

2. Fat-Soluble Vitamins and Nutrients

Vitamins A and E and Carotenoids

- Vitamin A
- Retinyl palmitate
- Retinyl stearate
- Vitamin E
- *gamma*-Tocopherol
- *alpha*-Carotene
- *trans-beta*-Carotene
- *cis-beta*-Carotene
- *beta*-Cryptoxanthin
- Lutein and zeaxanthin
- *trans*-Lycopene
- Total lycopene (*cis*- and *trans*-)

Vitamin D

- 25-Hydroxyvitamin D

Fatty Acids

Saturated

- Myristic acid (14:0)
- Palmitic acid (16:0)
- Stearic acid (18:0)
- Arachidic acid (20:0)
- Docosanoic acid (22:0)
- Lignoceric acid (24:0)

Monounsaturated

- Myristoleic acid (14:1n-5)
- Palmitoleic acid (16:1n-7)
- *cis*-Vaccenic acid (18:1n-7)
- Oleic acid (18:1n-9)
- Eicosenoic acid (20:1n-9)
- Docosenoic acid (22:1n-9)
- Nervonic acid (24:1n-9)

Polyunsaturated

- Linoleic acid (18:2n-6)
- *alpha*-Linolenic acid (18:3n-3)
- *gamma*-Linolenic acid (18:3n-6)
- Eicosadienoic acid (20:2n-6)
- *homo-gamma*-Linolenic acid (20:3n-6)
- Arachidonic acid (20:4n-6)
- Eicosapentaenoic acid (20:5n-3)
- Docosatetraenoic acid (22:4n-6)
- Docosapentaenoic acid (22:5n-3)
- Docosapentaenoic acid (22:5n-6)
- Docosahexaenoic acid (22:6n-3)

Vitamins A, E and Carotenoids

Background Information

Sources and Physiological Functions. Vitamins A (retinol) and E (*alpha*-tocopherol) and the carotenoids are fat-soluble micronutrients found in many foods, including some vegetables, fruits, meats, and animal products. Fish-liver oils, liver, egg yolks, butter, and cream are known for their higher content of vitamin A. Nuts and seeds are particularly rich sources of vitamin E (Thomas 2006). At least 700 carotenoids—fat-soluble red and yellow pigments—are found in nature (Britton 2004). Americans consume 40–50 of these carotenoids, primarily in fruits and vegetables (Khachik 1992), and smaller amounts in poultry products, including egg yolks, as well as in seafoods (Boylston 2007). Eight different carotenoids are easily measured in human serum: *alpha*-carotene, *cis*- and *trans*-*beta*-carotene, *beta*-cryptoxanthin, lutein, *cis*- and *trans*-lycopene, and zeaxanthin. Main sources of carotenes are orange-colored fruits and vegetables such as carrots, pumpkins, and mangos. Lutein and zeaxanthin are also found in dark green leafy vegetables, where any orange coloring is overshadowed by chlorophyll. *Trans*-lycopene is obtained primarily from tomatoes and tomato products and some fruits. For information on the carotenoid content of U.S. foods, see the 1998 carotenoid database created by the U.S. Department of Agriculture and the Nutrition Coordinating Center at the University of Minnesota (<http://www.nal.usda.gov/fnic/foodcomp/Data/car98/car98.html>).

Vitamin A, found in foods that come from animal sources, is called preformed vitamin A. Some carotenoids found in colorful fruits and vegetables are called provitamin A because they are metabolized in the body to vitamin A. Among the carotenoids, *beta*-carotene, a retinol dimer consisting of two linked retinol molecules, has the most significant provitamin A activity. Approximately 12 micrograms (μg) of dietary *beta*-carotene can provide the equivalent of 1 μg of retinol. Other provitamin A carotenoids, such as *alpha*-carotene and *beta*-cryptoxanthin, are half as active as *beta*-carotene (Institute of Medicine 2000). The bioconversion of carotenoids to vitamin A is highly variable from person to person (Krinsky 2005). Retinyl esters serve as the storage form of vitamin A and are mostly concentrated in the liver.

The absorption of fat-soluble micronutrients from the gastrointestinal tract depends on processes responsible for fat absorption or metabolism. Thus, people with conditions resulting in fat malabsorption (e.g., celiac disease, Crohn's disease, pancreatic disorders) can develop vitamin A deficiency over time. Vitamin A also has interactions with other nutrients. Iron and zinc deficiency can affect vitamin A metabolism and transport of vitamin A stores from the liver to body tissues (Institute of Medicine 2001). The absorption of carotenoids from foods is highly dependent on cooking techniques that break down plant cell walls and release carotenoids; it is also dependent on the availability of dietary fat to enhance carotenoid uptake (Krinsky 2005). The liver regulates the concentration of vitamin A in the circulation by releasing stored retinyl esters as needed; only when liver reserves are nearly exhausted does serum vitamin A fall into the deficient range (Napoli 2006). The variation in serum carotenoid concentrations among people in the United States is relatively large, primarily reflecting wide-ranging differences in dietary intake (Lacher 2005).

Vitamin E activity is derived from at least eight naturally occurring tocopherols, the most potent of which is *alpha*-tocopherol. Other less active forms of vitamin E are plentiful in the U.S. diet, with *gamma*-tocopherol being the predominant form. The most commonly consumed sources of *alpha*-tocopherol in the diet of American adults are mixed foods (spaghetti sauce, pizza and chili), fried potatoes, salad dressings, and bakery goods (Ahuja 2004). Other important sources are

tomatoes, eggs, nuts and seeds, and snack foods. Plasma concentrations of tocopherols vary widely among healthy individuals and are highly correlated with plasma lipid concentrations (Ford 1999; Ford 2006).

Health Effects. Inadequate or excessive intake of vitamins A or E can lead to various disorders. For example, vitamin A deficiency, considered to be the main cause of childhood blindness in low-income countries (Roodhooft 2002), is a rare condition in the United States. Prominent signs of vitamin A deficiency include night blindness, corneal thinning, and conjunctival metaplasia. Vitamin A is also essential for proper immune function, epithelial growth and repair, bone growth, reproduction, and normal embryonic and fetal development (West 2006). Acute toxicity resulting from single or short-term large doses of preformed vitamin A is characterized by nausea, vomiting, headache, vertigo, blurred vision, increased cerebrospinal fluid pressure, and lack of muscular coordination. Central nervous system effects, liver abnormalities, bone and skin changes, and other nonspecific adverse effects can be indicative of chronic hypervitaminosis A. Consuming excess amounts of vitamin A during early pregnancy may lead to serious birth defects (Institute of Medicine 2001).

Serum or plasma concentrations of carotenoids are considered among the best biological markers for fruit and vegetable intake. The strongest dietary predictors of serum carotenoid concentrations are fruits (for sources of *beta*-cryptoxanthin), carrots and root vegetables (for sources of carotenes), and tomato products (for sources of *trans*-lycopene) (Al-Delaimy 2005). Research studies have shown inconsistencies in the relation between carotenoid intake and protection from cancer. Carotenoids in foods, even when consumed over long periods and in large amounts are not known to produce adverse health effects. However, results of intervention studies of smokers who used 20–30 milligrams (mg) of *beta*-carotene per day showed that this group had more lung cancers than placebo-treated groups (Albanes 1996; Redlich 1998).

Vitamin E deficiency occurs only rarely in people, and overt deficiency symptoms in people consuming low-vitamin E diets have never been described (Institute of Medicine 2000). The main manifestation of vitamin E deficiency is peripheral neuropathy characterized by the degeneration of the large-caliber axons of sensory neurons (Institute of Medicine 2000). The upper limit (UL) for vitamin E intake (1000 mg/day) is based on hemorrhagic effects; however, a causal association between excess *alpha*-tocopherol intake in apparently healthy individuals and adverse health outcomes has not consistently been shown (Institute of Medicine 2000). Studies evaluating tocopherols to reduce the risk for cardiovascular disease demonstrated inconsistent findings (Agency for Healthcare Research and Quality 2003). The American Heart Association currently advises that antioxidant supplements (such as vitamins E and C and *beta*-carotene) should not be used for primary or secondary prevention of cardiovascular disease (Lichtenstein 2006). Nevertheless, the American Heart Association recommends consuming food sources of antioxidant nutrients, principally from a variety of plant-derived foods such as fruits, vegetables, whole grains, and vegetable oils.

Intake Recommendations. The National Academy of Sciences has established dietary-requirement intake values for vitamins A and E by determining the Adequate Intake (AI) for infants and the recommended dietary allowance (RDA) for older age groups (Institute of Medicine 2000 and 2001). The RDA for vitamin A in retinol equivalents is 900 µg/day for men and 700 µg/day for women; for children and adolescents (1–18 years), the RDA ranges from 300–900 µg/day. For infants (0–12 months), the AI is set at 400–500 µg/day of retinol equivalents. The Tolerable Upper Intake Level (UL) for adults is set at 3,000 µg/day of preformed vitamin A, whereas the UL for infants (600 µg/day), younger children 1–8 years (600–900 µg/day), older children 9–13 years (1700 µg/day), and

adolescents 14–18 years (2800 µg/day) are age-dependent. For adults, the RDA for vitamin E is 15 mg/day of *alpha*-tocopherol; for children and adolescents (1–18 years), the RDA ranges from 6–15 mg/day. There is no RDA for other forms of vitamin E, such as *gamma*-tocopherol. The UL for vitamin E which applies to all eight stereoisomers of *alpha*-tocopherol is 1000 mg/day for adults; a UL for infants could not be established and thus only food and formula sources of dietary intake are recommended. The UL for children and adolescents ranges from 200-800 mg/day of vitamin E. Although no quantitative recommendations are available for the intake of carotenoids, existing recommendations support increased consumption of carotenoid-rich fruits and vegetables. Current public health guidelines advise that people consume at least 2.5 cups of fruits and vegetables a day, depending on caloric need, to ensure adequate nutrient intake (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010).

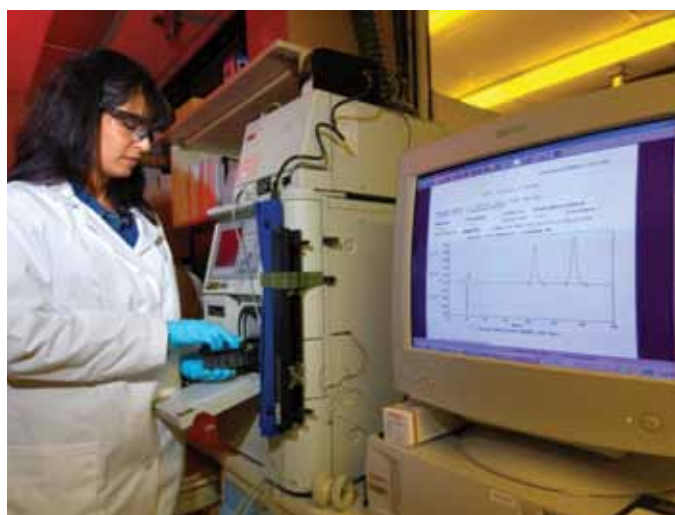
Biochemical Indicators and Methods. The best way to determine inadequate vitamin A status is through hepatic biopsy, but this invasive procedure is unsuitable for population studies. Serum or plasma retinol is measured by use of high performance liquid chromatography (HPLC) with ultraviolet (UV) detection after separation from its carrier retinol binding protein (RBP). Because retinol is closely correlated with RBP, the measurement of this transport protein through enzyme-linked immunosorbent assay (ELISA) has also been used to assess vitamin A status. In most populations, serum RBP has been shown to be a suitable surrogate for retinol. Serum or plasma concentrations of carotenoids are measured by use of HPLC and visible light (450 nm) absorbance.

Clinical laboratories typically use conventional units for serum concentrations of these fat-soluble micronutrients (µg per deciliter [dL]). Conversion factors to international system (SI) units are 1 µg/dL = 0.0349 micromole per liter (µmol/L) for vitamin A and 1 µg/dL = 0.02322 µmol/L for vitamin E. Depending on its molecular weight, each carotenoid has a specific conversion factor.

International reference materials for vitamins A and E and carotenoids are available from the U.S. National Institutes of Standards and Technology (https://www-s.nist.gov/srmors/view_detail.cfm?srn=968e). Among most laboratories participating in an external quality assurance program, standardized HPLC methods for measuring fat-soluble micronutrients show consistent agreement of values (Deweer 2000).

The diagnosis of vitamin A or E deficiency is supported by measuring these concentrations in the body. People with serum retinol concentrations of less than 20 µg/dL are considered vitamin A deficient, and those with serum concentrations of less than 10 µg/dL are considered severely deficient (West 2006). Serum retinol values do not always reflect total body status because of homeostatic

control and therefore are often not useful for assessing the vitamin A status of individuals. Additional tests may be required to confirm vitamin A deficiency when 20 µg/dL is used as a cutoff (Gibson 2005). The distribution of serum retinol values in a population together with the prevalence of individuals with serum retinol values below a given cutoff point provide important information about the vitamin A status of a population. WHO (2011) recommends using the prevalence of serum retinol concentrations of less than or equal to 20 µg/dL to define public health problems involving vitamin A deficiency as mild (2–9%), moderate (10–19%) or severe (≥20%). In chronic hypervitaminosis A, serum concentrations are generally greater than 100 µg/dL (Bendich 1989). Carotenoid



deficiency has no defined serum concentrations. The laboratory diagnosis of vitamin E deficiency is based on serum concentrations of alpha-tocopherol (less than 500 µg/dL or less than 0.8 mg of alpha-tocopherol per gram of total lipids) (Beers 2006). Such concentrations are associated with in vitro hydrogen peroxide-induced red blood cell lysis, not with clinical deficiency symptoms (Institute of Medicine 2000).

Data in NHANES. The fat-soluble micronutrients vitamin A, E, and carotenoids presented in this report were measured by a single assay panel employing HPLC separation and detection by use of UV or visible light (HPLC-UV/vis). This is the same method used during the first four years of the continuous NHANES survey (1999-2002).

Since 1971, various fat-soluble micronutrients have been measured in the serum of NHANES participants. In NHANES III (1988–1994), clinically low concentrations of serum retinol were uncommon in U.S. residents aged 4 years and older, although racial/ethnic and socioeconomic differences existed (Ballew 2001). Variations in serum carotenoid concentrations by ethnicity and sex were found for adults, children, and adolescents (Ford 2000; Ford 2002). Ford *et al.* also found sociodemographic variations in serum concentrations of *alpha*-tocopherol among U.S. adults in NHANES III (1999) and *alpha*- and *gamma*-tocopherol in NHANES 1999–2000 (2006). Application of the most common cut-off value for serum *alpha*-tocopherol concentrations in NHANES 1999–2000 (500 µg/dL), demonstrated a low prevalence of vitamin E deficiency, despite the fact that the U.S. Department of Agriculture-estimated dietary intakes of vitamin E were low and that most of the U.S. population did not meet dietary intake recommendations.

For more information on these fat-soluble micronutrients, see the Institute of Medicine’s Dietary Reference Intake reports (Institute of Medicine 2000 and 2001) and the vitamin fact sheets from the National Institutes of Health, Office of Dietary Supplements (http://ods.od.nih.gov/Health_Information/Vitamin_and_Mineral_Supplement_Fact_Sheets.aspx).

Highlights

Serum concentrations of fat-soluble micronutrients (vitamin A, E, and carotenoids) in the U.S. population showed the following demographic patterns and characteristics:

- With few exceptions, the highest concentrations of fat-soluble micronutrients were found in persons 60 years and older.
- No consistent pattern was observed with regard to gender or race/ethnicity.
- The likelihood of being vitamin A or E deficient was very low throughout the population.
- The likelihood of vitamin A excess was also very low, but it increased with increasing age.

For more than 20 years, the majority of the U.S. population (greater than 95%) has had adequate serum concentrations of vitamin A (≥ 20 µg/dL) and vitamin E (≥ 500 µg/dL).

Despite NHANES 2001–2002 dietary intake data demonstrating that 93% of the U.S. population consumed less than the Estimated Average Requirement (EAR) for vitamin E (Moshfegh 2005), for decades mean serum vitamin E concentrations have remained consistently adequate (Figure H.2.a), with less than 1% of the population vitamin E deficient. Analyses of NHANES data showed that in 1999–2000, 52% of adults (Rock 2007) and in 2003–2006, 49% of the total U.S. population (Bailey 2011) used dietary supplements; thus, the intake data (food and supplements) for vitamin E seem to be inconsistent with the biomarker data. Several explanatory possibilities have been raised, including a suggestion that the intake of fats (and

fat-soluble nutrients) is under-reported in overweight and obese subjects, the database of food values is not accurate, and/or that the EAR for vitamin E needs adjustment. Low intake without widespread manifestation of deficiency suggests the need for further evaluations to determine whether improved estimates are necessary, either in the nutrient tables or in dietary intake.

