age from 11.9 g/dl at age 1 year to 15.8 g/dl at ages 18-19 years. It remains fairly constant at ages 18-54 years and declines slightly at the older ages to a value of 15.3 g/dl at ages 65-74 years (table 1, figure 1).

A different pattern was observed for females, where the mean hemoglobin level increased with age from 12.0 g/dl at age 1 year to a maximum value of 14.1 g/dl at ages 55-64 years. Then the level dipped slightly to 14.0 g/dl in the age group 65-74 years (table 2, figure 1).

The differences in mean hemoglobin level for males and females increased with age. For

example, the differences at ages 1-11 years were small—ranging from 0.0 to 0.2 g/dl (tables 1 and 2). However, at ages 12 years and over the mean hemoglobin levels for males were consistently higher than those for females. These differences ranged from 1.0 g/dl at ages 12-17 years to 2.2 g/dl at ages 18-24 years (tables 1 and 2).

The hemoglobin pattern observed previously for the total male population aged 1-74 years was similar to the ones observed for white males and black males separately (table 1, figure 2). Mean levels generally increased with age to ages 18-19 years, remained reasonably constant to ages 45-54 years, and then declined at ages 55-74 years.

The age-hemoglobin pattern for the female population was similar in all three categories—all races, white females, and black females. For example, the pattern for white females was similar to the pattern observed for the total female population, generally increasing from 12.0 g/dl at age 1 year to 14.2 g/dl at ages 55-64 years, and declining slightly to 14.1 g/dl at ages 65-74 years. Black females also generally followed the same pattern as the total female population, reaching a high value of 13.5 g/dl at ages 45-54 years and declining to 13.1 g/dl at ages 65-74 years (table 2, figure 3).

For all ages, white males had higher mean hemoglobin levels than black males (table 1 and figure 2). Similarly, mean hemoglobin levels for white females were consistently higher than those for black females at all ages (table 2, figure 3). A detailed analysis of the hemoglobin data for females of reproductive age<sup>7</sup> reveals that this mean difference between the races is not explained by differences in iron nutriture as measured by transferrin saturation values.

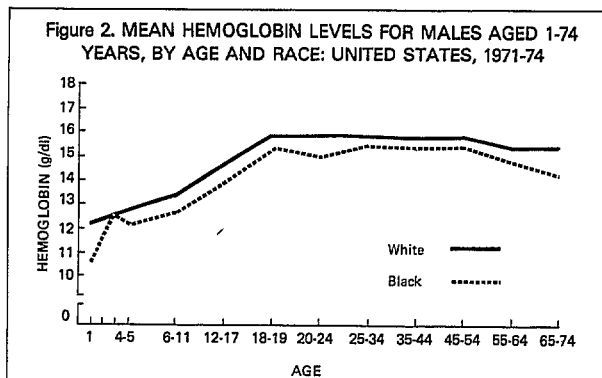
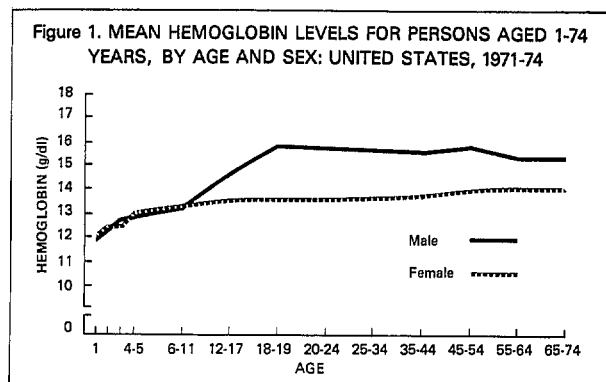
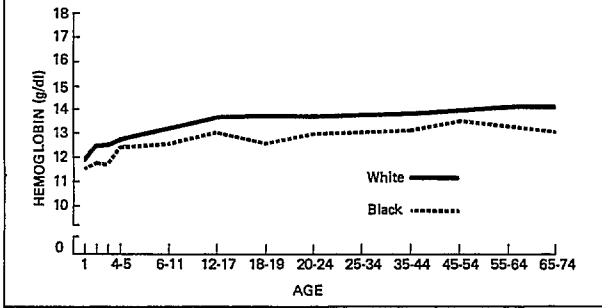


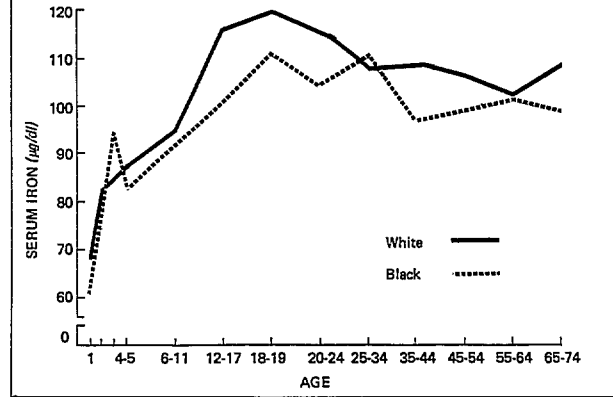
Figure 3. MEAN HEMOGLOBIN LEVELS FOR FEMALES AGED 1-74 YEARS, BY AGE AND RACE: UNITED STATES, 1971-74



Serum Iron

Mean serum iron levels for males increased from 86.3  $\mu\text{g/dl}$  at ages 4-5 years to 119.4  $\mu\text{g/dl}$  at ages 18-19 years. Thereafter, the mean levels decreased with age to a low value of 102.4  $\mu\text{g/dl}$  at ages 55-64 years, and then increased to 107.7  $\mu\text{g/dl}$  at ages 65-74 years (table 3, figure 4). Table 4 and figure 4 show that the mean serum iron levels for females increased with age from 89.4  $\mu\text{g/dl}$  at ages 4-5 years to a high value of 106.2  $\mu\text{g/dl}$  at ages 20-24 years. The mean levels then decreased irregularly to a low of 97.6  $\mu\text{g/dl}$  at ages 65-74 years. Although females had higher mean serum iron values than males at the younger ages, these differences were small. The differences in mean values were 3.1  $\mu\text{g/dl}$  at ages 4-5 years and 2.0  $\mu\text{g/dl}$  at ages 6-11 years. This pattern was reversed at ages 12-74 years, with males having consistently higher mean serum iron levels. These differences were larger—

Figure 5. MEAN SERUM IRON LEVELS FOR MALES AGED 1-74 YEARS, BY AGE AND RACE: UNITED STATES, 1971-74



ranging from 1.2  $\mu\text{g/dl}$  at ages 55-64 years to 18.1  $\mu\text{g/dl}$  at ages 18-19 years (tables 3, 4, and figure 4).