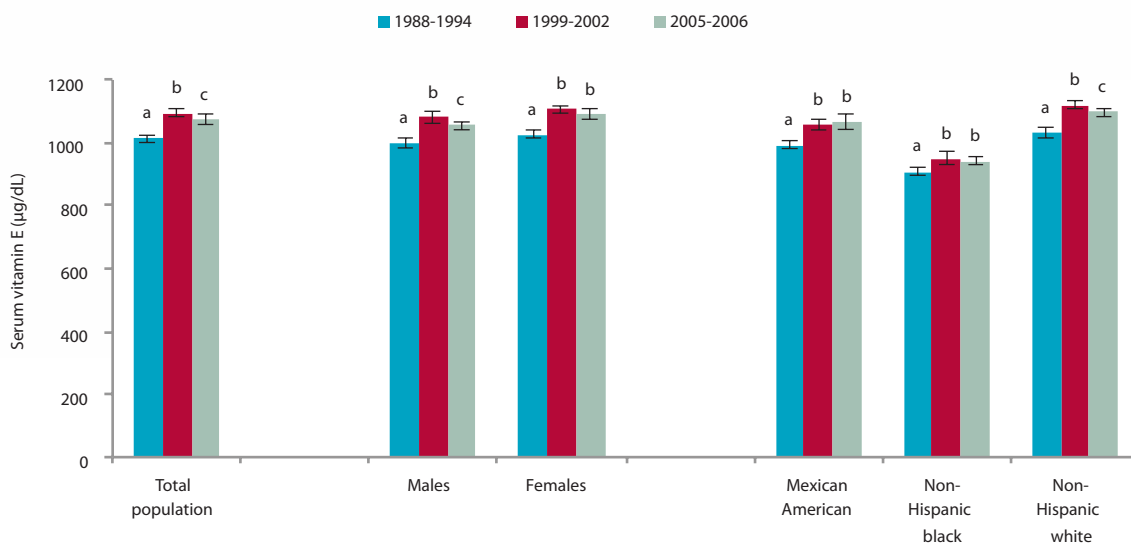


Figure H.2.a. Age-adjusted geometric mean concentrations of serum vitamin E (alpha-tocopherol) in the U.S. population aged 6 years and older by gender or race/ethnicity, National Health and Nutrition Examination Survey, 1988–2006.

Error bars represent 95% confidence intervals. Within a demographic group, bars not sharing a common letter differ ($p < 0.05$). Age adjustment was done using direct standardization.

Detailed Observations

The selected observations mentioned below are derived from the tables and figures presented next. Statements about categorical differences between demographic groups noted below are based on non-overlapping confidence limits from univariate analysis without adjusting for demographic variables (e.g., age, gender, race/ethnicity) or other blood concentration determinants (e.g., dietary intake, supplement usage, smoking, BMI). A multivariate analysis may alter the size and statistical significance of these categorical differences. Furthermore, additional significant differences of smaller magnitude may be present despite their lack of mention here (e.g., if confidence limits slightly overlap or if differences are not statistically significant before covariate adjustment has occurred). For a selection of citations of descriptive NHANES papers related to these biochemical indicators of diet and nutrition, see [Appendix G](#).

Geometric mean concentrations (NHANES 2005–2006):

- Serum vitamin A concentrations increased with age (Table 2.1.a.1 and Figure 2.1.a).
- Serum retinyl palmitate concentrations were similar across age ranges, with a slight decrease in the adolescent years (Table 2.2.a.1 and Figure 2.2.a).
- Serum vitamin E concentrations decreased throughout childhood, then increased with age to concentrations higher than those seen in early childhood (Table 2.4.a.1 and Figure 2.4.a), while serum *gamma*-tocopherol concentrations remained relatively constant throughout the life cycle, decreasing slightly in older persons (Table 2.5.a.1 and Figure 2.5.a).

- Serum *alpha*-carotene, *trans-beta*-carotene, and lutein/zeaxanthin concentrations decreased throughout childhood, then increased with age to concentrations higher than those seen in early childhood (Tables 2.6.a.1, 2.7.a.1, and 2.10.a.1 and Figures 2.6.a, 2.7.a, 2.10.a).
- Serum *beta*-cryptoxanthin concentrations decreased in early childhood and then remained steady (Table 2.9.a.1 and Figure 2.9.a).
- Serum *trans*-lycopene and total lycopene concentrations were highest in young adults and lowest in older persons (Tables 2.11.a.1 and 2.12.a.1 and Figures 2.11.a, 2.12.a).
- Females had higher serum vitamin E than males, while males had higher serum vitamin A concentrations than females (Tables 2.4.a.1 and 2.1.a.1).
- Females had higher serum *alpha*-carotene and *trans-beta*-carotene concentrations than males, and males had higher serum total lycopene concentrations than females (Tables 2.6.a.1, 2.7.a.1, and 2.12.a.1).
- Non-Hispanic whites had the highest concentrations of serum vitamin A and vitamin E, and the lowest concentrations of serum *gamma*-tocopherol. Non-Hispanic whites had the lowest concentrations of serum lutein/zeaxanthin. Non-Hispanic blacks had the lowest concentrations of serum *alpha*-carotene. Mexican Americans had the highest concentrations of serum *beta*-cryptoxanthin and the lowest concentrations of serum *trans*-lycopene and total lycopene. (Tables 2.1.a.1, 2.4.a.1, 2.5.a.1, 2.10.a.1, 2.6.a.1, 2.9.a.1, 2.11.a.1, and 2.12.a.1).

Changes in geometric mean concentrations across survey cycles:

- Serum vitamin A concentrations increased between 1999–2000 and 2001–2002, then held steady through the 2005–2006 survey period (Table 2.1.b).
- Serum vitamin E and *gamma*-tocopherol concentrations held steady between 1999–2000 and 2005–2006 (Tables 2.4.b and 2.5.b).
- Serum *alpha*-carotene, *trans-beta*-carotene, *beta*-cryptoxanthin, lutein/zeaxanthin, and *trans*-lycopene concentrations did not change appreciably across the survey cycles (Tables 2.6.b, 2.7.b, 2.9.b, 2.10.b, and 2.11.b).
- Prevalence estimates of low or high biochemical indicator concentrations:
- In 2005–2006, less than 1% of the population aged 6 years and older had a vitamin A or vitamin E deficiency, defined as < 20 µg/dL and < 500 µg/dL, respectively (Tables 2.1.c.1 and 2.4.c). About 2%, however, were at risk for an excess of vitamin A, or > 100 µg/dL (Table 2.1.c.2).
- Between 1999 and 2006, the prevalence of low serum vitamin A was less than 1% of all persons (Table 2.1.d.1), and the prevalence of high serum vitamin A was 1–2% of all persons (Table 2.1.d.2).
- Between 1999 and 2006, the prevalence of low serum vitamin E was 2% or less for almost all groups except for adolescents, for whom the prevalence was 2–4% (Table 2.4.d).

Table 2.1.a.1. Serum vitamin A: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	54.7 (53.8 – 55.6)	29.6 (28.7 – 30.5)	32.5 (31.8 – 33.2)	55.2 (54.2 – 56.1)	87.8 (85.6 – 90.5)	96.7 (93.1 – 101)	7,254
Age group							
6–11 years	36.4 (35.6 – 37.2)	22.8 (19.9 – 24.8)	25.6 (24.3 – 26.9)	36.6 (35.9 – 37.3)	52.4 (49.1 – 54.3)	54.4 (53.3 – 57.3)	860
12–19 years	46.5 (45.4 – 47.7)	28.9 (28.6 – 29.6)	32.0 (30.6 – 33.0)	46.0 (44.6 – 47.5)	69.6 (66.9 – 73.1)	75.7 (71.4 – 82.9)	1,954
20–39 years	54.3 (53.3 – 55.3)	31.2 (29.2 – 32.1)	33.9 (32.2 – 35.1)	54.7 (53.5 – 55.6)	84.4 (81.9 – 87.9)	89.1 (87.2 – 93.3)	1,688
40–59 years	58.7 (57.7 – 59.7)	33.1 (31.4 – 34.2)	36.8 (36.0 – 38.0)	59.5 (58.1 – 60.4)	90.3 (87.2 – 94.3)	100 (94.7 – 107)	1,365
60 years and older	64.4 (62.8 – 66.1)	36.4 (31.6 – 38.8)	40.2 (38.2 – 43.0)	64.9 (63.1 – 67.0)	99.8 (96.2 – 102)	108 (105 – 115)	1,387
Gender							
Males	57.2 (56.3 – 58.2)	30.3 (29.2 – 31.2)	33.6 (32.7 – 34.8)	58.0 (57.1 – 59.0)	89.0 (86.5 – 93.0)	100 (93.3 – 104)	3,547
Females	52.4 (51.3 – 53.5)	28.9 (27.7 – 30.1)	31.9 (31.2 – 32.6)	52.4 (50.8 – 53.8)	85.9 (83.3 – 88.7)	94.8 (89.8 – 103)	3,707
Race/ethnicity							
Mexican Americans	48.4 (47.3 – 49.5)	27.8 (26.2 – 28.6)	30.3 (29.3 – 31.2)	48.8 (46.8 – 50.2)	73.7 (71.9 – 77.0)	82.1 (76.2 – 88.4)	1,844
Non-Hispanic Blacks	48.3 (47.3 – 49.3)	25.7 (23.8 – 27.5)	28.8 (27.6 – 29.8)	48.1 (47.0 – 49.5)	82.0 (78.4 – 85.5)	89.7 (86.1 – 93.6)	1,891
Non-Hispanic Whites	57.4 (56.4 – 58.4)	31.5 (30.6 – 32.4)	34.8 (33.0 – 36.2)	57.9 (56.8 – 59.0)	89.8 (87.6 – 93.3)	100 (95.6 – 104)	2,973

Figure 2.1.a. Serum vitamin A: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

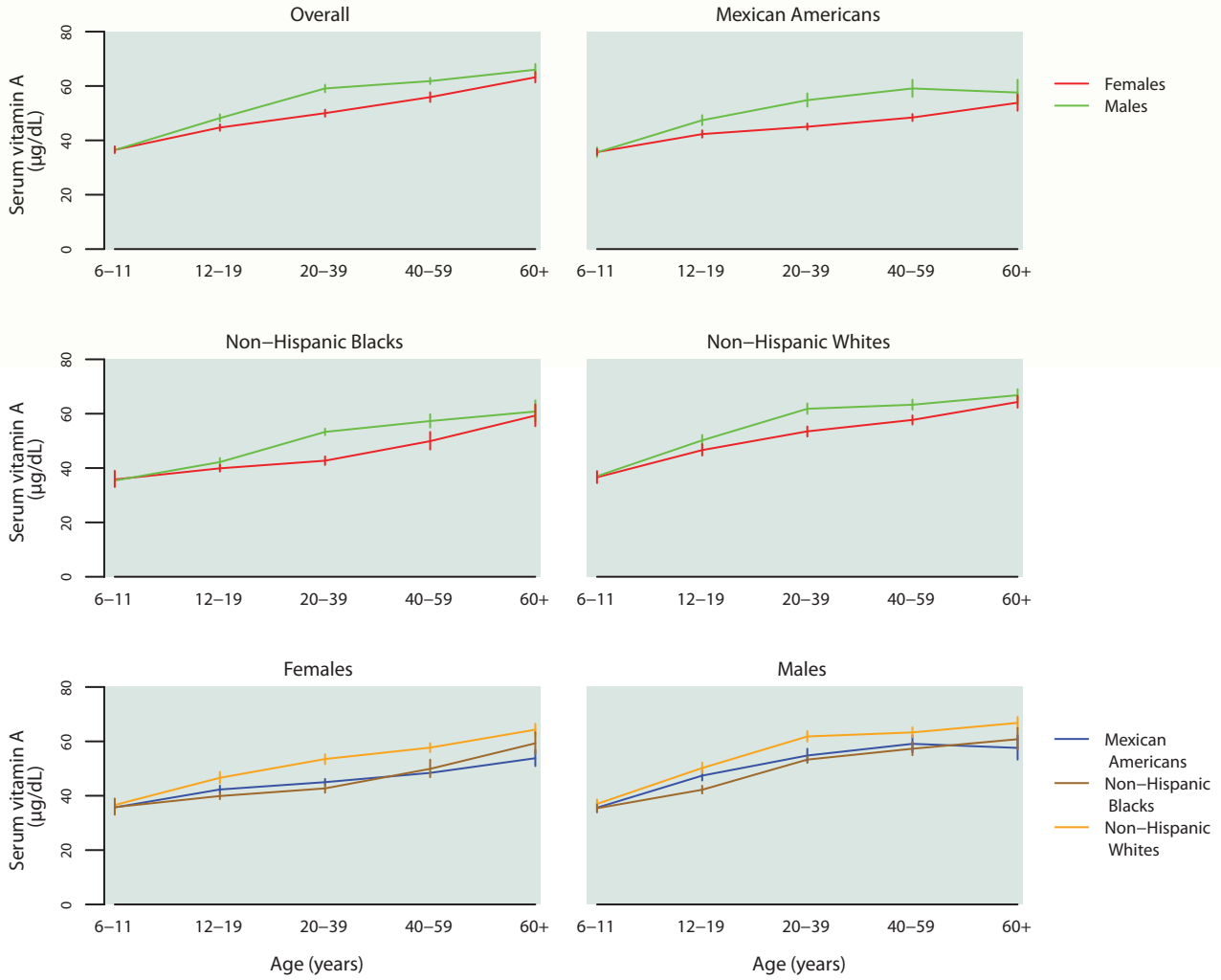


Table 2.1.a.2. Serum vitamin A: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	54.7 (53.8 – 55.6)	36.6 (35.8 – 37.4)	55.2 (54.2 – 56.1)	80.0 (78.1 – 82.2)	7,254
6–11 years	36.4 (35.6 – 37.2)	28.0 (27.5 – 29.1)	36.6 (35.9 – 37.3)	47.5 (45.7 – 50.1)	860
12–19 years	46.5 (45.4 – 47.7)	35.2 (33.9 – 35.9)	46.0 (44.6 – 47.5)	63.2 (60.7 – 66.9)	1,954
20–39 years	54.3 (53.3 – 55.3)	38.1 (36.5 – 39.2)	54.7 (53.5 – 55.6)	77.7 (74.1 – 81.6)	1,688
40–59 years	58.7 (57.7 – 59.7)	41.2 (39.5 – 43.0)	59.5 (58.1 – 60.4)	81.0 (79.0 – 85.2)	1,365
60 years and older	64.4 (62.8 – 66.1)	46.4 (44.7 – 47.9)	64.9 (63.1 – 67.0)	88.4 (86.0 – 91.7)	1,387
Males					
Total, 6 years and older	57.2 (56.3 – 58.2)	38.5 (37.8 – 39.2)	58.0 (57.1 – 59.0)	81.8 (79.7 – 85.0)	3,547
6–11 years	36.4 (35.4 – 37.3)	28.1 (26.4 – 29.1)	36.3 (35.0 – 37.2)	47.5 (45.7 – 51.6)	427
12–19 years	48.2 (46.9 – 49.6)	36.4 (35.3 – 37.7)	48.1 (46.3 – 49.8)	64.5 (62.9 – 67.4)	980
20–39 years	59.1 (57.7 – 60.5)	44.4 (42.3 – 46.0)	58.4 (56.8 – 60.2)	80.9 (76.8 – 84.5)	738
40–59 years	61.8 (60.7 – 63.0)	44.2 (41.6 – 47.1)	63.2 (62.4 – 64.2)	84.5 (80.1 – 92.0)	673
60 years and older	66.0 (63.9 – 68.1)	48.4 (46.0 – 50.0)	66.4 (63.7 – 68.7)	90.4 (86.3 – 97.2)	729
Females					
Total, 6 years and older	52.4 (51.3 – 53.5)	35.6 (34.3 – 36.4)	52.4 (50.8 – 53.8)	77.5 (75.0 – 79.0)	3,707
6–11 years	36.5 (35.3 – 37.8)	28.0 (27.5 – 29.4)	36.9 (35.9 – 38.0)	47.0 (45.1 – 52.3)	433
12–19 years	44.7 (43.5 – 45.9)	33.7 (33.3 – 35.0)	43.8 (42.7 – 45.1)	60.7 (57.0 – 66.6)	974
20–39 years	50.0 (48.7 – 51.3)	34.5 (32.7 – 36.1)	49.3 (48.3 – 50.9)	72.6 (69.5 – 75.9)	950
40–59 years	55.9 (54.1 – 57.7)	39.9 (36.9 – 41.2)	55.8 (53.8 – 58.5)	78.4 (74.2 – 82.8)	692
60 years and older	63.2 (61.3 – 65.2)	45.1 (43.0 – 47.2)	63.9 (62.5 – 65.7)	87.7 (84.0 – 91.2)	658