Mean serum iron levels for males did not follow the same pattern as that for females. The levels for black males and white males increased with age from ages 4-5 years to 18-19 years and then generally decreased at ages 20-74 years but with no consistent pattern (table 3, figure 5). For white females and black females, however, the highest mean serum iron levels were observed at ages 20-24 years, 106.9  $\mu\text{g/dl}$  and 103.2  $\mu\text{g/dl}$  respectively. At ages 25-74 years the mean levels decreased irregularly for both black and white females (table 4, figure 6).

With two exceptions, the white population had higher mean serum iron levels than the black

Figure 4. MEAN SERUM IRON LEVELS FOR PERSONS AGED 1-74 YEARS, BY AGE AND SEX: UNITED STATES, 1971-74

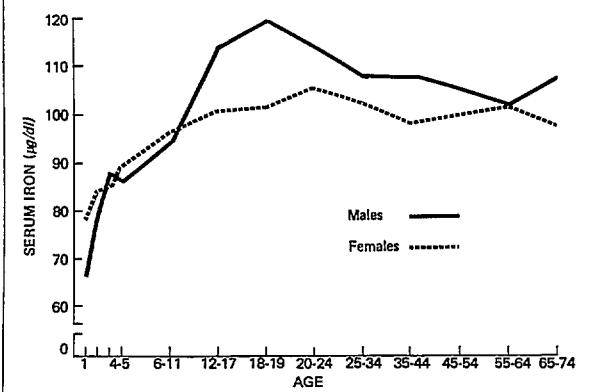


Figure 6. MEAN SERUM IRON LEVELS FOR FEMALES AGED 1-74 YEARS, BY AGE AND RACE: UNITED STATES, 1971-74

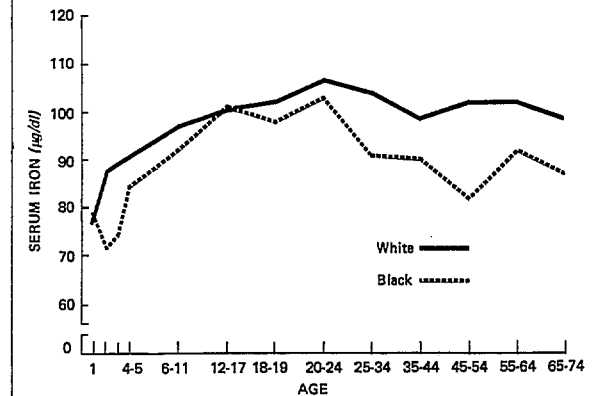
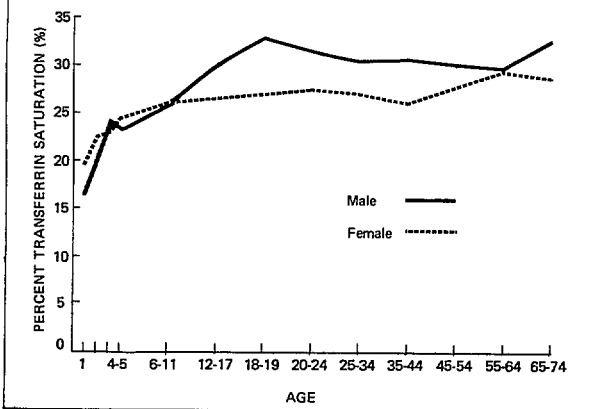


Figure 7. MEAN PERCENT TRANSFERRIN SATURATION LEVELS FOR PERSONS AGED 1-74 YEARS, BY AGE AND SEX: UNITED STATES, 1971-74



population did. One exception was at ages 25-34 years, where black males had higher mean levels than white males. The second exception was at ages 12-17 years where black females had higher levels than white females did.

### Percent Transferrin Saturation

The patterns observed for mean serum iron levels were also found for mean percent trans-

Figure 8. MEAN PERCENT TRANSFERRIN SATURATION LEVELS FOR MALES AGED 1-74 YEARS, BY AGE AND RACE: UNITED STATES, 1971-74

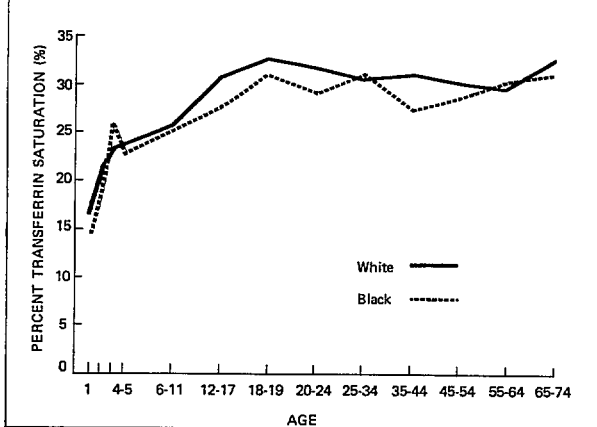
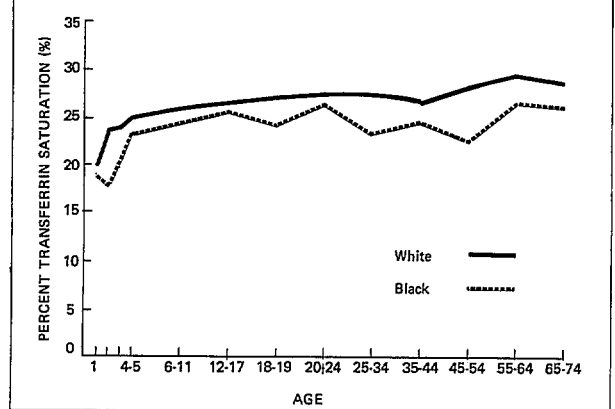