Table 2.1.a.3. Serum vitamin A: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	48.4 (47.3 – 49.5)	33.4 (32.6 – 34.2)	48.8 (46.8 – 50.2)	68.6 (66.7 – 70.3)	1,844
6–11 years	35.6 (34.4 – 37.0)	27.6 (24.8 – 28.9)	35.8 (33.8 – 37.6)	46.2 (45.0 – 48.2)	295
12–19 years	44.9 (43.3 – 46.4)	34.1 (33.4 – 35.0)	44.4 (43.2 – 46.1)	58.8 (55.6 – 64.7)	646
20–39 years	50.1 (49.1 – 51.2)	36.0 (33.3 – 37.3)	50.3 (48.7 – 53.3)	69.1 (66.8 – 72.7)	449
40–59 years	53.6 (52.4 – 54.8)	39.0 (36.6 – 41.0)	52.6 (50.7 – 55.6)	71.7 (67.2 – 85.3)	246
60 years and older	55.5 (52.8 – 58.3)	40.8 (37.3 – 42.8)	57.0 (54.7 – 58.4)	78.1 (72.9 – 85.4)	208
Males					
Total, 6 years and older	51.9 (50.0 – 53.9)	36.5 (33.7 – 38.5)	53.3 (50.2 – 55.9)	70.7 (68.8 – 73.3)	883
6–11 years	35.6 (33.9 – 37.4)	27.2 (24.0 – 28.8)	35.4 (33.0 – 38.7)	46.8 (45.6 – 49.1)	145
12–19 years	47.4 (45.6 – 49.3)	36.1 (33.8 – 38.0)	47.0 (45.0 – 48.6)	60.9 (58.7 – 65.7)	313
20–39 years	54.8 (52.4 – 57.3)	41.3 (36.6 – 43.9)	56.0 (54.0 – 59.0)	70.6 (68.0 – 74.3)	198
40–59 years	59.1 (56.0 – 62.3)	45.8 (42.9 – 47.4)	57.9 (53.9 – 63.1)	77.7 (70.5 – 110)	122
60 years and older	57.6 (53.3 – 62.3)	42.6† (19.8 – 47.4)	57.6 (55.1 – 62.0)	79.5† (70.6 – 93.0)	105
Females					
Total, 6 years and older	44.7 (44.0 – 45.5)	32.1 (31.3 – 32.7)	43.7 (42.7 – 45.2)	64.2 (62.1 – 67.0)	961
6–11 years	35.7 (34.6 – 36.8)	28.0 (24.0 – 29.4)	36.0 (34.3 – 37.6)	45.7 (42.2 – 52.7)	150
12–19 years	42.3 (41.0 – 43.7)	33.3 (32.2 – 33.8)	41.6 (40.2 – 43.0)	55.9 (52.3 – 61.5)	333
20–39 years	45.0 (43.9 – 46.2)	31.9 (29.8 – 33.8)	43.2 (41.7 – 46.6)	66.6 (61.2 – 69.5)	251
40–59 years	48.4 (47.1 – 49.7)	35.6 (32.4 – 37.4)	49.1 (46.5 – 50.2)	63.9 (57.7 – 81.3)	124
60 years and older	53.8 (50.9 – 56.9)	39.4† (32.9 – 42.3)	53.5 (51.4 – 58.9)	75.9† (72.9 – 83.0)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.1.a.4. Serum vitamin A: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	48.3 (47.3 – 49.3)	32.0 (31.2 – 32.8)	48.1 (47.0 – 49.5)	72.1 (70.0 – 75.1)	1,891
6–11 years	35.6 (34.0 – 37.3)	26.6 (24.0 – 28.5)	35.7 (34.5 – 36.8)	47.3 (44.6 – 51.8)	240
12–19 years	41.1 (40.0 – 42.2)	30.5 (29.4 – 31.3)	40.9 (39.7 – 42.6)	54.2 (52.8 – 57.5)	665
20–39 years	47.3 (45.8 – 48.9)	32.3 (29.8 – 35.3)	47.9 (44.9 – 50.5)	67.7 (63.6 – 71.6)	368
40–59 years	53.2 (51.4 – 55.0)	35.4 (33.3 – 37.2)	53.7 (50.3 – 57.2)	77.1 (72.8 – 85.7)	335
60 years and older	59.9 (56.3 – 63.7)	40.1 (36.2 – 45.6)	60.7 (56.6 – 64.5)	85.1 (78.8 – 91.4)	283
Males					
Total, 6 years and older	51.2 (49.9 – 52.5)	34.0 (32.9 – 35.2)	51.9 (50.2 – 53.6)	74.8 (70.9 – 79.0)	949
6–11 years	35.4 (34.1 – 36.8)	26.2 (23.2 – 28.7)	35.3 (33.5 – 36.6)	46.2 (43.7 – 51.9)	128
12–19 years	42.2 (40.8 – 43.7)	30.6 (28.8 – 32.0)	42.0 (39.7 – 44.7)	58.1 (55.1 – 60.7)	343
20–39 years	53.3 (52.1 – 54.5)	38.9 (35.7 – 40.4)	54.1 (52.3 – 55.5)	71.2 (65.9 – 77.7)	170
40–59 years	57.3 (54.9 – 59.8)	39.0 (35.8 – 42.6)	58.4 (54.0 – 62.9)	84.8 (74.8 – 92.7)	156
60 years and older	60.8 (57.0 – 64.9)	40.0 (33.9 – 46.7)	62.5 (59.9 – 64.7)	86.0 (78.4 – 110)	152
Females					
Total, 6 years and older	45.9 (44.7 – 47.1)	31.1 (29.4 – 32.1)	44.9 (43.5 – 46.7)	70.1 (65.9 – 74.6)	942
6–11 years	35.8 (33.0 – 39.0)	26.7 (19.8 – 28.8)	36.1 (33.0 – 38.8)	47.6 (44.2 – 54.2)	112
12–19 years	39.9 (38.7 – 41.2)	30.1 (29.4 – 30.8)	40.2 (38.7 – 41.7)	51.1 (49.9 – 53.1)	322
20–39 years	42.7 (41.1 – 44.3)	29.2 (24.3 – 32.0)	42.4 (40.4 – 44.5)	60.4 (57.4 – 63.5)	198
40–59 years	49.9 (46.8 – 53.3)	33.4 (31.9 – 34.3)	48.8 (45.9 – 53.5)	73.3 (68.1 – 84.7)	179
60 years and older	59.3 (55.4 – 63.4)	39.8 (36.7 – 43.8)	60.3 (54.6 – 64.5)	84.9 (77.9 – 90.2)	131

Table 2.1.a.5. Serum vitamin A: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	57.4 (56.4 – 58.4)	39.0 (37.8 – 40.0)	57.9 (56.8 – 59.0)	82.0 (79.8 – 85.3)	2,973
6–11 years	36.8 (35.5 – 38.2)	28.6 (26.6 – 30.1)	37.1 (35.4 – 38.2)	47.6 (45.3 – 53.0)	231
12–19 years	48.5 (46.8 – 50.2)	37.0 (35.5 – 38.4)	48.3 (45.9 – 50.0)	66.2 (63.1 – 69.3)	499
20–39 years	57.5 (55.9 – 59.1)	41.4 (39.1 – 43.0)	57.1 (56.0 – 58.6)	81.4 (77.1 – 85.6)	714
40–59 years	60.4 (59.2 – 61.6)	43.3 (41.2 – 45.6)	60.5 (59.3 – 62.6)	81.9 (79.2 – 88.0)	683
60 years and older	65.4 (63.8 – 67.0)	47.1 (45.3 – 48.8)	66.0 (63.8 – 67.9)	89.5 (86.7 – 92.6)	846
Males					
Total, 6 years and older	59.7 (58.5 – 60.9)	40.9 (39.4 – 41.9)	60.4 (58.9 – 62.1)	84.1 (80.7 – 87.8)	1,472
6–11 years	37.0 (35.6 – 38.6)	28.6 (25.1 – 30.3)	37.0 (35.1 – 38.4)	47.4 (45.3 – 53.2)	112
12–19 years	50.2 (48.3 – 52.2)	38.5 (35.2 – 40.4)	49.8 (47.5 – 52.0)	66.8 (64.3 – 69.7)	254
20–39 years	61.8 (59.9 – 63.8)	47.1 (45.1 – 48.4)	60.8 (58.3 – 63.5)	83.8 (79.8 – 87.8)	309
40–59 years	63.3 (61.5 – 65.2)	45.3 (40.1 – 49.9)	64.0 (62.7 – 66.1)	85.0 (80.0 – 101)	351
60 years and older	66.8 (64.6 – 69.0)	49.7 (46.1 – 50.4)	67.1 (63.8 – 70.2)	90.6 (87.3 – 99.0)	446
Females					
Total, 6 years and older	55.3 (54.1 – 56.4)	37.6 (36.2 – 39.2)	55.6 (54.4 – 56.6)	79.8 (78.2 – 82.4)	1,501
6–11 years	36.6 (34.5 – 38.9)	28.2 (26.0 – 30.5)	37.1 (34.9 – 38.9)	48.1 (44.3 – 54.7)	119
12–19 years	46.6 (44.6 – 48.8)	35.9 (33.4 – 37.4)	45.5 (43.1 – 48.5)	63.7 (59.5 – 70.1)	245
20–39 years	53.5 (51.6 – 55.3)	36.7 (34.2 – 39.7)	53.1 (51.2 – 54.9)	76.1 (72.8 – 83.1)	405
40–59 years	57.7 (56.0 – 59.4)	41.6 (40.2 – 43.5)	57.7 (55.6 – 59.6)	79.1 (75.6 – 83.9)	332
60 years and older	64.3 (62.2 – 66.5)	46.4 (44.5 – 48.3)	64.8 (62.7 – 67.4)	87.9 (84.1 – 95.0)	400

Table 2.1.b. Serum vitamin A: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
1999–2000	52.8 (51.8 – 53.8)	30.7 (29.8 – 31.6)	53.5 (52.2 – 54.9)	85.6 (83.9 – 87.2)	7,102
2001–2002	55.2 (54.1 – 56.4)	32.6 (31.8 – 33.5)	56.0 (54.7 – 57.3)	88.4 (86.6 – 91.6)	7,935
2005–2006	54.7 (53.8 – 55.6)	32.5 (31.8 – 33.2)	55.2 (54.2 – 56.1)	87.8 (85.6 – 90.5)	7,254
Age group					
3–5 years					
1999–2000	32.3 (31.6 – 33.1)	22.0 (19.0 – 23.1)	33.1 (31.5 – 34.6)	46.2 (41.1 – 66.3)	352
2001–2002	33.8 (33.1 – 34.6)	24.3 (16.5 – 25.5)	34.0 (33.1 – 35.2)	47.1 (44.3 – 50.3)	430
6–11 years					
1999–2000	35.1 (34.5 – 35.6)	25.3 (23.6 – 26.1)	35.4 (35.0 – 35.8)	48.5 (46.1 – 52.3)	866
2001–2002	37.3 (36.2 – 38.5)	26.5 (25.8 – 27.4)	37.3 (36.2 – 39.0)	51.6 (50.1 – 54.0)	1,014
2005–2006	36.4 (35.6 – 37.2)	25.6 (24.3 – 26.9)	36.6 (35.9 – 37.3)	52.4 (49.1 – 54.3)	860
12–19 years					
1999–2000	45.7 (44.7 – 46.6)	30.1 (29.1 – 30.9)	45.8 (45.0 – 46.9)	69.4 (66.9 – 71.8)	2,111
2001–2002	48.0 (47.1 – 48.9)	31.8 (30.4 – 33.3)	48.5 (47.6 – 49.3)	71.2 (69.0 – 74.2)	2,206
2005–2006	46.5 (45.4 – 47.7)	32.0 (30.6 – 33.0)	46.0 (44.6 – 47.5)	69.6 (66.9 – 73.1)	1,954
20–39 years					
1999–2000	52.1 (50.8 – 53.4)	33.0 (31.1 – 34.3)	52.8 (51.2 – 54.5)	80.3 (77.9 – 83.0)	1,461
2001–2002	54.8 (53.3 – 56.3)	34.2 (32.6 – 35.3)	55.8 (54.4 – 57.5)	83.4 (80.9 – 86.6)	1,716
2005–2006	54.3 (53.3 – 55.3)	33.9 (32.2 – 35.1)	54.7 (53.5 – 55.6)	84.4 (81.9 – 87.9)	1,688
40–59 years					
1999–2000	59.0 (57.6 – 60.6)	35.9 (34.2 – 38.1)	59.8 (57.9 – 61.5)	90.4 (86.4 – 96.8)	1,191
2001–2002	60.3 (59.2 – 61.5)	37.5 (34.8 – 39.9)	61.2 (59.8 – 62.7)	94.6 (90.3 – 97.8)	1,474
2005–2006	58.7 (57.7 – 59.7)	36.8 (36.0 – 38.0)	59.5 (58.1 – 60.4)	90.3 (87.2 – 94.3)	1,365
60 years and older					
1999–2000	62.5 (61.1 – 64.0)	39.7 (36.3 – 41.9)	63.0 (61.3 – 65.0)	94.3 (90.1 – 99.5)	1,473
2001–2002	65.0 (63.6 – 66.5)	40.3 (38.0 – 41.4)	65.4 (64.1 – 67.4)	102 (98.6 – 108)	1,525
2005–2006	64.4 (62.8 – 66.1)	40.2 (38.2 – 43.0)	64.9 (63.1 – 67.0)	99.8 (96.2 – 102)	1,387
Gender					
(6 years and older)					
Males					
1999–2000	55.8 (54.4 – 57.3)	31.9 (30.1 – 33.8)	57.5 (55.8 – 58.8)	86.3 (84.6 – 90.6)	3,450
2001–2002	58.5 (57.2 – 59.8)	34.4 (33.4 – 35.5)	59.8 (58.0 – 61.7)	91.5 (88.7 – 93.7)	3,841
2005–2006	57.2 (56.3 – 58.2)	33.6 (32.7 – 34.8)	58.0 (57.1 – 59.0)	89.0 (86.5 – 93.0)	3,547
Females					
1999–2000	50.1 (49.1 – 51.1)	30.2 (28.7 – 31.2)	50.0 (48.8 – 51.0)	84.1 (81.2 – 87.0)	3,652
2001–2002	52.3 (51.1 – 53.5)	31.7 (30.9 – 32.4)	52.5 (51.0 – 53.9)	86.6 (84.0 – 88.3)	4,094
2005–2006	52.4 (51.3 – 53.5)	31.9 (31.2 – 32.6)	52.4 (50.8 – 53.8)	85.9 (83.3 – 88.7)	3,707
Race/ethnicity					
(6 years and older)					
Mexican Americans					
1999–2000	47.0 (46.1 – 47.8)	29.0 (28.0 – 29.7)	46.9 (45.5 – 48.3)	75.6 (73.6 – 79.0)	2,410
2001–2002	48.6 (47.2 – 50.0)	29.8 (28.8 – 30.7)	48.8 (47.4 – 50.4)	76.6 (73.4 – 82.1)	1,991
2005–2006	48.4 (47.3 – 49.5)	30.3 (29.3 – 31.2)	48.8 (46.8 – 50.2)	73.7 (71.9 – 77.0)	1,844
Non-Hispanic Blacks					
1999–2000	45.8 (44.2 – 47.4)	27.8 (26.4 – 28.3)	45.4 (43.1 – 47.6)	75.7 (72.5 – 81.1)	1,590
2001–2002	47.2 (46.1 – 48.3)	28.2 (27.4 – 28.9)	47.0 (45.3 – 48.6)	80.2 (77.3 – 85.7)	1,864
2005–2006	48.3 (47.3 – 49.3)	28.8 (27.6 – 29.8)	48.1 (47.0 – 49.5)	82.0 (78.4 – 85.5)	1,891
Non-Hispanic Whites					
1999–2000	55.6 (54.2 – 57.1)	33.4 (31.2 – 34.7)	56.8 (55.0 – 58.2)	87.3 (85.4 – 90.5)	2,456
2001–2002	57.9 (56.4 – 59.5)	34.7 (33.1 – 36.2)	58.9 (56.8 – 60.7)	91.3 (88.9 – 93.5)	3,455
2005–2006	57.4 (56.4 – 58.4)	34.8 (33.0 – 36.2)	57.9 (56.8 – 59.0)	89.8 (87.6 – 93.3)	2,973

Figure 2.1.b. Serum vitamin A: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006

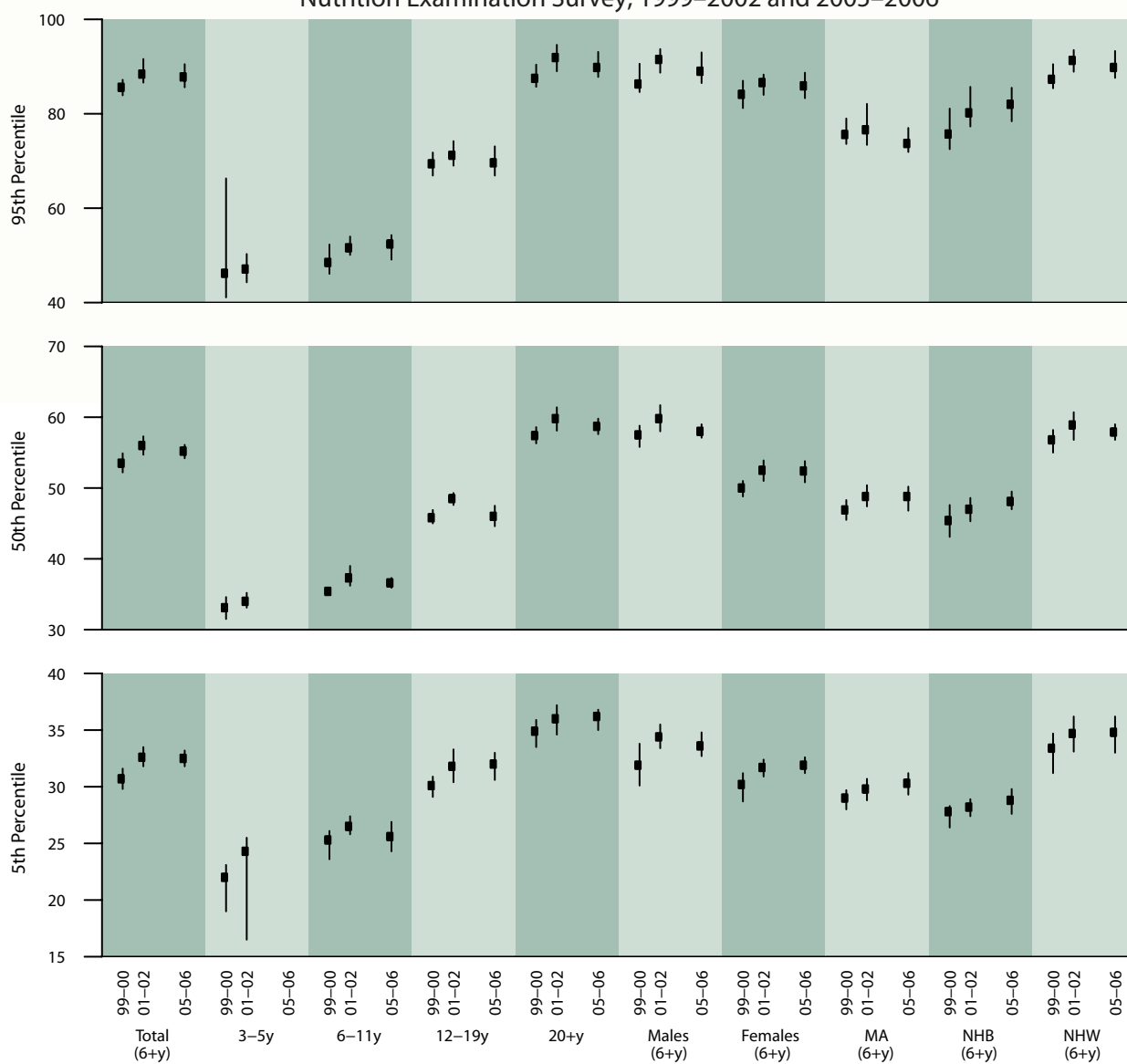


Table 2.1.c.1. Serum vitamin A: Prevalence

Prevalence (in percent) of low serum vitamin A concentration (< 20 µg/dL) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older	7,254	0.3 (0.1 – 0.5)	711,000
Age group			
6–11 years	860	1.0 (0.6 – 1.5)	231,000
12–19 years	1,954	§	§
20–39 years	1,688	§	§
40–59 years	1,365	§	§
60 years and older	1,387	§	§
Gender			
Males	3,547	§	§
Females	3,707	0.2‡ (0.1 – 0.4)	317,000‡
Race/ethnicity			
Mexican Americans	1,844	§	§
Non-Hispanic Blacks	1,891	0.5 (0.3 – 0.7)	145,000
Non-Hispanic Whites	2,973	0.2‡ (0.1 – 0.5)	386,000‡