Figure 9. MEAN PERCENT TRANSFERRIN SATURATION LEVELS FOR FEMALES AGED 1-74 YEARS, BY AGE AND RACE: UNITED STATES, 1971-74



ferrin saturation levels. Mean percent transferrin saturation levels for males increased with age from 23.3 percent at ages 4-5 years to a high value of 32.8 percent at ages 18-19 years. The mean values then decreased irregularly to 29.8 percent at ages 55-64 years and increased again to 32.5 percent at ages 65-74 years (table 5, figure 7). The mean percent transferrin saturation level for females also increased with age from 24.5 percent at ages 4-5 years to 29.2 percent at ages 55-64 years. At ages 65-74 years there was a slightly lower mean value of 28.6 percent (table 6, figure 7).

Mean percent transferrin saturation levels for females were higher than those for males at ages 4-11 years. At all other ages, males had higher mean levels than females, ranging from 0.6 percent at ages 55-64 years to 6.0 percent at ages 18-19 years (tables 5, 6, and figure 7). In a pattern similar to that for serum iron, and with few exceptions, mean percent transferrin saturation levels were higher for white males than for black males and for white females than for black females (figures 8 and 9).

Table 1. Hemoglobin levels of males aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean <sup>1</sup>	Standard deviation <sup>1</sup>	Standard error of the mean <sup>1</sup>	Percentile <sup>1</sup>						
						5th	10th	25th	50th	75th	90th	95th
<u>All races</u>												
1 year-----	272	1,811	11.9	1.7	.08	7.9	9.8	11.2	12.1	13.0	13.6	13.9
2 years-----	283	1,778	12.3	1.1	.09	10.6	10.7	11.6	12.4	13.0	13.7	14.0
3 years-----	294	1,802	12.6	1.1	.09	11.0	11.3	11.9	12.5	13.1	13.8	14.3
4-5 years-----	549	3,427	12.7	1.0	.07	11.2	11.5	12.1	12.7	13.3	14.0	14.4
6-11 years-----	974	11,819	13.2	1.0	.05	11.7	12.0	12.6	13.3	13.9	14.4	14.8
12-17 years-----	1,006	12,558	14.6	1.3	.06	12.5	13.0	13.7	14.5	15.5	16.4	16.7
18-19 years-----	246	3,667	15.8	1.1	.06	14.0	14.3	15.1	15.9	16.5	17.2	17.6
20-24 years-----	486	8,088	15.8	1.1	.06	14.0	14.6	15.1	15.8	16.5	17.0	17.4
25-34 years-----	766	12,991	15.7	1.1	.07	13.9	14.3	15.1	15.8	16.4	17.1	17.5
35-44 years-----	631	10,663	15.6	1.1	.06	13.9	14.2	15.0	15.6	16.3	17.0	17.5
45-54 years-----	740	11,195	15.8	1.3	.05	13.9	14.3	15.0	15.8	16.6	17.4	17.9
55-64 years-----	569	8,971	15.4	1.4	.06	13.2	13.8	14.7	15.5	16.2	17.0	17.6
65-74 years-----	1,581	5,470	15.3	1.4	.04	13.0	13.6	14.5	15.3	16.2	16.9	17.4
<u>White</u>												
1 year-----	199	1,502	12.2	1.5	.09	9.6	10.2	11.5	12.3	13.1	13.7	14.0
2 years-----	205	1,500	12.4	1.0	.11	10.6	10.8	11.8	12.4	13.1	13.8	14.1
3 years-----	220	1,513	12.6	1.1	.10	11.0	11.4	11.9	12.5	13.1	13.8	14.4
4-5 years-----	419	2,893	12.8	1.0	.07	11.3	11.6	12.1	12.7	13.5	14.1	14.4
6-11 years-----	734	10,017	13.3	0.9	.06	11.9	12.2	12.7	13.4	13.9	14.4	14.8
12-17 years-----	769	10,752	14.7	1.2	.06	12.9	13.2	13.8	14.6	15.6	16.4	16.7
18-19 years-----	195	3,173	15.9	1.0	.06	14.2	14.7	15.3	15.9	16.5	17.2	17.6
20-24 years-----	407	7,077	15.9	1.0	.07	14.3	14.7	15.3	15.9	16.5	17.1	17.5
25-34 years-----	642	11,601	15.8	1.2	.07	13.9	14.3	15.1	15.9	16.5	17.2	17.5
35-44 years-----	543	9,501	15.7	1.2	.07	13.9	14.3	15.0	15.6	16.3	16.9	17.5
45-54 years-----	607	10,096	15.8	1.2	.05	14.0	14.4	15.1	15.8	16.6	17.4	17.8
55-64 years-----	484	8,169	15.4	1.3	.06	13.2	13.8	14.7	15.5	16.3	17.0	17.6
65-74 years-----	1,293	4,948	15.4	1.3	.04	13.2	13.8	14.6	15.5	16.3	16.9	17.4
<u>Black</u>												
1 year-----	70	298	10.6	2.0	.21	6.8	7.3	9.6	11.1	12.2	12.7	12.8
2 years-----	74	260	11.7	1.4	.10	8.6	10.3	10.8	12.0	12.6	13.2	13.2
3 years-----	64	230	12.5	1.0	.14	10.8	11.2	12.0	12.5	13.1	13.7	13.7
4-5 years-----	127	508	12.2	1.0	.11	10.8	11.0	11.5	12.2	12.9	13.3	13.6
6-11 years-----	229	1,686	12.7	1.1	.09	11.1	11.4	11.9	12.6	13.4	14.2	14.4
12-17 years-----	229	1,687	13.8	1.3	.08	11.7	12.0	12.8	13.7	14.7	15.6	16.3
18-19 years-----	46	422	15.2	1.2	.18	11.8	13.4	14.4	15.2	16.3	16.5	16.5
20-24 years-----	70	871	15.0	1.2	.12	12.6	13.1	14.6	15.1	15.9	16.4	16.7
25-34 years-----	111	1,213	15.4	0.9	.10	13.7	14.2	14.9	15.4	15.9	16.5	16.9
35-44 years-----	80	1,007	15.3	1.1	.12	13.8	13.9	14.4	15.3	15.6	16.8	17.8
45-54 years-----	126	1,044	15.4	1.6	.09	13.3	13.6	14.3	15.3	16.0	17.6	18.2
55-64 years-----	77	707	14.8	1.3	.12	12.3	13.8	14.0	14.9	15.4	16.0	16.8
65-74 years-----	270	482	14.3	1.6	.10	11.8	12.3	13.2	14.4	15.1	15.9	17.0