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.1.c.2. Serum vitamin A: Prevalence

Prevalence (in percent) of high serum vitamin A concentration (> 100 µg/dL) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older	7,254	2.1 (1.6 – 2.7)	5,573,000
Age group			
6–11 years	860	§	§
12–19 years	1,954	§	§
20–39 years	1,688	1.1‡ (0.5 – 2.3)	847,000‡
40–59 years	1,365	2.7 (1.8 – 3.9)	2,182,000
60 years and older	1,387	4.8 (3.8 – 6.0)	2,301,000
Gender			
Males	3,547	2.5 (1.8 – 3.4)	3,265,000
Females	3,707	1.7 (1.0 – 2.9)	2,306,000
Race/ethnicity			
Mexican Americans	1,844	0.5‡ (0.3 – 1.1)	129,000‡
Non-Hispanic Blacks	1,891	1.1 (0.6 – 2.0)	348,000
Non-Hispanic Whites	2,973	2.6 (2.0 – 3.5)	4,752,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.1.d.1. Serum vitamin A: Prevalence by survey cycle

Prevalence (in percent) of low serum vitamin A concentration (< 20 µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
1999–2000	7,102	0.1 (0.1 – 0.2)	360,000
2001–2002	7,935	0.3 (0.2 – 0.4)	698,000
2005–2006	7,254	0.3 (0.1 – 0.5)	711,000
Age group			
3–5 years			
1999–2000	352	§	§
2001–2002	430	§	§
6–11 years			
1999–2000	866	1.0 (0.6 – 1.6)	243,000
2001–2002	1,014	§	§
2005–2006	860	1.0 (0.6 – 1.5)	231,000
12–19 years			
1999–2000	2,111	§	§
2001–2002	2,206	§	§
2005–2006	1,954	§	§
20–39 years			
1999–2000	1,461	§	§
2001–2002	1,716	§	§
2005–2006	1,688	§	§
40–59 years			
1999–2000	1,191	§	§
2001–2002	1,474	§	§
2005–2006	1,365	§	§
60 years and older			
1999–2000	1,473	§	§
2001–2002	1,525	§	§
2005–2006	1,387	§	§
Gender			
(6 years and older)			
Males			
1999–2000	3,450	0.1‡ (0.1 – 0.3)	179,000‡
2001–2002	3,841	0.4 (0.2 – 0.7)	456,000
2005–2006	3,547	§	§
Females			
1999–2000	3,652	0.1 (0.1 – 0.2)	181,000
2001–2002	4,094	0.2‡ (0.1 – 0.4)	242,000‡
2005–2006	3,707	0.2‡ (0.1 – 0.4)	317,000‡
Race/ethnicity			
(6 years and older)			
Mexican Americans			
1999–2000	2,410	0.4‡ (0.2 – 0.8)	75,000‡
2001–2002	1,991	§	§
2005–2006	1,844	§	§
Non-Hispanic Blacks			
1999–2000	1,590	0.5 (0.3 – 0.8)	153,000
2001–2002	1,864	0.7 (0.3 – 1.2)	201,000
2005–2006	1,891	0.5 (0.3 – 0.7)	145,000
Non-Hispanic Whites			
1999–2000	2,456	§	§
2001–2002	3,455	0.2‡ (0.1 – 0.5)	398,000‡
2005–2006	2,973	0.2‡ (0.1 – 0.5)	386,000‡

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.1.d.2. Serum vitamin A: Prevalence by survey cycle

Prevalence (in percent) of high serum vitamin A concentration (> 100 µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
1999–2000	7,102	1.3 (1.0 – 1.8)	3,312,000
2001–2002	7,935	2.0 (1.6 – 2.5)	5,242,000
2005–2006	7,254	2.1 (1.6 – 2.7)	5,573,000
Age group			
3–5 years			
1999–2000	352	§	§
2001–2002	430	§	§
6–11 years			
1999–2000	866	§	§
2001–2002	1,014	§	§
2005–2006	860	§	§
12–19 years			
1999–2000	2,111	§	§
2001–2002	2,206	§	§
2005–2006	1,954	§	§
20–39 years			
1999–2000	1,461	§	§
2001–2002	1,716	0.6‡ (0.2 – 1.3)	437,000‡
2005–2006	1,688	1.1‡ (0.5 – 2.3)	847,000‡
40–59 years			
1999–2000	1,191	2.4 (1.4 – 4.0)	1,688,000
2001–2002	1,474	2.9 (2.0 – 4.4)	2,222,000
2005–2006	1,365	2.7 (1.8 – 3.9)	2,182,000
60 years and older			
1999–2000	1,473	3.2 (2.1 – 4.8)	1,381,000
2001–2002	1,525	5.9 (4.3 – 8.0)	2,628,000
2005–2006	1,387	4.8 (3.8 – 6.0)	2,301,000
Gender			
(6 years and older)			
Males			
1999–2000	3,450	1.4 (0.9 – 2.4)	1,741,000
2001–2002	3,841	2.4 (1.9 – 3.0)	3,013,000
2005–2006	3,547	2.5 (1.8 – 3.4)	3,265,000
Females			
1999–2000	3,652	1.2 (0.7 – 2.0)	1,570,000
2001–2002	4,094	1.7 (1.2 – 2.4)	2,226,000
2005–2006	3,707	1.7 (1.0 – 2.9)	2,306,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
1999–2000	2,410	§	§
2001–2002	1,991	§	§
2005–2006	1,844	0.5‡ (0.3 – 1.1)	129,000‡
Non-Hispanic Blacks			
1999–2000	1,590	1.2 (0.7 – 2.2)	376,000
2001–2002	1,864	1.7‡ (0.8 – 3.7)	519,000‡
2005–2006	1,891	1.1 (0.6 – 2.0)	348,000
Non-Hispanic Whites			
1999–2000	2,456	1.7 (1.2 – 2.4)	2,962,000
2001–2002	3,455	2.4 (1.9 – 2.9)	4,296,000
2005–2006	2,973	2.6 (2.0 – 3.5)	4,752,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.2.a.1. Serum retinyl palmitate: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	2.11 (2.05 – 2.17)	< LOD	< LOD	2.08 (1.99 – 2.17)	5.67 (5.35 – 6.03)	7.35 (6.93 – 7.96)	6,946
Age group							
6–11 years	2.15 (2.01 – 2.29)	< LOD	< LOD	2.14 (1.93 – 2.27)	5.01 (4.70 – 5.81)	6.18 (5.67 – 8.84)	827
12–19 years	1.90 (1.84 – 1.97)	< LOD	< LOD	1.83 (1.74 – 1.94)	4.78 (4.51 – 5.37)	6.19 (5.77 – 6.77)	1,865
20–39 years	2.13 (2.04 – 2.23)	< LOD	< LOD	2.18 (2.03 – 2.29)	5.00 (4.67 – 5.36)	6.31 (5.70 – 7.62)	1,620
40–59 years	2.14 (2.04 – 2.25)	< LOD	< LOD	2.12 (2.00 – 2.24)	6.15 (5.46 – 6.80)	7.58 (6.74 – 9.10)	1,315
60 years and older	2.14 (2.01 – 2.28)	< LOD	< LOD	2.04 (1.88 – 2.23)	6.87 (6.04 – 8.01)	8.80 (7.86 – 11.7)	1,319
Gender							
Males	2.15 (2.08 – 2.23)	< LOD	< LOD	2.14 (2.04 – 2.24)	5.89 (5.50 – 6.32)	7.26 (6.78 – 8.26)	3,397
Females	2.07 (2.01 – 2.12)	< LOD	< LOD	2.01 (1.94 – 2.11)	5.51 (4.96 – 6.12)	7.45 (6.53 – 8.14)	3,549
Race/ethnicity							
Mexican Americans	1.85 (1.78 – 1.91)	< LOD	< LOD	1.78 (1.69 – 1.88)	4.77 (4.40 – 5.18)	5.69 (5.19 – 7.49)	1,746
Non-Hispanic Blacks	2.04 (1.90 – 2.19)	< LOD	< LOD	2.03 (1.84 – 2.20)	5.00 (4.65 – 5.76)	6.36 (5.70 – 7.56)	1,842
Non-Hispanic Whites	2.17 (2.10 – 2.25)	< LOD	< LOD	2.17 (2.04 – 2.27)	6.02 (5.60 – 6.49)	7.82 (7.04 – 8.74)	2,838

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Figure 2.2.a. Serum retinyl palmitate: Concentrations by age group

Geometric Mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

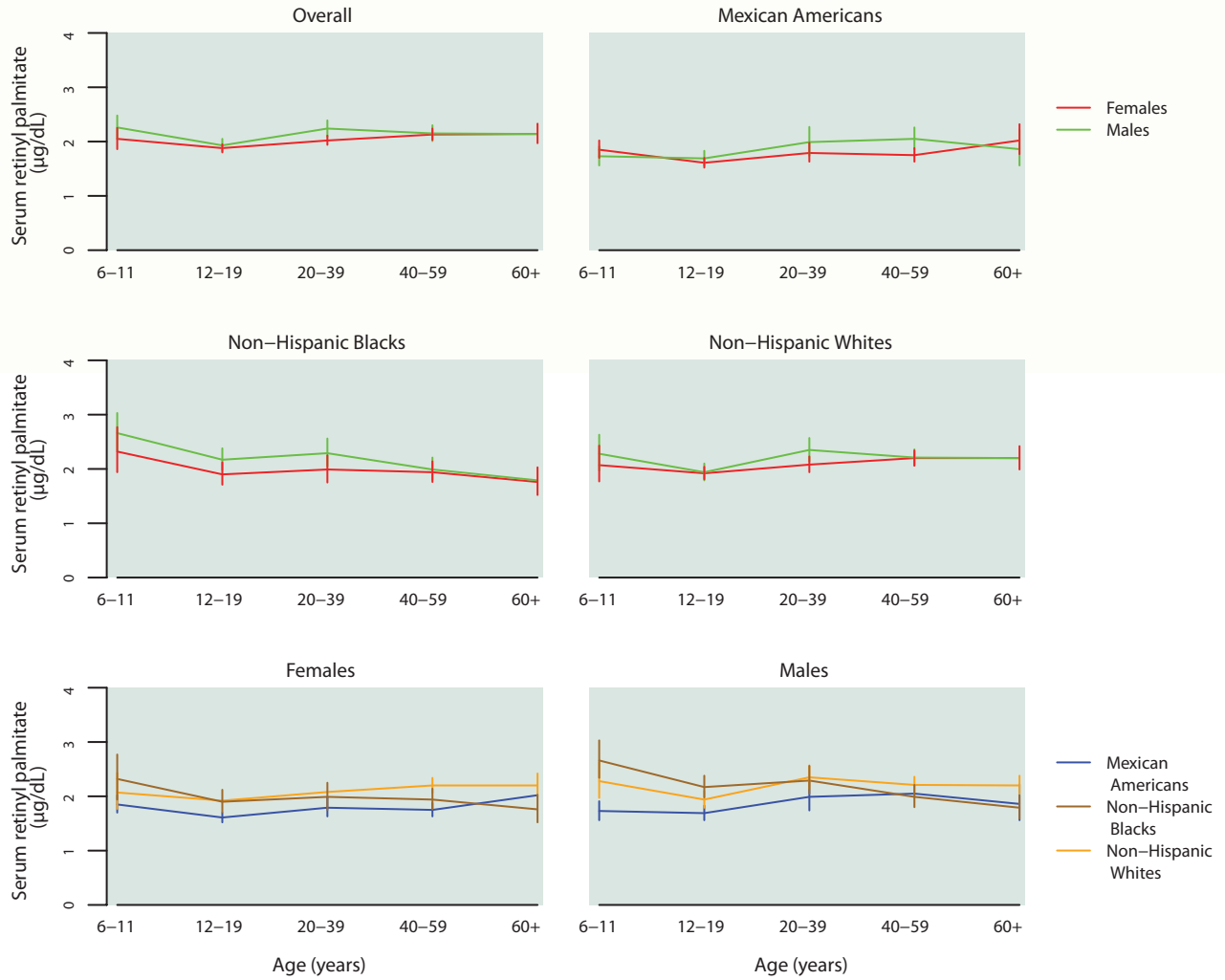


Table 2.2.a.2. Serum retinyl palmitate: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.11 (2.05 – 2.17)	< LOD	2.08 (1.99 – 2.17)	4.40 (4.28 – 4.54)	6,946
6–11 years	2.15 (2.01 – 2.29)	< LOD	2.14 (1.93 – 2.27)	4.19 (4.02 – 4.62)	827
12–19 years	1.90 (1.84 – 1.97)	< LOD	1.83 (1.74 – 1.94)	3.79 (3.60 – 4.10)	1,865
20–39 years	2.13 (2.04 – 2.23)	< LOD	2.18 (2.03 – 2.29)	4.16 (3.86 – 4.43)	1,620
40–59 years	2.14 (2.04 – 2.25)	< LOD	2.12 (2.00 – 2.24)	4.57 (4.23 – 5.15)	1,315
60 years and older	2.14 (2.01 – 2.28)	< LOD	2.04 (1.88 – 2.23)	4.99 (4.54 – 5.60)	1,319
Males					
Total, 6 years and older	2.15 (2.08 – 2.23)	< LOD	2.14 (2.04 – 2.24)	4.52 (4.39 – 4.69)	3,397
6–11 years	2.26 (2.05 – 2.48)	< LOD	2.22 (2.02 – 2.36)	4.56 (4.13 – 5.45)	411
12–19 years	1.93 (1.82 – 2.05)	< LOD	1.85 (1.72 – 2.02)	3.84 (3.55 – 4.26)	935
20–39 years	2.24 (2.09 – 2.39)	< LOD	2.30 (2.14 – 2.43)	4.42 (4.04 – 4.69)	714
40–59 years	2.15 (2.01 – 2.30)	< LOD	2.14 (2.01 – 2.27)	4.66 (4.29 – 5.53)	650
60 years and older	2.14 (2.01 – 2.28)	< LOD	2.03 (1.87 – 2.25)	5.04 (4.47 – 5.60)	687
Females					
Total, 6 years and older	2.07 (2.01 – 2.12)	< LOD	2.01 (1.94 – 2.11)	4.29 (4.13 – 4.44)	3,549
6–11 years	2.05 (1.86 – 2.25)	< LOD	2.03 (1.81 – 2.25)	4.02 (3.76 – 4.41)	416
12–19 years	1.88 (1.80 – 1.95)	< LOD	1.82 (1.69 – 1.92)	3.69 (3.44 – 4.31)	930
20–39 years	2.02 (1.94 – 2.11)	< LOD	2.03 (1.91 – 2.18)	3.87 (3.65 – 4.31)	906
40–59 years	2.13 (2.03 – 2.24)	< LOD	2.10 (1.97 – 2.24)	4.48 (4.00 – 5.50)	665
60 years and older	2.14 (1.97 – 2.33)	< LOD	2.05 (1.78 – 2.31)	4.95 (4.36 – 6.43)	632

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Table 2.2.a.3. Serum retinyl palmitate: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	1.85 (1.78 – 1.91)	< LOD	1.78 (1.69 – 1.88)	3.84 (3.60 – 4.09)	1,746
6–11 years	1.79 (1.67 – 1.91)	< LOD	1.68 (1.58 – 1.80)	3.66 (3.09 – 4.25)	275
12–19 years	1.65 (1.56 – 1.74)	< LOD	1.62 (1.57 – 1.67)	3.11 (2.87 – 3.51)	614
20–39 years	1.90 (1.77 – 2.04)	< LOD	1.87 (1.68 – 2.04)	3.94 (3.68 – 4.49)	432
40–59 years	1.89 (1.78 – 2.02)	< LOD	1.81 (1.67 – 2.00)	4.08 (3.50 – 4.79)	233
60 years and older	1.95 (1.78 – 2.14)	< LOD	1.79 (1.63 – 2.06)	4.57 (3.78 – 5.89)	192
Males					
Total, 6 years and older	1.91 (1.80 – 2.03)	< LOD	1.84 (1.69 – 2.00)	3.99 (3.70 – 4.70)	832
6–11 years	1.73 (1.56 – 1.91)	< LOD	1.60 (1.51 – 1.79)	3.68 (2.85 – 5.04)	136
12–19 years	1.69 (1.56 – 1.83)	< LOD	1.64 (1.56 – 1.75)	3.12 (2.70 – 3.94)	294
20–39 years	1.99 (1.74 – 2.27)	< LOD	1.95 (1.67 – 2.27)	4.21 (3.82 – 5.31)	193
40–59 years	2.05 (1.86 – 2.26)	< LOD	1.98 (1.55 – 2.44)	4.35 (3.76 – 5.44)	114
60 years and older	1.86 (1.56 – 2.22)	< LOD†	1.76 (1.35 – 2.41)	4.45† (3.55 – 5.43)	95
Females					
Total, 6 years and older	1.78 (1.70 – 1.85)	< LOD	1.72 (1.63 – 1.83)	3.56 (3.44 – 3.71)	914
6–11 years	1.85 (1.70 – 2.02)	< LOD	1.76 (1.63 – 1.94)	3.64 (3.14 – 4.87)	139
12–19 years	1.61 (1.52 – 1.70)	< LOD	1.60 (1.47 – 1.69)	3.09 (2.79 – 3.66)	320
20–39 years	1.79 (1.63 – 1.98)	< LOD	1.77 (1.53 – 2.03)	3.56 (3.32 – 3.89)	239
40–59 years	1.75 (1.63 – 1.88)	< LOD	1.72 (1.52 – 1.95)	3.52 (3.24 – 4.47)	119
60 years and older	2.02 (1.77 – 2.32)	< LOD†	1.79 (1.58 – 2.24)	4.59† (3.30 – 8.50)	97

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.2.a.4. Serum retinyl palmitate: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.04 (1.90 – 2.19)	< LOD	2.03 (1.84 – 2.20)	4.13 (3.85 – 4.48)	1,842
6–11 years	2.49 (2.19 – 2.82)	< LOD	2.49 (2.13 – 3.01)	4.82 (4.58 – 5.44)	238
12–19 years	2.03 (1.88 – 2.21)	< LOD	1.99 (1.84 – 2.23)	4.05 (3.58 – 4.59)	643
20–39 years	2.12 (1.92 – 2.35)	< LOD	2.10 (1.91 – 2.27)	4.23 (3.81 – 4.67)	363
40–59 years	1.96 (1.82 – 2.12)	< LOD	1.94 (1.73 – 2.21)	3.88 (3.59 – 4.61)	326
60 years and older	1.77 (1.60 – 1.96)	< LOD	1.65 (1.44 – 1.89)	3.95 (3.26 – 4.67)	272
Males					
Total, 6 years and older	2.15 (1.99 – 2.32)	< LOD	2.16 (2.00 – 2.30)	4.45 (3.88 – 5.02)	921
6–11 years	2.66 (2.34 – 3.03)	< LOD	2.71 (2.35 – 2.96)	5.34 (4.54 – 6.33)	127
12–19 years	2.17 (1.98 – 2.38)	< LOD	2.13 (1.88 – 2.36)	4.49 (3.67 – 5.39)	330
20–39 years	2.29 (2.05 – 2.56)	< LOD	2.28 (2.05 – 2.56)	4.45 (3.73 – 5.85)	168
40–59 years	1.99 (1.80 – 2.21)	< LOD	2.12 (1.69 – 2.30)	3.84 (3.42 – 7.34)	153
60 years and older	1.79 (1.59 – 2.01)	< LOD	1.62 (1.32 – 1.99)	4.64 (3.40 – 5.35)	143
Females					
Total, 6 years and older	1.95 (1.79 – 2.12)	< LOD	1.92 (1.74 – 2.14)	3.93 (3.80 – 4.22)	921
6–11 years	2.32 (1.94 – 2.77)	< LOD†	2.37 (1.87 – 2.87)	4.60† (4.24 – 5.12)	111
12–19 years	1.90 (1.71 – 2.12)	< LOD	1.91 (1.65 – 2.19)	3.55 (3.39 – 4.26)	313
20–39 years	1.99 (1.75 – 2.25)	< LOD	2.01 (1.73 – 2.24)	3.92 (3.70 – 4.67)	195
40–59 years	1.94 (1.76 – 2.14)	< LOD	1.88 (1.69 – 2.11)	3.92 (3.61 – 4.47)	173
60 years and older	1.76 (1.52 – 2.03)	< LOD	1.66 (1.43 – 2.02)	3.54 (3.07 – 4.22)	129

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.2.a.5. Serum retinyl palmitate: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.17 (2.10 – 2.25)	< LOD	2.17 (2.04 – 2.27)	4.54 (4.39 – 4.71)	2,838
6–11 years	2.18 (1.97 – 2.41)	< LOD	2.16 (1.87 – 2.30)	4.19 (3.82 – 4.82)	224
12–19 years	1.93 (1.84 – 2.03)	< LOD	1.85 (1.70 – 2.01)	3.92 (3.56 – 4.47)	475
20–39 years	2.21 (2.07 – 2.36)	< LOD	2.30 (2.12 – 2.44)	4.32 (3.85 – 4.66)	676
40–59 years	2.20 (2.08 – 2.33)	< LOD	2.21 (2.02 – 2.34)	4.66 (4.33 – 5.45)	658
60 years and older	2.20 (2.05 – 2.37)	< LOD	2.12 (1.91 – 2.35)	5.16 (4.63 – 5.86)	805
Males					
Total, 6 years and older	2.22 (2.12 – 2.32)	< LOD	2.21 (2.08 – 2.30)	4.66 (4.45 – 4.99)	1,407
6–11 years	2.28 (1.97 – 2.63)	< LOD†	2.22 (1.95 – 2.61)	4.52† (3.80 – 5.92)	107
12–19 years	1.94 (1.79 – 2.10)	< LOD	1.87 (1.68 – 2.10)	3.80 (3.40 – 4.67)	245
20–39 years	2.35 (2.14 – 2.57)	< LOD	2.40 (2.22 – 2.59)	4.49 (4.09 – 5.04)	293
40–59 years	2.21 (2.06 – 2.36)	< LOD	2.20 (2.02 – 2.35)	4.77 (4.35 – 6.02)	339
60 years and older	2.20 (2.04 – 2.38)	< LOD	2.10 (1.89 – 2.36)	5.16 (4.50 – 5.79)	423
Females					
Total, 6 years and older	2.13 (2.05 – 2.21)	< LOD	2.13 (1.96 – 2.26)	4.41 (4.25 – 4.65)	1,431
6–11 years	2.07 (1.77 – 2.43)	< LOD	2.10 (1.75 – 2.39)	4.05 (3.50 – 4.51)	117
12–19 years	1.92 (1.81 – 2.04)	< LOD	1.81 (1.67 – 1.98)	3.98 (3.30 – 4.57)	230
20–39 years	2.08 (1.94 – 2.23)	< LOD	2.21 (1.91 – 2.36)	4.07 (3.57 – 4.65)	383
40–59 years	2.20 (2.06 – 2.34)	< LOD	2.21 (1.97 – 2.40)	4.54 (4.05 – 5.85)	319
60 years and older	2.20 (1.99 – 2.42)	< LOD	2.15 (1.80 – 2.41)	5.15 (4.45 – 6.71)	382

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.2.b. Serum retinyl palmitate: Concentrations by survey cycle

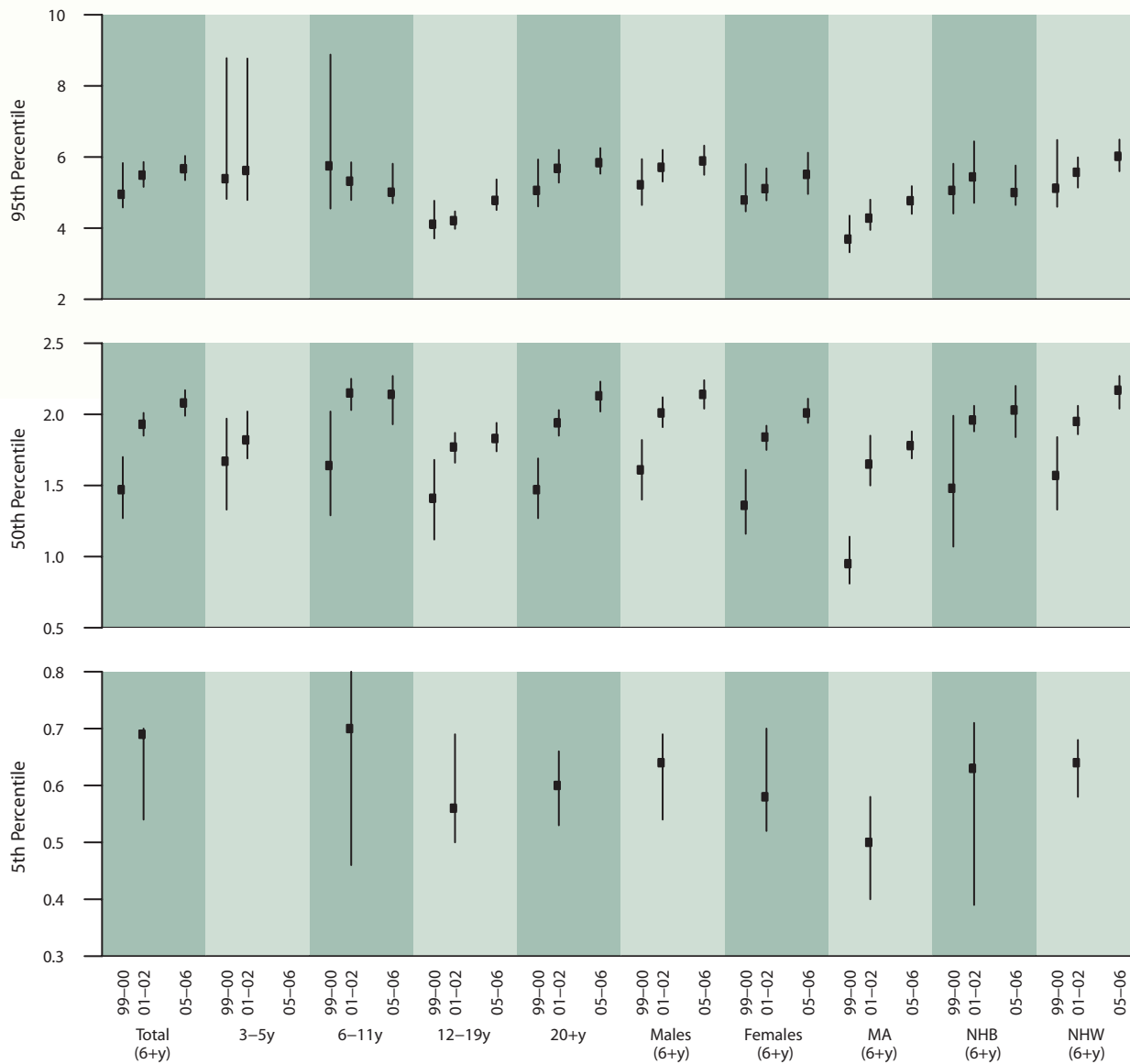
Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
1999–2000	1.23 (1.04 – 1.46)	< LOD	1.47 (1.27 – 1.70)	4.95 (4.58 – 5.83)	5,589
2001–2002	1.92 (1.83 – 2.02)	.690 (.537 – .696)	1.93 (1.85 – 2.01)	5.49 (5.16 – 5.86)	7,641
2005–2006	2.11 (2.05 – 2.17)	< LOD	2.08 (1.99 – 2.17)	5.67 (5.35 – 6.03)	6,946
Age group					
3–5 years					
1999–2000	1.46 (1.16 – 1.84)	< LOD	1.67 (1.33 – 1.97)	5.39 (4.82 – 8.78)	278
2001–2002	1.88 (1.71 – 2.06)	.482 (< LOD – .710)	1.82 (1.69 – 2.02)	5.62 (4.79 – 8.77)	412
6–11 years					
1999–2000	1.33 (1.07 – 1.67)	< LOD	1.64 (1.29 – 2.02)	5.75 (4.55 – 8.88)	651
2001–2002	2.02 (1.90 – 2.15)	.700 (.462 – .801)	2.15 (2.03 – 2.25)	5.32 (4.79 – 5.85)	967
2005–2006	2.15 (2.01 – 2.29)	< LOD	2.14 (1.93 – 2.27)	5.01 (4.70 – 5.81)	827
12–19 years					
1999–2000	1.17 (.963 – 1.41)	< LOD	1.41 (1.12 – 1.68)	4.11 (3.71 – 4.77)	1,620
2001–2002	1.71 (1.61 – 1.80)	.560 (.500 – .692)	1.77 (1.66 – 1.87)	4.21 (3.98 – 4.47)	2,122
2005–2006	1.90 (1.84 – 1.97)	< LOD	1.83 (1.74 – 1.94)	4.78 (4.51 – 5.37)	1,865
20–39 years					
1999–2000	1.14 (.928 – 1.39)	< LOD	1.40 (1.21 – 1.62)	4.58 (4.14 – 5.67)	1,201
2001–2002	1.91 (1.77 – 2.06)	.643 (.543 – .720)	1.91 (1.79 – 2.03)	5.14 (4.65 – 5.79)	1,655
2005–2006	2.13 (2.04 – 2.23)	< LOD	2.18 (2.03 – 2.29)	5.00 (4.67 – 5.36)	1,620
40–59 years					
1999–2000	1.30 (1.06 – 1.59)	< LOD	1.55 (1.30 – 1.84)	5.49 (4.61 – 6.83)	959
2001–2002	1.99 (1.87 – 2.11)	.623 (.529 – .698)	1.96 (1.89 – 2.06)	5.70 (5.19 – 6.53)	1,429
2005–2006	2.14 (2.04 – 2.25)	< LOD	2.12 (2.00 – 2.24)	6.15 (5.46 – 6.80)	1,315
60 years and older					
1999–2000	1.34 (1.11 – 1.62)	< LOD	1.54 (1.29 – 1.89)	5.78 (4.87 – 6.47)	1,158
2001–2002	1.96 (1.82 – 2.11)	.522 (.453 – .580)	1.91 (1.75 – 2.13)	6.79 (6.11 – 7.83)	1,468
2005–2006	2.14 (2.01 – 2.28)	< LOD	2.04 (1.88 – 2.23)	6.87 (6.04 – 8.01)	1,319
Gender					
(6 years and older)					
Males					
1999–2000	1.38 (1.17 – 1.63)	< LOD	1.61 (1.40 – 1.82)	5.22 (4.65 – 5.94)	2,676
2001–2002	2.01 (1.90 – 2.12)	.636 (.544 – .687)	2.01 (1.91 – 2.12)	5.71 (5.31 – 6.20)	3,698
2005–2006	2.15 (2.08 – 2.23)	< LOD	2.14 (2.04 – 2.24)	5.89 (5.50 – 6.32)	3,397
Females					
1999–2000	1.11 (.922 – 1.33)	< LOD	1.36 (1.16 – 1.61)	4.79 (4.47 – 5.80)	2,913
2001–2002	1.85 (1.76 – 1.95)	.582 (.515 – .695)	1.84 (1.75 – 1.92)	5.11 (4.78 – 5.68)	3,943
2005–2006	2.07 (2.01 – 2.12)	< LOD	2.01 (1.94 – 2.11)	5.51 (4.96 – 6.12)	3,549
Race/ethnicity					
(6 years and older)					
Mexican Americans					
1999–2000	.759 (.635 – .906)	< LOD	.945 (.808 – 1.14)	3.69 (3.32 – 4.35)	1,463
2001–2002	1.62 (1.47 – 1.78)	.503 (.398 – .575)	1.65 (1.50 – 1.85)	4.28 (3.95 – 4.80)	1,980
2005–2006	1.85 (1.78 – 1.91)	< LOD	1.78 (1.69 – 1.88)	4.77 (4.40 – 5.18)	1,746
Non-Hispanic Blacks					
1999–2000	1.18 (.848 – 1.64)	< LOD	1.48 (1.07 – 1.99)	5.06 (4.41 – 5.81)	1,422
2001–2002	1.92 (1.82 – 2.02)	.628 (.390 – .709)	1.96 (1.88 – 2.06)	5.44 (4.71 – 6.44)	1,734
2005–2006	2.04 (1.90 – 2.19)	< LOD	2.03 (1.84 – 2.20)	5.00 (4.65 – 5.76)	1,842
Non-Hispanic Whites					
1999–2000	1.32 (1.08 – 1.60)	< LOD	1.57 (1.33 – 1.84)	5.12 (4.60 – 6.48)	2,121
2001–2002	1.97 (1.87 – 2.08)	.636 (.584 – .684)	1.95 (1.86 – 2.06)	5.57 (5.14 – 5.99)	3,318
2005–2006	2.17 (2.10 – 2.25)	< LOD	2.17 (2.04 – 2.27)	6.02 (5.60 – 6.49)	2,838

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Figure 2.2.b. Serum retinyl palmitate: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006



Values in the graph are suppressed if either the point estimate or the lower 95% confidence limit is noted as "< LOD" in the accompanying table.