<sup>1</sup>g/dl

Table 2. Hemoglobin levels of females aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean	Standard deviation <sup>1</sup>	Standard error of the mean <sup>1</sup>	Percentile <sup>1</sup>						
						5th	10th	25th	50th	75th	90th	95th
<u>All races</u>												
1 year-----	254	1,729	12.0	1.2	.06	9.5	10.5	11.4	12.1	12.6	13.3	13.7
2 years-----	257	1,742	12.4	1.1	.09	10.7	11.0	11.6	12.5	13.1	13.5	14.2
3 years-----	278	1,694	12.4	1.0	.10	10.8	11.2	11.8	12.4	13.1	13.9	14.0
4-5 years-----	571	3,299	12.8	1.0	.07	11.2	11.5	12.0	12.7	13.5	14.0	14.6
6-11 years-----	974	11,392	13.2	1.0	.05	11.6	11.9	12.5	13.1	13.8	14.2	14.8
12-17 years-----	1,006	12,187	13.6	1.0	.06	12.0	12.3	12.9	13.6	14.3	14.9	15.4
18-19 years-----	260	3,810	13.6	1.2	.09	11.8	12.3	13.0	13.6	14.3	15.0	15.3
20-24 years-----	1,171	9,047	13.6	1.1	.06	11.9	12.3	12.9	13.6	14.3	14.9	15.3
25-34 years-----	1,793	13,943	13.7	1.2	.04	11.9	12.3	13.0	13.7	14.5	15.2	15.6
35-44 years-----	1,584	11,577	13.7	1.2	.04	11.7	12.2	13.0	13.7	14.4	15.2	15.7
45-54 years-----	788	12,180	14.0	1.3	.06	12.0	12.5	13.2	14.0	14.7	15.4	15.9
55-64 years-----	639	9,998	14.1	1.1	.06	12.5	12.7	13.4	14.1	14.9	15.5	15.8
65-74 years-----	1,728	7,138	14.0	1.2	.05	12.0	12.4	13.2	14.0	14.8	15.5	15.8
<u>White</u>												
1 year-----	179	1,426	12.0	1.1	.06	9.5	10.9	11.4	12.1	12.7	13.3	13.6
2 years-----	197	1,459	12.5	1.1	.12	10.7	11.0	11.7	12.6	13.2	13.6	14.3
3 years-----	204	1,417	12.5	1.0	.11	10.8	11.2	11.9	12.5	13.2	14.0	14.0
4-5 years-----	418	2,768	12.8	1.0	.08	11.2	11.6	12.1	12.8	13.5	14.0	14.7
6-11 years-----	734	9,602	13.2	0.9	.05	11.6	12.1	12.6	13.2	13.8	14.4	14.8
12-17 years-----	764	10,391	13.7	1.0	.07	12.1	12.4	13.0	13.7	14.4	15.1	15.5
18-19 years-----	194	3,263	13.8	1.0	.11	12.2	12.6	13.2	13.7	14.3	15.0	15.4
20-24 years-----	910	7,827	13.7	1.0	.06	12.1	12.5	13.0	13.7	14.3	15.0	15.3
25-34 years-----	1,477	12,193	13.8	1.2	.05	12.1	12.4	13.0	13.8	14.6	15.3	15.7
35-44 years-----	1,249	10,100	13.8	1.2	.04	11.9	12.3	13.1	13.8	14.4	15.3	15.7
45-54 years-----	665	10,878	14.0	1.3	.06	12.1	12.6	13.3	14.1	14.8	15.4	16.0
55-64 years-----	531	9,058	14.2	1.0	.06	12.6	12.9	13.5	14.2	14.9	15.6	15.8
65-74 years-----	1,426	6,486	14.1	1.2	.05	12.2	12.6	13.3	14.0	14.9	15.6	15.9
<u>Black</u>												
1 year-----	70	267	11.6	1.4	.17	9.5	9.7	11.1	11.7	12.5	13.0	13.4
2 years-----	57	270	11.8	0.8	.13	10.2	10.7	11.3	11.9	12.3	12.6	12.9
3 years-----	71	259	11.8	1.0	.18	10.1	10.6	11.3	11.8	12.3	13.1	13.3
4-5 years-----	148	503	12.5	1.0	.10	11.0	11.1	11.7	12.4	13.1	13.8	14.1
6-11 years-----	234	1,715	12.6	0.9	.07	11.2	11.5	12.0	12.5	13.2	13.7	14.2
12-17 years-----	235	1,709	13.0	1.0	.06	11.3	11.7	12.5	13.0	13.8	14.2	14.5
18-19 years-----	64	530	12.6	1.5	.15	7.7	11.1	11.9	12.8	13.4	14.2	14.3
20-24 years-----	236	1,053	13.0	1.3	.09	10.6	11.5	12.1	12.9	14.0	14.6	15.0
25-34 years-----	294	1,623	13.1	1.2	.08	10.9	11.5	12.3	13.2	14.0	14.6	14.8
35-44 years-----	307	1,314	13.2	1.4	.07	10.7	11.3	12.3	13.2	14.1	14.8	15.3
45-54 years-----	118	1,256	13.5	1.2	.12	11.4	12.0	12.8	13.6	14.2	14.7	15.0
55-64 years-----	105	872	13.3	1.1	.15	11.3	11.8	12.5	13.4	14.1	14.5	15.2
65-74 years-----	294	629	13.1	1.4	.07	10.7	11.3	12.3	13.1	14.0	14.7	15.1