Table 2.3.a.1. Serum retinyl stearate: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	*	< LOD	< LOD	< LOD	1.31 (1.23 – 1.48)	1.95 (1.79 – 2.09)	6,698
Age group							
6–11 years	*	< LOD	< LOD	< LOD	1.33 (1.08 – 1.97)	1.97 (1.65 – 4.08)	792
12–19 years	*	< LOD	< LOD	< LOD	.911 (.743 – 1.14)	1.48 (1.18 – 2.00)	1,801
20–39 years	*	< LOD	< LOD	< LOD	.947 (.850 – 1.09)	1.32 (1.14 – 1.76)	1,555
40–59 years	*	< LOD	< LOD	< LOD	1.35 (1.23 – 1.63)	2.00 (1.68 – 2.31)	1,262
60 years and older	*	< LOD	< LOD	< LOD	1.93 (1.59 – 2.58)	2.77 (2.26 – 3.58)	1,288
Gender							
Males	*	< LOD	< LOD	< LOD	1.40 (1.29 – 1.54)	1.94 (1.86 – 2.05)	3,276
Females	*	< LOD	< LOD	< LOD	1.25 (1.09 – 1.48)	1.99 (1.62 – 2.34)	3,422
Race/ethnicity							
Mexican Americans	*	< LOD	< LOD	< LOD	.933 (.792 – 1.19)	1.35 (1.08 – 2.07)	1,739
Non-Hispanic Blacks	*	< LOD	< LOD	< LOD	.896 (.829 – 1.10)	1.38 (1.10 – 1.71)	1,699
Non-Hispanic Whites	*	< LOD	< LOD	< LOD	1.50 (1.36 – 1.64)	2.06 (1.93 – 2.36)	2,747

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

No serum retinyl stearate figure for concentrations by age group is presented because the geometric means were not calculated due to the proportion of results below the limit of detection being too high for valid results (see Table 2.3.a.1).

Table 2.3.a.2. Serum retinyl stearate: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	.894 (.794 – 1.02)	6,698
6–11 years	*	< LOD	< LOD	.972 (.730 – 1.21)	792
12–19 years	*	< LOD	< LOD	< LOD	1,801
20–39 years	*	< LOD	< LOD	< LOD	1,555
40–59 years	*	< LOD	< LOD	.944 (.810 – 1.16)	1,262
60 years and older	*	< LOD	< LOD	1.32 (1.13 – 1.58)	1,288
Males					
Total, 6 years and older	*	< LOD	< LOD	.964 (.871 – 1.08)	3,276
6–11 years	*	< LOD	< LOD	1.03 (< LOD – 1.76)	394
12–19 years	*	< LOD	< LOD	< LOD	898
20–39 years	*	< LOD	< LOD	.813 (.709 – .968)	682
40–59 years	*	< LOD	< LOD	.993 (.842 – 1.17)	624
60 years and older	*	< LOD	< LOD	1.33 (1.16 – 1.53)	678
Females					
Total, 6 years and older	*	< LOD	< LOD	.839 (.741 – .960)	3,422
6–11 years	*	< LOD	< LOD	.896 (< LOD – 1.17)	398
12–19 years	*	< LOD	< LOD	< LOD	903
20–39 years	*	< LOD	< LOD	< LOD	873
40–59 years	*	< LOD	< LOD	.903 (.764 – 1.21)	638
60 years and older	*	< LOD	< LOD	1.32 (1.06 – 1.74)	610

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

Table 2.3.a.3. Serum retinyl stearate: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	< LOD	1,739
6–11 years	*	< LOD	< LOD	< LOD	272
12–19 years	*	< LOD	< LOD	< LOD	604
20–39 years	*	< LOD	< LOD	< LOD	428
40–59 years	*	< LOD	< LOD	.766 (< LOD – 1.23)	238
60 years and older	*	< LOD	< LOD	.902 (.707 – 1.32)	197
Males					
Total, 6 years and older	*	< LOD	< LOD	.736 (< LOD – .877)	832
6–11 years	*	< LOD	< LOD	< LOD	135
12–19 years	*	< LOD	< LOD	< LOD	290
20–39 years	*	< LOD	< LOD	.700 (< LOD – .965)	190
40–59 years	*	< LOD	< LOD	.851 (< LOD – 1.95)	118
60 years and older	*	< LOD†	< LOD	.780† (< LOD – 3.26)	99
Females					
Total, 6 years and older	*	< LOD	< LOD	< LOD	907
6–11 years	*	< LOD	< LOD	< LOD	137
12–19 years	*	< LOD	< LOD	< LOD	314
20–39 years	*	< LOD	< LOD	< LOD	238
40–59 years	*	< LOD	< LOD	< LOD	120
60 years and older	*	< LOD†	< LOD	1.02† (< LOD – 1.97)	98

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.3.a.4. Serum retinyl stearate: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	< LOD	1,699
6–11 years	*	< LOD	< LOD	< LOD	219
12–19 years	*	< LOD	< LOD	< LOD	597
20–39 years	*	< LOD	< LOD	< LOD	322
40–59 years	*	< LOD	< LOD	.781 (< LOD – .931)	301
60 years and older	*	< LOD	< LOD	.770 (< LOD – 1.39)	260
Males					
Total, 6 years and older	*	< LOD	< LOD	.746 (< LOD – .868)	849
6–11 years	*	< LOD	< LOD	< LOD	118
12–19 years	*	< LOD	< LOD	< LOD	300
20–39 years	*	< LOD	< LOD	< LOD	152
40–59 years	*	< LOD	< LOD	.813 (< LOD – 1.06)	141
60 years and older	*	< LOD	< LOD	1.06 (< LOD – 1.55)	138
Females					
Total, 6 years and older	*	< LOD	< LOD	< LOD	850
6–11 years	*	< LOD†	< LOD	< LOD†	101
12–19 years	*	< LOD	< LOD	< LOD	297
20–39 years	*	< LOD	< LOD	< LOD	170
40–59 years	*	< LOD	< LOD	.701 (< LOD – .962)	160
60 years and older	*	< LOD	< LOD	< LOD	122

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.3.a.5. Serum retinyl stearate: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	1.01 (.932 – 1.10)	2,747
6–11 years	*	< LOD	< LOD	1.06 (.756 – 1.99)	212
12–19 years	*	< LOD	< LOD	< LOD	465
20–39 years	*	< LOD	< LOD	.727 (< LOD – .878)	660
40–59 years	*	< LOD	< LOD	1.00 (.869 – 1.20)	627
60 years and older	*	< LOD	< LOD	1.40 (1.17 – 1.73)	783
Males					
Total, 6 years and older	*	< LOD	< LOD	1.09 (.967 – 1.18)	1,370
6–11 years	*	< LOD†	< LOD	1.09† (< LOD – 7.58)	103
12–19 years	*	< LOD	< LOD	.740 (< LOD – 1.05)	244
20–39 years	*	< LOD	< LOD	.927 (.740 – 1.16)	283
40–59 years	*	< LOD	< LOD	1.07 (.862 – 1.24)	324
60 years and older	*	< LOD	< LOD	1.39 (1.19 – 1.65)	416
Females					
Total, 6 years and older	*	< LOD	< LOD	.948 (.855 – 1.07)	1,377
6–11 years	*	< LOD†	< LOD	1.04† (.755 – 2.95)	109
12–19 years	*	< LOD	< LOD	< LOD	221
20–39 years	*	< LOD	< LOD	< LOD	377
40–59 years	*	< LOD	< LOD	.953 (.798 – 1.31)	303
60 years and older	*	< LOD	< LOD	1.41 (1.08 – 2.01)	367

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.3.b. Serum retinyl stearate: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
1999–2000	*	< LOD	< LOD	1.12 (.983 – 1.44)	4,148
2001–2002	*	< LOD	< LOD	1.08 (.988 – 1.19)	7,690
2005–2006	*	< LOD	< LOD	1.31 (1.23 – 1.48)	6,698
Age group					
3–5 years					
1999–2000	*	< LOD†	< LOD	2.43† (1.72 – 3.65)	212
2001–2002	*	< LOD	< LOD	1.75 (1.37 – 3.49)	416
6–11 years					
1999–2000	*	< LOD	< LOD	1.74 (1.09 – 10.3)	434
2001–2002	*	< LOD	< LOD	1.14 (.964 – 1.34)	981
2005–2006	*	< LOD	< LOD	1.33 (1.08 – 1.97)	792
12–19 years					
1999–2000	*	< LOD	< LOD	.829 (< LOD – 1.30)	1,194
2001–2002	*	< LOD	< LOD	< LOD	2,145
2005–2006	*	< LOD	< LOD	.911 (.743 – 1.14)	1,801
20–39 years					
1999–2000	*	< LOD	< LOD	.928 (.651 – 1.36)	872
2001–2002	*	< LOD	< LOD	.721 (.693 – .893)	1,658
2005–2006	*	< LOD	< LOD	.947 (.850 – 1.09)	1,555
40–59 years					
1999–2000	*	< LOD	< LOD	1.32 (.944 – 2.40)	716
2001–2002	*	< LOD	< LOD	1.15 (1.04 – 1.46)	1,422
2005–2006	*	< LOD	< LOD	1.35 (1.23 – 1.63)	1,262
60 years and older					
1999–2000	*	< LOD	< LOD	1.83 (1.39 – 2.90)	932
2001–2002	*	< LOD	< LOD	1.77 (1.52 – 2.08)	1,484
2005–2006	*	< LOD	< LOD	1.93 (1.59 – 2.58)	1,288
Gender					
(6 years and older)					
Males					
1999–2000	*	< LOD	< LOD	1.13 (.987 – 1.66)	2,008
2001–2002	*	< LOD	< LOD	1.19 (1.09 – 1.42)	3,710
2005–2006	*	< LOD	< LOD	1.40 (1.29 – 1.54)	3,276
Females					
1999–2000	*	< LOD	< LOD	1.10 (.951 – 1.42)	2,140
2001–2002	*	< LOD	< LOD	.953 (.856 – 1.09)	3,980
2005–2006	*	< LOD	< LOD	1.25 (1.09 – 1.48)	3,422
Race/ethnicity					
(6 years and older)					
Mexican Americans					
1999–2000	*	< LOD	< LOD	.695 (< LOD – 2.14)	1,002
2001–2002	*	< LOD	< LOD	.587 (< LOD – .880)	1,921
2005–2006	*	< LOD	< LOD	.933 (.792 – 1.19)	1,739
Non-Hispanic Blacks					
1999–2000	*	< LOD	< LOD	.962 (.590 – 15.0)	1,060
2001–2002	*	< LOD	< LOD	.733 (.619 – .963)	1,827
2005–2006	*	< LOD	< LOD	.896 (.829 – 1.10)	1,699
Non-Hispanic Whites					
1999–2000	*	< LOD	< LOD	1.27 (1.00 – 1.81)	1,608
2001–2002	*	< LOD	< LOD	1.13 (1.02 – 1.30)	3,331
2005–2006	*	< LOD	< LOD	1.50 (1.36 – 1.64)	2,747

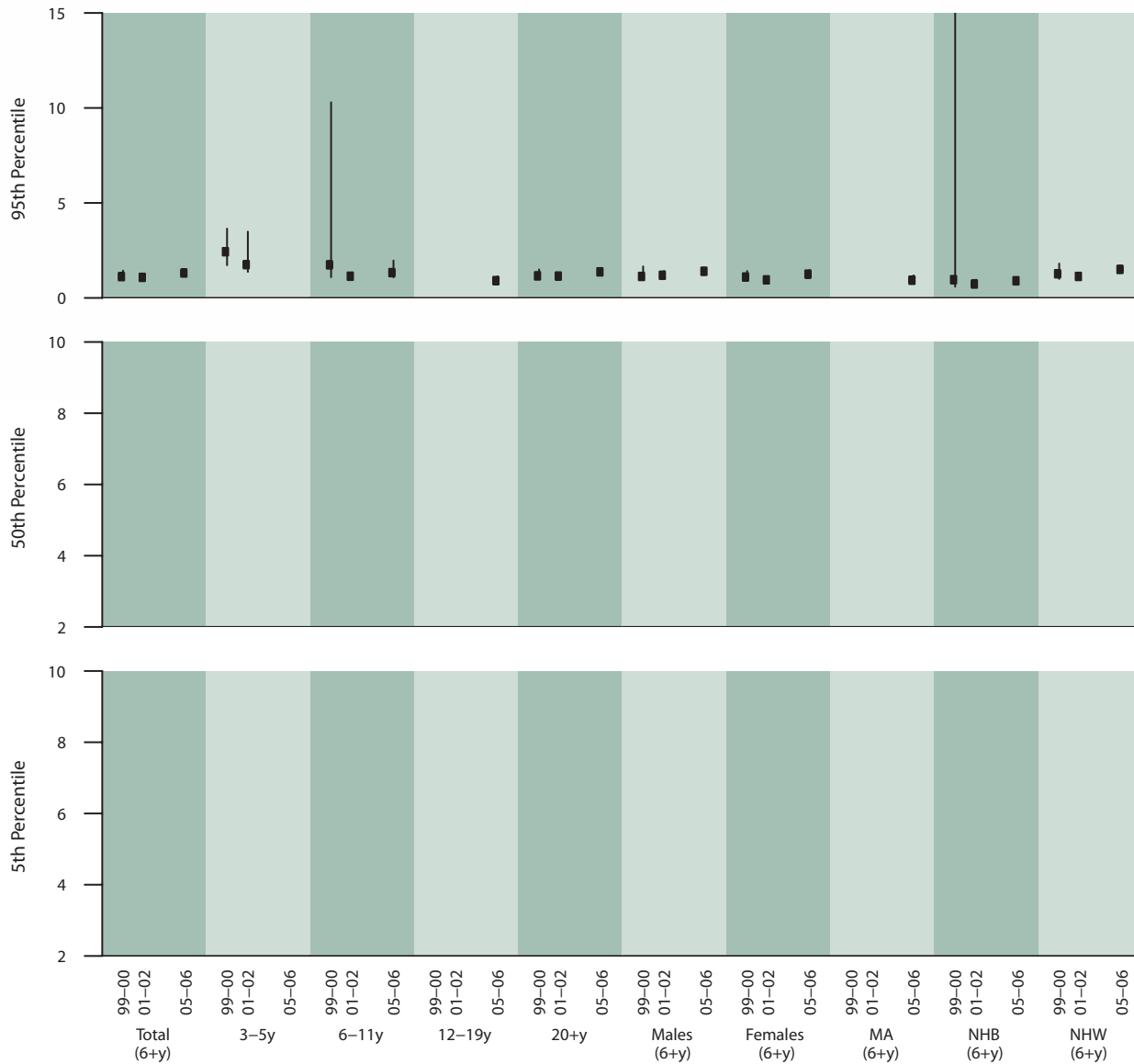
< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to cell size.

Figure 2.3.b. Serum retinyl stearate: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006



Values in the graph are suppressed if either the point estimate or the lower 95% confidence limit is noted as "< LOD" in the accompanying table.

Table 2.4.a.1. Serum vitamin E: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	1,090 (1,070 – 1,120)	578 (563 – 587)	631 (620 – 642)	1,060 (1,030 – 1,080)	2,090 (2,010 – 2,180)	2,460 (2,310 – 2,600)	7,254
Age group							
6–11 years	820 (800 – 841)	546 (518 – 573)	583 (563 – 601)	806 (788 – 826)	1,200 (1,120 – 1,370)	1,360 (1,230 – 1,510)	860
12–19 years	770 (757 – 783)	497 (466 – 519)	527 (516 – 541)	759 (749 – 767)	1,160 (1,130 – 1,200)	1,320 (1,240 – 1,450)	1,954
20–39 years	1,020 (998 – 1,040)	590 (559 – 619)	645 (621 – 668)	1,000 (980 – 1,020)	1,730 (1,620 – 1,900)	1,940 (1,810 – 2,380)	1,688
40–59 years	1,230 (1,190 – 1,260)	702 (656 – 721)	749 (724 – 769)	1,200 (1,160 – 1,240)	2,210 (2,080 – 2,400)	2,510 (2,260 – 3,110)	1,365
60 years and older	1,400 (1,360 – 1,440)	704 (611 – 750)	783 (733 – 835)	1,390 (1,330 – 1,430)	2,600 (2,510 – 2,660)	2,900 (2,710 – 3,130)	1,387
Gender							
Males	1,060 (1,040 – 1,090)	559 (543 – 575)	610 (594 – 625)	1,030 (1,010 – 1,070)	2,010 (1,930 – 2,090)	2,360 (2,160 – 2,520)	3,547
Females	1,120 (1,090 – 1,140)	596 (585 – 612)	653 (639 – 664)	1,080 (1,050 – 1,100)	2,170 (2,080 – 2,260)	2,510 (2,370 – 2,660)	3,707
Race/ethnicity							
Mexican Americans	1,010 (980 – 1,040)	581 (553 – 599)	623 (602 – 637)	976 (945 – 1,000)	1,790 (1,750 – 1,870)	2,120 (1,960 – 2,330)	1,844
Non-Hispanic Blacks	933 (915 – 951)	548 (530 – 559)	588 (581 – 601)	903 (884 – 918)	1,660 (1,560 – 1,750)	1,800 (1,740 – 2,080)	1,891
Non-Hispanic Whites	1,140 (1,110 – 1,160)	584 (566 – 596)	643 (624 – 658)	1,110 (1,080 – 1,140)	2,170 (2,090 – 2,270)	2,520 (2,420 – 2,690)	2,973

Figure 2.4.a. Serum vitamin E: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