<sup>1</sup>g/dl

Table 3. Serum iron levels of males aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean <sup>1</sup>	Standard deviation <sup>1</sup>	Standard error of the mean <sup>1</sup>	Percentile <sup>1</sup>						
						5th	10th	25th	50th	75th	90th	95th
<b>All races</b>												
1 year-----	114	(2)	67.1	34.1	(2)	25.7	29.0	41.0	59.0	88.5	109.8	128.1
2 years-----	153	(2)	80.4	34.1	(2)	33.6	39.0	54.0	77.0	95.0	128.8	146.1
3 years-----	192	(2)	87.4	34.1	(2)	36.0	45.2	60.0	83.0	110.0	128.8	148.2
4-5 years-----	552	3,427	86.3	33.8	1.4	33.0	41.4	63.0	84.0	109.0	131.2	145.3
6-11 years----	979	11,819	94.1	33.7	1.2	42.1	52.0	70.0	92.0	113.0	138.7	153.2
12-17 years----	1,011	12,558	113.4	41.1	1.4	56.0	67.0	87.0	108.0	135.0	161.0	180.0
18-19 years---	246	3,667	119.4	44.6	2.9	55.1	73.2	93.0	113.0	140.0	177.0	194.6
20-24 years---	483	8,088	114.4	35.7	1.5	65.0	72.0	89.0	110.0	136.1	160.0	179.0
25-34 years---	764	12,991	108.2	36.4	1.4	58.0	66.0	84.0	103.0	127.0	152.0	178.0
35-44 years---	634	10,663	108.1	38.0	2.0	61.0	65.0	80.0	103.9	129.0	152.2	171.0
45-54 years---	715	11,195	105.7	38.9	1.8	53.8	64.0	79.9	99.0	126.5	151.0	173.7
55-64 years---	556	8,971	102.4	34.9	1.6	51.3	61.8	78.8	100.0	121.0	149.8	170.0
65-74 years---	1,545	5,470	107.7	34.9	0.9	57.0	66.0	84.0	105.0	126.0	153.8	167.0
<b>White</b>												
1 year-----	88	(2)	68.9	32.6	(2)	26.0	29.0	45.0	64.0	88.0	111.4	130.2
2 years-----	111	(2)	82.2	31.7	(2)	36.2	45.0	56.0	79.5	95.2	124.7	144.0
3 years-----	142	(2)	85.0	34.4	(2)	35.1	44.2	56.5	81.0	107.5	123.8	151.0
4-5 years-----	411	2,893	87.2	33.6	1.7	33.0	44.7	64.0	85.0	109.0	133.7	145.4
6-11 years----	719	10,017	94.5	34.4	1.4	42.0	50.6	70.0	93.0	114.0	139.0	154.0
12-17 years---	753	10,752	115.4	42.0	1.6	56.0	67.0	88.0	111.0	138.0	162.0	182.0
18-19 years---	189	3,173	119.5	44.5	3.0	55.5	73.5	93.0	113.7	140.0	176.5	193.9
20-24 years---	394	7,077	115.7	36.2	1.5	65.0	72.1	89.9	113.0	138.0	161.0	179.2
25-34 years---	632	11,601	108.0	36.9	1.5	57.0	65.0	82.6	103.0	127.0	152.1	177.7
35-44 years---	539	9,501	108.7	38.3	2.1	62.0	67.0	81.8	104.0	129.0	153.0	170.3
45-54 years---	579	10,096	106.4	39.7	2.0	53.3	64.0	80.0	99.0	127.0	152.8	175.0
55-64 years---	464	8,169	102.3	35.5	1.8	51.0	61.0	78.6	99.0	121.0	151.0	171.1
65-74 years---	1,232	4,948	108.6	34.7	1.0	57.0	67.0	85.0	106.0	128.0	154.0	166.9
<b>Black</b>												
1 year-----	26	(2)	61.1	38.8	(2)	23.6	25.6	34.0	45.0	81.5	102.4	119.3
2 years-----	40	(2)	74.0	37.9	(2)	25.0	32.0	43.0	62.0	93.0	130.0	144.0
3 years-----	43	(2)	94.6	34.4	(2)	46.4	55.0	67.0	80.5	116.0	132.7	144.1
4-5 years-----	138	508	82.3	34.8	2.6	32.0	35.0	61.0	79.0	108.3	123.4	141.9
6-11 years----	250	1,686	91.6	30.0	2.3	48.0	53.0	67.0	91.0	110.2	134.5	145.8
12-17 years---	250	1,687	100.8	32.6	1.5	47.2	65.0	78.0	97.9	120.0	136.2	153.4
18-19 years---	52	422	111.3	43.3	8.5	48.0	62.2	86.6	102.0	129.0	161.4	171.0
20-24 years---	79	871	104.7	31.0	4.6	57.0	71.0	86.8	97.5	120.3	140.8	152.0
25-34 years---	119	1,213	110.3	32.8	3.3	61.0	74.0	88.4	104.0	134.0	151.5	176.7
35-44 years---	87	1,007	96.7	32.9	3.6	55.0	61.3	72.7	91.6	115.4	139.0	155.9
45-54 years---	130	1,044	99.1	29.5	3.1	60.0	63.5	77.0	96.8	114.5	132.3	148.1
55-64 years---	85	707	101.0	27.3	3.4	59.0	68.9	78.1	101.3	116.0	133.6	143.7
65-74 years---	294	482	98.0	35.9	1.7	50.8	59.0	75.0	92.0	116.0	144.0	169.9

<sup>1</sup>µg/dl

<sup>2</sup>Estimated population in thousands and standard error of the mean not included because of possible bias due to missing values.

Table 4. Serum iron levels of females aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean <sup>1</sup>	Standard deviation <sup>1</sup>	Standard error of the mean <sup>1</sup>	Percentile <sup>1</sup>						
						5th	10th	25th	50th	75th	90th	95th
<u>All races</u>												
1 year-----	77	(2)	78.3	33.8	(2)	26.7	36.4	56.0	74.0	94.8	122.3	150.6
2 years-----	139	(2)	84.2	35.6	(2)	30.9	35.9	54.2	83.5	113.0	134.0	144.0
3 years-----	175	(2)	85.0	34.1	(2)	34.8	43.0	59.0	83.5	105.5	124.0	146.0
4-5 years-----	571	3,299	89.4	31.7	1.8	41.0	52.6	68.0	86.0	108.0	129.8	144.1
6-11 years----	988	11,392	96.1	32.1	1.2	48.0	58.0	71.0	95.0	117.0	137.0	147.0
12-17 years---	1,011	12,187	100.4	36.2	1.4	45.0	55.0	75.0	99.0	122.0	146.3	163.0
18-19 years---	263	3,810	101.3	42.3	2.3	38.0	50.0	67.0	95.0	129.0	154.0	173.5
20-24 years---	1,188	9,047	106.2	42.0	1.2	48.0	55.0	77.0	101.0	130.0	161.4	182.0
25-34 years---	1,822	13,943	102.4	42.9	0.9	44.0	52.0	72.0	95.2	127.0	161.0	180.9
35-44 years---	1,582	11,577	98.0	40.3	1.2	42.0	53.0	69.0	94.0	120.0	149.0	171.0
45-54 years---	789	12,180	99.9	36.8	2.3	47.0	58.1	76.0	94.0	116.8	152.0	172.0
55-64 years---	632	9,998	101.2	34.4	3.0	55.0	61.5	78.0	97.0	118.0	138.0	164.8
65-74 years---	1,701	7,138	97.6	31.2	0.6	54.0	60.0	76.0	95.0	116.0	135.0	152.0
<u>White</u>												
1 year-----	56	(2)	78.3	33.8	(2)	26.6	36.2	56.0	74.0	94.0	121.4	151.4
2 years-----	104	(2)	88.2	36.4	(2)	29.4	37.0	59.0	85.0	114.0	140.0	146.6
3 years-----	130	(2)	88.7	34.4	(2)	38.0	45.0	63.0	88.0	109.0	124.0	151.0
4-5 years-----	405	2,768	90.4	31.6	2.0	43.9	54.0	69.0	87.0	108.0	131.0	144.5
6-11 years----	720	9,602	96.8	32.7	1.5	48.0	58.0	72.1	95.0	118.0	138.0	149.1
12-17 years---	744	10,391	100.4	36.2	1.6	45.0	55.0	75.0	99.0	122.0	147.2	163.0
18-19 years---	191	3,263	101.9	42.4	2.6	39.0	52.3	67.0	95.0	129.9	153.8	176.6
20-24 years---	903	7,827	106.9	42.5	1.3	48.0	55.0	77.0	102.0	130.0	165.0	183.0
25-34 years---	1,468	12,193	104.0	43.3	1.0	44.0	54.0	75.0	96.1	129.0	161.0	182.2
35-44 years---	1,221	10,100	98.7	40.3	1.3	43.0	53.6	70.0	94.0	122.0	150.0	173.0
45-54 years---	658	10,878	102.0	37.5	2.6	46.0	59.0	78.0	96.0	119.7	157.0	175.0
55-64 years---	514	9,058	102.2	34.6	3.2	55.0	62.0	79.0	98.0	118.0	141.0	167.0
65-74 years---	1,375	6,486	98.7	31.3	0.7	55.0	62.0	77.0	95.0	117.0	136.6	153.5
<u>Black</u>												
1 year-----	20	(2)	78.5	35.3	(2)	25.0	35.0	45.0	70.0	98.0	123.0	138.0
2 years-----	33	(2)	71.8	31.1	(2)	30.2	33.0	45.8	64.0	97.2	111.8	120.0
3 years-----	43	(2)	74.8	31.8	(2)	33.2	35.3	50.8	71.0	91.0	115.5	140.3
4-5 years-----	161	503	84.4	31.8	2.3	34.6	43.1	61.4	85.0	105.0	119.1	143.4
6-11 years----	262	1,715	91.8	28.3	2.1	53.5	57.0	69.0	87.0	114.0	128.0	137.4
12-17 years---	260	1,709	100.6	37.4	2.4	48.1	54.0	74.0	97.0	127.0	145.0	156.4
18-19 years---	70	530	97.8	41.9	5.2	20.6	37.7	65.0	96.6	124.0	150.0	162.6
20-24 years---	258	1,053	103.2	39.6	2.1	40.8	51.0	74.0	96.6	136.0	151.0	168.8
25-34 years---	334	1,623	90.7	37.1	1.8	44.0	47.4	64.0	84.0	110.9	143.1	162.5
35-44 years---	334	1,314	90.1	37.2	2.2	36.8	45.2	65.0	89.0	108.1	134.0	138.5
45-54 years---	126	1,256	81.7	23.5	2.3	47.6	56.0	66.0	76.0	92.0	110.6	133.2
55-64 years---	115	872	92.0	31.8	3.4	55.0	57.4	67.0	84.0	112.0	125.0	144.0
65-74 years---	318	629	86.9	28.1	1.1	47.9	54.0	71.0	82.0	105.0	124.0	135.6

<sup>1</sup> μg/dl

<sup>2</sup> Estimated population in thousands and standard error of the mean not included because of possible bias due to missing values.