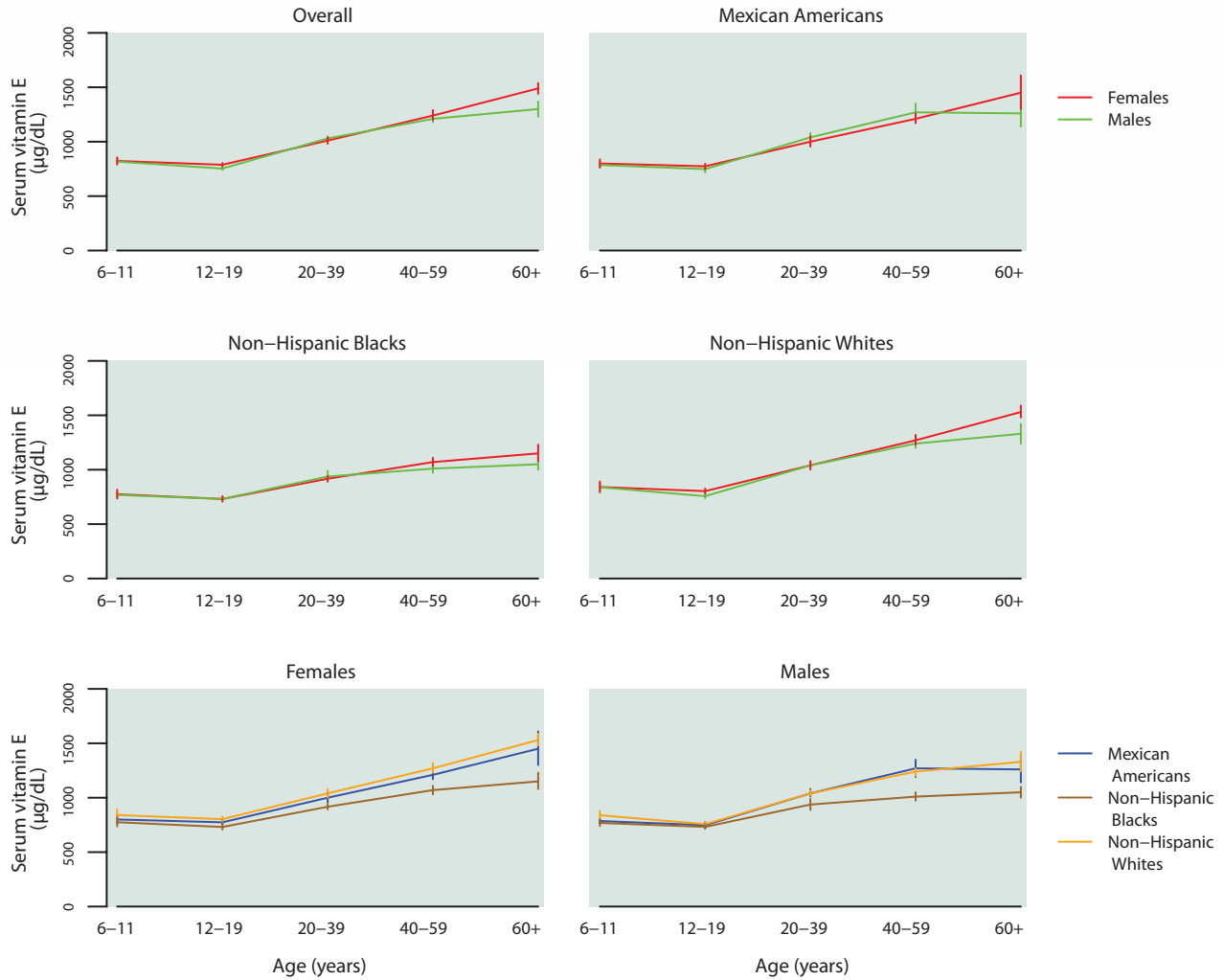


Table 2.4.a.2. Serum vitamin E: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	1,090 (1,070 – 1,120)	702 (686 – 716)	1,060 (1,030 – 1,080)	1,790 (1,730 – 1,840)	7,254
6–11 years	820 (800 – 841)	629 (621 – 638)	806 (788 – 826)	1,070 (1,040 – 1,180)	860
12–19 years	770 (757 – 783)	578 (557 – 587)	759 (749 – 767)	1,050 (1,000 – 1,070)	1,954
20–39 years	1,020 (998 – 1,040)	710 (683 – 727)	1,000 (980 – 1,020)	1,520 (1,410 – 1,610)	1,688
40–59 years	1,230 (1,190 – 1,260)	824 (799 – 848)	1,200 (1,160 – 1,240)	1,870 (1,790 – 2,040)	1,365
60 years and older	1,400 (1,360 – 1,440)	897 (828 – 949)	1,390 (1,330 – 1,430)	2,190 (2,130 – 2,270)	1,387
Males					
Total, 6 years and older	1,060 (1,040 – 1,090)	682 (664 – 704)	1,030 (1,010 – 1,070)	1,730 (1,640 – 1,770)	3,547
6–11 years	817 (789 – 847)	629 (593 – 642)	807 (766 – 843)	1,070 (1,030 – 1,180)	427
12–19 years	753 (739 – 768)	553 (527 – 580)	747 (733 – 759)	1,030 (986 – 1,070)	980
20–39 years	1,030 (1,010 – 1,050)	699 (671 – 728)	1,010 (984 – 1,030)	1,570 (1,440 – 1,730)	738
40–59 years	1,210 (1,180 – 1,250)	798 (767 – 848)	1,190 (1,160 – 1,240)	1,820 (1,740 – 1,950)	673
60 years and older	1,300 (1,230 – 1,370)	827 (762 – 887)	1,290 (1,220 – 1,330)	2,070 (1,950 – 2,310)	729
Females					
Total, 6 years and older	1,120 (1,090 – 1,140)	717 (705 – 723)	1,080 (1,050 – 1,100)	1,840 (1,790 – 1,910)	3,707
6–11 years	823 (792 – 856)	628 (608 – 647)	805 (784 – 837)	1,090 (1,020 – 1,230)	433
12–19 years	788 (772 – 804)	594 (570 – 611)	771 (755 – 788)	1,050 (991 – 1,120)	974
20–39 years	1,010 (981 – 1,040)	717 (679 – 738)	997 (956 – 1,030)	1,470 (1,360 – 1,580)	950
40–59 years	1,240 (1,200 – 1,290)	841 (818 – 860)	1,210 (1,160 – 1,240)	1,920 (1,820 – 2,120)	692
60 years and older	1,490 (1,440 – 1,540)	966 (926 – 987)	1,500 (1,430 – 1,540)	2,260 (2,190 – 2,470)	658

Table 2.4.a.3. Serum vitamin E: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	1,010 (980 – 1,040)	671 (656 – 695)	976 (945 – 1,000)	1,580 (1,530 – 1,630)	1,844
6–11 years	793 (770 – 816)	623 (599 – 644)	779 (755 – 800)	1,010 (977 – 1,110)	295
12–19 years	760 (740 – 781)	587 (578 – 597)	750 (723 – 773)	991 (970 – 1,050)	646
20–39 years	1,020 (991 – 1,060)	727 (676 – 755)	997 (968 – 1,020)	1,520 (1,420 – 1,640)	449
40–59 years	1,240 (1,200 – 1,280)	836 (808 – 861)	1,220 (1,160 – 1,270)	1,790 (1,730 – 1,950)	246
60 years and older	1,360 (1,250 – 1,470)	913 (816 – 996)	1,300 (1,240 – 1,370)	2,000 (1,720 – 3,120)	208
Males					
Total, 6 years and older	1,010 (970 – 1,050)	671 (640 – 701)	972 (925 – 999)	1,570 (1,510 – 1,610)	883
6–11 years	786 (762 – 811)	622 (598 – 643)	763 (745 – 802)	989 (962 – 1,060)	145
12–19 years	748 (718 – 778)	591 (573 – 603)	733 (690 – 775)	978 (930 – 1,060)	313
20–39 years	1,040 (1,010 – 1,080)	753 (703 – 772)	990 (967 – 1,020)	1,590 (1,460 – 1,700)	198
40–59 years	1,270 (1,190 – 1,350)	863 (814 – 908)	1,260 (1,140 – 1,350)	1,670 (1,610 – 2,030)	122
60 years and older	1,260 (1,140 – 1,390)	845† (650 – 931)	1,240 (1,100 – 1,340)	1,970† (1,570 – 3,130)	105
Females					
Total, 6 years and older	1,010 (984 – 1,030)	670 (649 – 696)	985 (949 – 1,020)	1,610 (1,530 – 1,670)	961
6–11 years	800 (763 – 838)	625 (514 – 658)	787 (760 – 799)	1,050 (958 – 1,240)	150
12–19 years	774 (750 – 798)	583 (570 – 597)	763 (748 – 784)	1,020 (960 – 1,090)	333
20–39 years	1,000 (955 – 1,050)	700 (634 – 742)	1,000 (947 – 1,060)	1,490 (1,340 – 1,650)	251
40–59 years	1,210 (1,170 – 1,260)	808 (778 – 859)	1,200 (1,110 – 1,240)	1,840 (1,710 – 2,100)	124
60 years and older	1,450 (1,300 – 1,610)	1,000† (872 – 1,090)	1,410 (1,240 – 1,540)	2,040† (1,720 – 4,610)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.4.a.4. Serum vitamin E: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	933 (915 – 951)	644 (630 – 656)	903 (884 – 918)	1,400 (1,360 – 1,470)	1,891
6–11 years	771 (743 – 801)	587 (550 – 634)	762 (735 – 800)	1,010 (941 – 1,090)	240
12–19 years	731 (715 – 748)	575 (551 – 591)	727 (717 – 736)	945 (913 – 990)	665
20–39 years	926 (896 – 957)	665 (620 – 686)	893 (865 – 933)	1,340 (1,250 – 1,450)	368
40–59 years	1,040 (1,010 – 1,070)	736 (688 – 779)	1,010 (998 – 1,050)	1,540 (1,420 – 1,670)	335
60 years and older	1,110 (1,060 – 1,160)	752 (709 – 791)	1,080 (993 – 1,150)	1,680 (1,560 – 1,780)	283
Males					
Total, 6 years and older	915 (897 – 933)	636 (618 – 651)	882 (870 – 895)	1,390 (1,310 – 1,460)	949
6–11 years	768 (740 – 799)	588 (558 – 634)	752 (726 – 799)	1,030 (928 – 1,110)	128
12–19 years	732 (714 – 751)	582 (558 – 606)	727 (712 – 737)	940 (904 – 981)	343
20–39 years	937 (888 – 989)	650 (603 – 687)	896 (862 – 939)	1,400 (1,240 – 1,670)	170
40–59 years	1,010 (972 – 1,050)	718 (632 – 743)	988 (960 – 1,020)	1,520 (1,390 – 1,640)	156
60 years and older	1,050 (1,000 – 1,100)	726 (580 – 770)	980 (894 – 1,080)	1,680 (1,410 – 2,250)	152
Females					
Total, 6 years and older	949 (923 – 976)	651 (638 – 673)	916 (897 – 944)	1,450 (1,350 – 1,560)	942
6–11 years	775 (735 – 817)	579 (400 – 643)	776 (746 – 803)	1,000 (931 – 1,140)	112
12–19 years	731 (706 – 757)	567 (517 – 596)	726 (712 – 750)	957 (906 – 1,050)	322
20–39 years	917 (893 – 941)	677 (613 – 704)	892 (862 – 925)	1,270 (1,190 – 1,490)	198
40–59 years	1,070 (1,030 – 1,110)	761 (707 – 808)	1,040 (1,000 – 1,110)	1,540 (1,400 – 1,740)	179
60 years and older	1,150 (1,080 – 1,230)	774 (650 – 848)	1,130 (1,040 – 1,230)	1,670 (1,560 – 1,770)	131

Table 2.4.a.5. Serum vitamin E: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	1,140 (1,110 – 1,160)	718 (706 – 729)	1,110 (1,080 – 1,140)	1,870 (1,810 – 1,940)	2,973
6–11 years	840 (815 – 866)	627 (612 – 642)	826 (805 – 854)	1,120 (1,060 – 1,260)	231
12–19 years	779 (761 – 797)	579 (544 – 589)	765 (751 – 784)	1,060 (1,010 – 1,140)	499
20–39 years	1,040 (1,010 – 1,070)	711 (671 – 741)	1,030 (1,000 – 1,060)	1,550 (1,410 – 1,710)	714
40–59 years	1,260 (1,220 – 1,300)	846 (817 – 866)	1,230 (1,190 – 1,260)	1,910 (1,800 – 2,100)	683
60 years and older	1,430 (1,390 – 1,480)	919 (856 – 976)	1,430 (1,390 – 1,480)	2,230 (2,170 – 2,330)	846
Males					
Total, 6 years and older	1,100 (1,070 – 1,130)	703 (671 – 725)	1,080 (1,050 – 1,120)	1,770 (1,740 – 1,850)	1,472
6–11 years	839 (801 – 879)	629 (562 – 680)	830 (791 – 880)	1,080 (1,030 – 1,300)	112
12–19 years	757 (737 – 778)	542 (523 – 572)	754 (730 – 783)	1,060 (1,000 – 1,110)	254
20–39 years	1,040 (1,020 – 1,070)	687 (640 – 735)	1,030 (1,020 – 1,060)	1,590 (1,430 – 1,770)	309
40–59 years	1,240 (1,200 – 1,270)	818 (769 – 865)	1,230 (1,180 – 1,260)	1,840 (1,750 – 2,040)	351
60 years and older	1,330 (1,240 – 1,420)	862 (733 – 930)	1,300 (1,250 – 1,360)	2,100 (1,970 – 2,460)	446
Females					
Total, 6 years and older	1,170 (1,150 – 1,200)	727 (718 – 746)	1,140 (1,100 – 1,170)	1,930 (1,870 – 2,050)	1,501
6–11 years	841 (792 – 892)	624 (597 – 656)	819 (774 – 878)	1,160 (1,050 – 1,470)	119
12–19 years	803 (780 – 827)	601 (562 – 641)	779 (750 – 805)	1,060 (985 – 1,200)	245
20–39 years	1,040 (1,000 – 1,080)	720 (699 – 754)	1,020 (978 – 1,060)	1,510 (1,360 – 1,630)	405
40–59 years	1,270 (1,230 – 1,320)	862 (842 – 894)	1,240 (1,190 – 1,280)	2,000 (1,850 – 2,190)	332
60 years and older	1,530 (1,480 – 1,590)	985 (964 – 1,020)	1,530 (1,470 – 1,590)	2,320 (2,240 – 2,500)	400

Table 2.4.b. Serum vitamin E: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
1999–2000	1,070 (1,040 – 1,110)	597 (575 – 612)	1,010 (986 – 1,040)	2,350 (2,280 – 2,500)	7,054
2001–2002	1,110 (1,090 – 1,140)	637 (623 – 649)	1,050 (1,010 – 1,090)	2,380 (2,260 – 2,520)	7,935
2005–2006	1,090 (1,070 – 1,120)	631 (620 – 642)	1,060 (1,030 – 1,080)	2,090 (2,010 – 2,180)	7,254
Age group					
3–5 years					
1999–2000	785 (752 – 820)	559 (514 – 585)	772 (734 – 829)	1,160 (1,120 – 1,400)	347
2001–2002	814 (780 – 850)	577 (553 – 601)	796 (760 – 824)	1,200 (1,090 – 1,670)	430
6–11 years					
1999–2000	783 (754 – 814)	545 (519 – 557)	781 (749 – 824)	1,130 (1,090 – 1,210)	859
2001–2002	804 (788 – 821)	576 (560 – 591)	798 (780 – 819)	1,140 (1,090 – 1,220)	1,014
2005–2006	820 (800 – 841)	583 (563 – 601)	806 (788 – 826)	1,200 (1,120 – 1,370)	860
12–19 years					
1999–2000	736 (717 – 756)	513 (491 – 530)	729 (712 – 744)	1,100 (1,020 – 1,240)	2,108
2001–2002	782 (768 – 796)	550 (540 – 559)	771 (761 – 786)	1,170 (1,110 – 1,280)	2,206
2005–2006	770 (757 – 783)	527 (516 – 541)	759 (749 – 767)	1,160 (1,130 – 1,200)	1,954
20–39 years					
1999–2000	973 (952 – 995)	615 (590 – 630)	938 (911 – 972)	1,750 (1,640 – 1,860)	1,452
2001–2002	1,010 (987 – 1,030)	646 (627 – 661)	979 (960 – 1,000)	1,720 (1,620 – 1,880)	1,716
2005–2006	1,020 (998 – 1,040)	645 (621 – 668)	1,000 (980 – 1,020)	1,730 (1,620 – 1,900)	1,688
40–59 years					
1999–2000	1,300 (1,250 – 1,360)	753 (716 – 791)	1,230 (1,200 – 1,280)	2,670 (2,470 – 2,940)	1,181
2001–2002	1,310 (1,270 – 1,340)	776 (751 – 793)	1,260 (1,220 – 1,300)	2,530 (2,380 – 3,030)	1,474
2005–2006	1,230 (1,190 – 1,260)	749 (724 – 769)	1,200 (1,160 – 1,240)	2,210 (2,080 – 2,400)	1,365
60 years and older					
1999–2000	1,510 (1,470 – 1,560)	788 (749 – 825)	1,450 (1,390 – 1,510)	3,020 (2,920 – 3,290)	1,454
2001–2002	1,540 (1,490 – 1,590)	830 (763 – 869)	1,500 (1,440 – 1,550)	3,290 (3,030 – 3,540)	1,525
2005–2006	1,400 (1,360 – 1,440)	783 (733 – 835)	1,390 (1,330 – 1,430)	2,600 (2,510 – 2,660)	1,387
Gender					
(6 years and older)					
Males					
1999–2000	1,050 (1,010 – 1,090)	580 (557 – 604)	993 (976 – 1,020)	2,280 (2,130 – 2,470)	3,426
2001–2002	1,090 (1,060 – 1,130)	623 (607 – 646)	1,030 (986 – 1,080)	2,300 (2,160 – 2,470)	3,841
2005–2006	1,060 (1,040 – 1,090)	610 (594 – 625)	1,030 (1,010 – 1,070)	2,010 (1,930 – 2,090)	3,547
Females					
1999–2000	1,100 (1,070 – 1,140)	605 (580 – 627)	1,030 (990 – 1,070)	2,450 (2,300 – 2,690)	3,628
2001–2002	1,130 (1,110 – 1,150)	646 (629 – 660)	1,060 (1,040 – 1,100)	2,480 (2,280 – 2,700)	4,094
2005–2006	1,120 (1,090 – 1,140)	653 (639 – 664)	1,080 (1,050 – 1,100)	2,170 (2,080 – 2,260)	3,707
Race/ethnicity					
(6 years and older)					
Mexican Americans					
1999–2000	962 (932 – 994)	572 (558 – 587)	918 (895 – 947)	1,810 (1,740 – 2,010)	2,410
2001–2002	994 (954 – 1,040)	606 (584 – 625)	949 (917 – 979)	1,810 (1,690 – 2,080)	1,991
2005–2006	1,010 (980 – 1,040)	623 (602 – 637)	976 (945 – 1,000)	1,790 (1,750 – 1,870)	1,844
Non-Hispanic Blacks					
1999–2000	904 (869 – 941)	566 (539 – 580)	869 (835 – 910)	1,700 (1,620 – 1,910)	1,584
2001–2002	930 (907 – 953)	601 (573 – 617)	897 (883 – 915)	1,690 (1,540 – 1,940)	1,864
2005–2006	933 (915 – 951)	588 (581 – 601)	903 (884 – 918)	1,660 (1,560 – 1,750)	1,891
Non-Hispanic Whites					
1999–2000	1,130 (1,100 – 1,170)	618 (600 – 634)	1,060 (1,040 – 1,100)	2,540 (2,380 – 2,720)	2,414
2001–2002	1,160 (1,130 – 1,200)	653 (626 – 674)	1,110 (1,060 – 1,150)	2,510 (2,380 – 2,690)	3,455
2005–2006	1,140 (1,110 – 1,160)	643 (624 – 658)	1,110 (1,080 – 1,140)	2,170 (2,090 – 2,270)	2,973