Table 5. Percent transferrin saturation of males aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean	Standard deviation	Standard error of the mean	Percentile						
						5th	10th	25th	50th	75th	90th	95th
<b>All races</b>												
1 year-----	113	(1)	16.4	9.3	(1)	5.1	6.0	9.2	14.1	21.4	28.3	33.4
2 years-----	150	(1)	20.6	9.5	(1)	7.2	9.4	14.2	18.8	26.2	32.7	36.8
3 years-----	192	(1)	23.8	10.5	(1)	10.2	11.7	15.9	22.5	29.7	36.5	40.8
4-5 years-----	552	3,427	23.3	9.2	0.40	9.0	11.3	16.6	22.6	29.0	35.1	38.8
6-11 years-----	979	11,819	25.5	9.7	0.36	11.2	13.8	18.9	24.7	31.1	38.2	42.4
12-17 years-----	1,011	12,558	30.1	11.8	0.39	14.2	17.4	22.1	28.6	35.9	44.0	50.5
18-19 years-----	246	3,667	32.8	12.7	0.82	15.0	19.5	23.6	30.0	38.5	49.4	60.1
20-24 years-----	483	8,088	31.6	10.0	0.44	17.6	20.6	24.2	30.0	37.8	44.2	47.0
25-34 years-----	764	12,991	30.5	10.4	0.43	16.2	18.2	22.9	29.1	36.4	42.9	51.3
35-44 years-----	634	10,663	30.9	11.8	0.63	16.8	18.6	22.4	28.9	37.0	43.4	50.1
45-54 years-----	715	11,195	30.0	12.3	0.58	15.4	17.4	21.8	27.7	35.3	44.1	51.0
55-64 years-----	556	8,971	29.8	11.7	0.64	14.8	17.3	22.2	28.3	35.7	43.9	48.0
65-74 years-----	1,545	5,470	32.5	11.6	0.30	16.8	19.6	24.7	31.2	39.1	46.1	51.9
<b>White</b>												
1 year-----	87	(1)	16.9	9.2	(1)	5.3	6.0	9.7	15.7	21.5	27.5	34.2
2 years-----	109	(1)	21.2	8.9	(1)	8.8	11.4	15.3	19.9	26.6	32.6	36.9
3 years-----	142	(1)	23.1	10.4	(1)	10.1	11.2	15.3	21.6	28.6	36.3	40.7
4-5 years-----	411	2,893	23.5	9.2	0.46	9.1	11.4	16.8	23.0	29.1	35.3	38.5
6-11 years-----	719	10,017	25.6	9.9	0.39	11.0	13.6	18.8	24.8	31.3	38.5	43.1
12-17 years-----	753	10,752	30.6	12.0	0.45	14.4	17.6	22.1	29.1	36.5	44.8	50.5
18-19 years-----	189	3,173	32.7	12.6	0.87	15.1	19.5	23.6	29.5	38.4	49.4	60.2
20-24 years-----	394	7,077	31.9	10.1	0.46	18.2	20.6	24.4	30.2	38.1	44.6	47.1
25-34 years-----	632	11,601	30.5	10.5	0.46	16.1	18.2	22.8	29.1	36.3	42.9	53.0
35-44 years-----	539	9,501	31.1	11.9	0.67	16.8	18.7	22.6	29.2	37.0	43.5	49.7
45-54 years-----	579	10,096	30.1	12.5	0.63	15.4	17.6	21.9	27.7	35.3	44.4	52.1
55-64 years-----	464	8,169	29.7	12.0	0.70	14.8	17.3	21.8	28.0	35.6	44.5	48.1
65-74 years-----	1,232	4,948	32.7	11.6	0.32	16.6	19.6	24.9	31.4	39.2	46.3	52.1
<b>Black</b>												
1 year-----	26	(1)	14.5	9.8	(1)	4.5	4.9	8.2	9.7	19.8	27.9	31.6
2 years-----	39	(1)	18.0	9.3	(1)	5.5	6.2	10.6	15.8	23.2	32.2	35.8
3 years-----	43	(1)	25.7	11.5	(1)	9.8	13.1	16.7	23.3	31.4	38.8	41.2
4-5 years-----	138	508	22.3	9.4	0.63	8.4	8.9	15.1	21.0	28.5	34.9	40.0
6-11 years-----	250	1,686	25.1	8.6	0.64	13.2	14.2	19.0	24.3	31.0	34.8	39.8
12-17 years-----	250	1,687	27.3	9.8	0.40	13.8	15.8	21.2	26.7	31.5	38.4	40.8
18-19 years-----	52	422	31.1	12.1	2.47	14.8	17.5	22.3	30.1	36.5	40.6	49.6
20-24 years-----	79	871	29.2	9.1	1.19	16.0	16.7	23.5	29.0	32.5	41.3	42.4
25-34 years-----	119	1,213	31.0	9.1	0.97	17.8	19.9	23.7	30.2	37.5	42.9	43.1
35-44 years-----	87	1,007	27.4	9.9	1.24	16.1	17.8	19.7	25.2	32.3	37.0	47.2
45-54 years-----	130	1,044	28.5	9.5	0.95	15.4	16.1	20.4	26.7	35.3	40.6	43.1
55-64 years-----	85	707	30.3	8.3	1.01	15.7	18.9	24.7	29.0	37.2	39.3	43.6
65-74 years-----	294	482	30.8	11.4	0.52	17.2	19.5	23.1	27.9	36.6	45.6	50.3

<sup>1</sup> Estimated population in thousands and standard error of the mean not included because of possible bias due to missing values.

Table 6. Percent transferrin saturation of females aged 1-74 years, sample size, estimated population in thousands, mean, standard deviation, standard error of the mean, and selected percentiles, by race and age: United States, 1971-74

Race and age	Sample size	Estimated population in thousands	Mean	Standard deviation	Standard error of the mean	Percentile						
						5th	10th	25th	50th	75th	90th	95th
<u>All races</u>												
1 year-----	77	(1)	19.5	9.3	(1)	6.5	8.3	12.7	18.2	23.8	31.9	36.0
2 years-----	138	(1)	22.2	10.3	(1)	6.2	8.5	14.8	21.1	28.6	35.8	40.8
3 years-----	175	(1)	22.7	9.6	(1)	9.5	11.3	15.4	22.3	28.1	33.8	39.2
4-5 years-----	571	3,299	24.5	8.9	0.53	11.2	13.3	18.2	23.8	30.2	35.3	40.9
6-11 years-----	988	11,392	25.8	9.3	0.34	12.5	14.8	18.8	25.1	30.9	38.2	41.6
12-17 years-----	1,011	12,187	26.2	9.8	0.38	11.5	14.6	19.2	25.3	32.4	38.6	44.6
18-19 years-----	263	3,810	26.8	12.2	0.69	10.4	12.7	18.7	24.4	33.7	43.4	56.2
20-24 years-----	1,188	9,047	27.3	11.5	0.34	11.5	14.5	19.1	25.9	33.6	43.2	47.8
25-34 years-----	1,822	13,943	27.1	11.9	0.26	10.2	13.2	18.7	25.8	33.4	43.1	48.3
35-44 years-----	1,582	11,577	26.5	11.6	0.36	10.1	13.2	18.0	25.4	33.2	42.6	48.5
45-54 years-----	789	12,180	27.8	11.3	0.78	11.4	16.2	20.6	25.8	32.7	42.3	50.7
55-64 years-----	632	9,998	29.2	10.6	1.07	15.2	17.1	22.5	27.6	34.5	41.0	47.3
65-74 years-----	1,701	7,138	28.6	10.0	0.23	15.0	17.1	22.1	27.5	34.4	40.5	44.6
<u>White</u>												
1 year-----	56	(1)	19.7	9.0	(1)	6.5	8.7	13.1	18.4	23.2	33.6	36.1
2 years-----	103	(1)	23.6	10.5	(1)	6.3	9.5	15.7	23.0	30.8	37.3	42.0
3 years-----	130	(1)	23.8	9.6	(1)	10.4	12.1	16.9	23.7	28.8	34.9	39.8
4-5 years-----	405	2,768	24.8	8.9	0.59	11.5	13.6	18.7	23.9	30.3	35.5	40.9
6-11 years-----	720	9,602	26.1	9.5	0.41	12.2	14.9	18.8	25.3	30.9	38.7	42.8
12-17 years-----	744	10,391	26.4	9.9	0.43	11.5	14.8	19.2	25.4	32.4	39.6	44.9
18-19 years-----	199	3,263	27.2	12.3	0.74	10.5	13.2	18.8	24.6	33.7	43.7	56.3
20-24 years-----	903	7,827	27.4	11.5	0.39	11.7	14.7	19.1	26.0	33.6	43.4	48.5
25-34 years-----	1,468	12,193	27.6	12.0	0.30	10.4	13.5	19.1	26.3	34.1	43.4	48.7
35-44 years-----	1,221	10,100	26.7	11.6	0.43	10.4	13.3	18.2	25.4	33.6	42.9	48.5
45-54 years-----	658	10,878	28.4	11.6	0.88	11.3	16.3	20.8	26.7	33.8	43.5	51.6
55-64 years-----	514	9,058	29.5	10.7	1.18	15.2	17.8	22.8	27.8	34.5	41.2	48.6
65-74 years-----	1,375	6,486	28.8	10.1	0.26	15.0	17.1	22.1	27.7	34.5	40.9	44.9
<u>Black</u>												
1 year-----	20	(1)	18.9	10.4	(1)	4.6	6.8	9.3	17.8	25.2	30.7	31.7
2 years-----	33	(1)	17.8	8.7	(1)	5.8	7.2	9.3	17.1	23.9	30.1	31.6
3 years-----	43	(1)	19.7	9.1	(1)	6.7	9.5	12.8	18.2	24.5	30.0	33.7
4-5 years-----	161	503	23.1	9.0	0.63	9.6	11.9	16.6	22.6	28.0	32.3	40.5
6-11 years-----	262	1,715	24.5	8.1	0.65	13.4	15.0	18.7	23.3	29.9	35.0	38.9
12-17 years-----	260	1,709	25.6	9.5	0.62	12.0	13.3	18.9	24.6	32.7	38.2	39.0
18-19 years-----	70	530	24.4	11.4	1.30	4.7	9.2	14.4	23.8	30.6	38.7	42.1
20-24 years-----	258	1,053	26.4	10.9	0.59	9.8	12.9	19.0	24.4	33.5	39.8	44.7
25-34 years-----	334	1,623	23.5	10.3	0.50	10.0	11.9	16.0	22.9	28.7	34.2	43.6
35-44 years-----	334	1,314	24.8	11.3	0.59	9.2	11.6	16.9	23.9	29.8	37.9	42.7
45-54 years-----	126	1,256	22.7	7.3	0.62	11.5	14.2	17.6	21.0	25.8	31.2	35.9
55-64 years-----	115	872	26.6	9.7	1.15	14.8	15.2	18.3	25.4	34.5	38.1	43.4
65-74 years-----	318	629	26.1	8.1	0.37	13.0	16.1	21.4	25.2	31.3	35.7	38.6

<sup>1</sup>Estimated population in thousands and standard error of the mean not included because of possible bias due to missing values.

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## TECHNICAL NOTES

The sampling plan for the 65 preselected examination locations in the Health and Nutrition Examination Survey followed a highly stratified multistage probability design in which a sample of the civilian noninstitutionalized population of the conterminous United States 1-74 years of age was selected. Successive elements of the sampling process were the primary sampling unit, census enumeration district, segment (a cluster of households), household, eligible person, and finally, sample person. The sampling design provided for oversampling among persons living in poverty areas, preschool

children, women of childbearing age, and the elderly.

The biochemical findings for each individual have been "weighted" by the reciprocal of the probability of selecting the person. An adjustment for persons in the sample who were not examined and poststratified ratio adjustments were also made. Thus the final sampling estimates of the population size were brought into closer alignment with the independent U.S. Bureau of the Census estimates for the civilian noninstitutionalized population of the United States as of November 1, 1972, by race, sex, and age.

## SYMBOLS

Data not available-----	---
Category not applicable-----	...
Quantity zero-----	-
Quantity more than 0 but less than 0.05----	0.0
Figure does not meet standards of reliability or precision-----	*

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