Figure 2.4.b. Serum vitamin E: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006

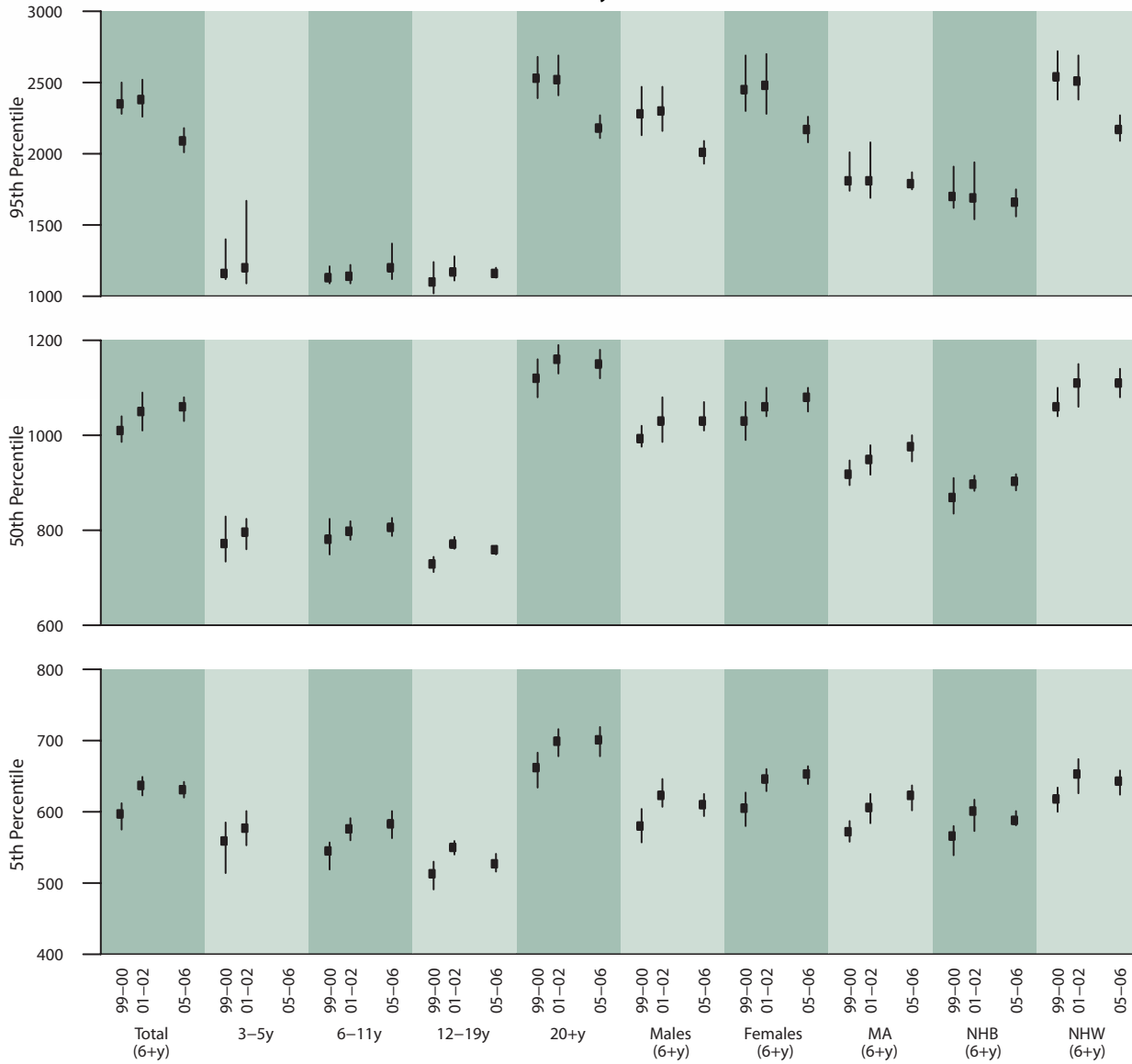


Table 2.4.c. Serum vitamin E: Prevalence

Prevalence (in percent) of low serum vitamin E concentration (< 500 µg/dL) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older	7,254	0.7 (0.5 – 0.9)	1,835,000
Age group			
6–11 years	860	0.9‡ (0.4 – 2.0)	221,000‡
12–19 years	1,954	2.6 (1.6 – 4.3)	885,000
20–39 years	1,688	§	§
40–59 years	1,365	0.3‡ (0.1 – 0.6)	237,000‡
60 years and older	1,387	0.4 (0.3 – 0.7)	209,000
Gender			
Males	3,547	0.9 (0.6 – 1.2)	1,110,000
Females	3,707	0.5 (0.3 – 0.8)	725,000
Race/ethnicity			
Mexican Americans	1,844	§	§
Non-Hispanic Blacks	1,891	1.2 (0.9 – 1.7)	396,000
Non-Hispanic Whites	2,973	0.6 (0.4 – 0.8)	1,059,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.4.d. Serum vitamin E: Prevalence by survey cycle

Prevalence (in percent) of low serum vitamin E concentration (< 500 µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
1999–2000	7,054	1.0 (0.7 – 1.6)	2,558,000
2001–2002	7,935	0.4 (0.3 – 0.6)	1,108,000
2005–2006	7,254	0.7 (0.5 – 0.9)	1,835,000
Age group			
3–5 years			
1999–2000	347	§	§
2001–2002	430	§	§
6–11 years			
1999–2000	859	2.0‡ (1.0 – 4.1)	492,000‡
2001–2002	1,014	§	§
2005–2006	860	0.9‡ (0.4 – 2.0)	221,000‡
12–19 years			
1999–2000	2,108	3.8 (2.1 – 6.8)	1,202,000
2001–2002	2,206	1.6 (1.0 – 2.6)	509,000
2005–2006	1,954	2.6 (1.6 – 4.3)	885,000
20–39 years			
1999–2000	1,452	0.9‡ (0.5 – 1.8)	730,000‡
2001–2002	1,716	§	§
2005–2006	1,688	§	§
40–59 years			
1999–2000	1,181	0.1‡ (0.1 – 0.2)	80,000‡
2001–2002	1,474	§	§
2005–2006	1,365	0.3‡ (0.1 – 0.6)	237,000‡
60 years and older			
1999–2000	1,454	§	§
2001–2002	1,525	§	§
2005–2006	1,387	0.4 (0.3 – 0.7)	209,000
Gender			
(6 years and older)			
Males			
1999–2000	3,426	1.4 (0.8 – 2.3)	1,660,000
2001–2002	3,841	0.6 (0.4 – 1.0)	781,000
2005–2006	3,547	0.9 (0.6 – 1.2)	1,110,000
Females			
1999–2000	3,628	0.7 (0.4 – 1.1)	895,000
2001–2002	4,094	0.2 (0.1 – 0.5)	325,000
2005–2006	3,707	0.5 (0.3 – 0.8)	725,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
1999–2000	2,410	1.3 (0.9 – 1.8)	227,000
2001–2002	1,991	0.7‡ (0.4 – 1.5)	156,000‡
2005–2006	1,844	§	§
Non-Hispanic Blacks			
1999–2000	1,584	1.7 (0.9 – 3.2)	520,000
2001–2002	1,864	0.7 (0.4 – 1.1)	207,000
2005–2006	1,891	1.2 (0.9 – 1.7)	396,000
Non-Hispanic Whites			
1999–2000	2,414	0.8 (0.5 – 1.3)	1,491,000
2001–2002	3,455	0.3 (0.2 – 0.5)	556,000
2005–2006	2,973	0.6 (0.4 – 0.8)	1,059,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.5.a.1. Serum gamma-tocopherol: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th		
Total, 6 years and older	188 (180 – 196)	70.4 (62.9 – 75.4)	196 (187 – 204)	424 (408 – 446)	489 (464 – 519)	7,217	
Age group							
6–11 years	182 (171 – 193)	68.1 (55.2 – 85.2)	179 (169 – 193)	353 (333 – 390)	392 (367 – 455)	858	
12–19 years	179 (171 – 188)	75.5 (62.0 – 81.8)	184 (175 – 194)	324 (311 – 343)	376 (344 – 413)	1,942	
20–39 years	194 (184 – 205)	65.4 (50.6 – 76.7)	200 (192 – 209)	423 (401 – 460)	489 (447 – 553)	1,675	
40–59 years	201 (192 – 212)	53.0 (46.5 – 61.2)	213 (203 – 221)	452 (437 – 498)	545 (492 – 604)	1,358	
60 years and older	165 (154 – 177)	45.1 (41.4 – 49.8)	176 (161 – 192)	422 (403 – 462)	486 (461 – 539)	1,384	
Gender							
Males	192 (184 – 200)	54.9 (48.6 – 63.3)	198 (189 – 206)	434 (411 – 471)	505 (478 – 564)	3,528	
Females	184 (175 – 194)	52.4 (49.4 – 58.5)	194 (183 – 203)	419 (400 – 441)	464 (444 – 497)	3,689	
Race/ethnicity							
Mexican Americans	204 (192 – 217)	80.4 (64.2 – 86.3)	209 (195 – 222)	437 (390 – 503)	504 (463 – 585)	1,841	
Non-Hispanic Blacks	214 (198 – 231)	70.6 (52.2 – 85.5)	219 (204 – 235)	429 (408 – 488)	509 (457 – 550)	1,865	
Non-Hispanic Whites	182 (173 – 191)	51.2 (46.7 – 55.0)	190 (179 – 200)	423 (407 – 445)	485 (454 – 531)	2,965	

Figure 2.5.a. Serum gamma-tocopherol: Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

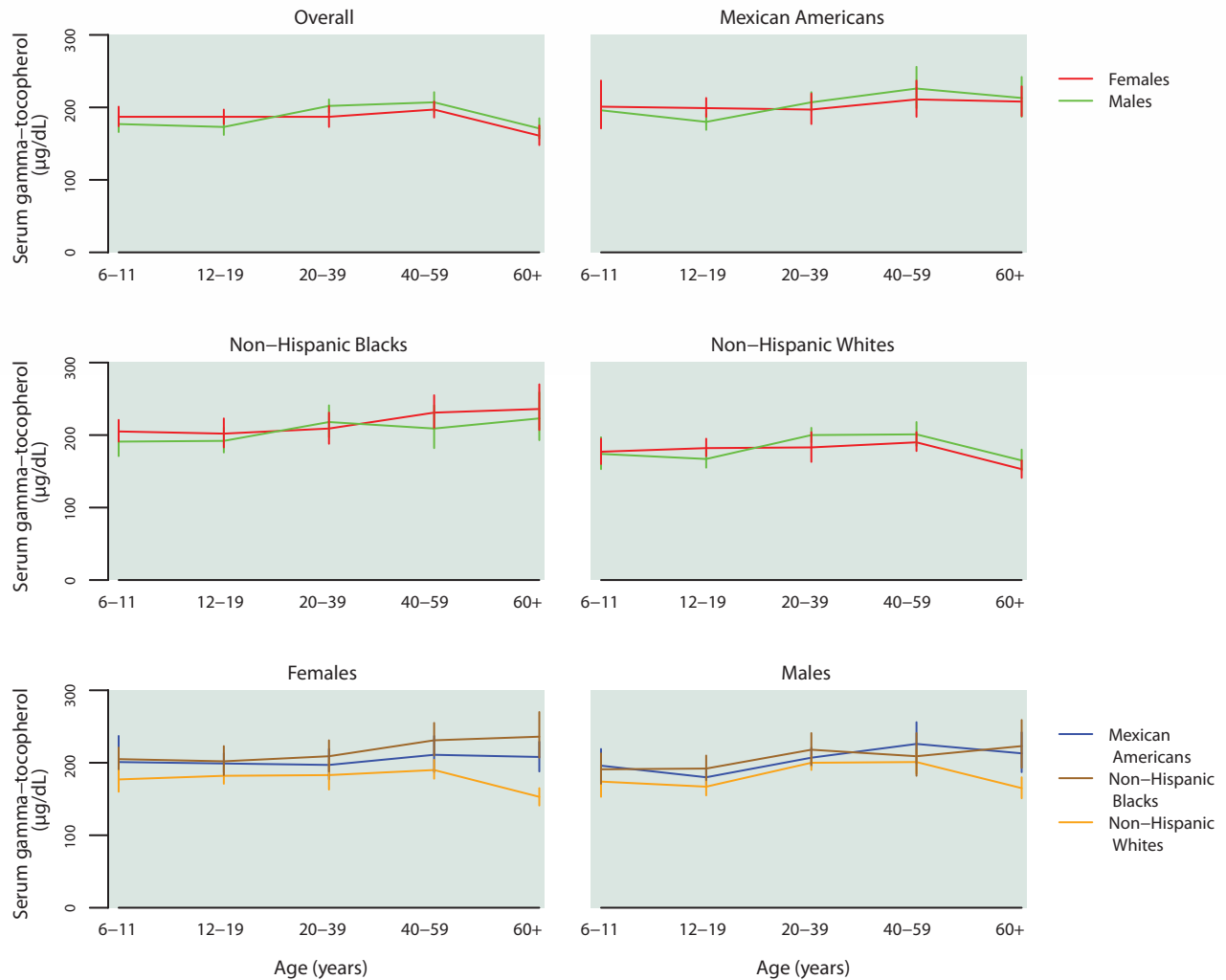


Table 2.5.a.2. Serum gamma-tocopherol: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	188 (180 – 196)	93.2 (86.8 – 98.0)	196 (187 – 204)	361 (347 – 385)	7,217
6–11 years	182 (171 – 193)	106 (102 – 111)	179 (169 – 193)	311 (298 – 341)	858
12–19 years	179 (171 – 188)	106 (98.1 – 114)	184 (175 – 194)	288 (276 – 304)	1,942
20–39 years	194 (184 – 205)	106 (94.7 – 114)	200 (192 – 209)	353 (330 – 393)	1,675
40–59 years	201 (192 – 212)	95.2 (84.4 – 102)	213 (203 – 221)	400 (376 – 423)	1,358
60 years and older	165 (154 – 177)	68.6 (60.9 – 73.4)	176 (161 – 192)	358 (340 – 397)	1,384
Males					
Total, 6 years and older	192 (184 – 200)	98.7 (89.3 – 107)	198 (189 – 206)	359 (349 – 389)	3,528
6–11 years	177 (166 – 189)	105 (94.0 – 109)	176 (163 – 189)	304 (276 – 349)	425
12–19 years	173 (162 – 184)	103 (89.6 – 114)	177 (168 – 188)	284 (266 – 306)	974
20–39 years	202 (193 – 211)	113 (105 – 119)	203 (194 – 215)	386 (349 – 414)	732
40–59 years	207 (194 – 221)	99.0 (86.0 – 113)	215 (202 – 230)	403 (365 – 442)	669
60 years and older	171 (157 – 185)	73.7 (66.9 – 77.2)	184 (159 – 204)	354 (336 – 396)	728
Females					
Total, 6 years and older	184 (175 – 194)	88.2 (80.0 – 93.8)	194 (183 – 203)	362 (338 – 388)	3,689
6–11 years	187 (174 – 201)	110 (93.6 – 122)	183 (169 – 199)	323 (299 – 346)	433
12–19 years	187 (177 – 197)	110 (101 – 119)	191 (184 – 201)	292 (274 – 313)	968
20–39 years	187 (173 – 202)	97.2 (79.9 – 110)	196 (180 – 207)	331 (312 – 383)	943
40–59 years	197 (186 – 208)	90.5 (75.5 – 99.0)	207 (195 – 223)	398 (377 – 423)	689
60 years and older	161 (148 – 175)	63.9 (53.9 – 72.6)	168 (155 – 188)	375 (328 – 405)	656

Table 2.5.a.3. Serum gamma-tocopherol: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	204 (192 – 217)	113 (106 – 117)	209 (195 – 222)	363 (343 – 403)	1,841
6–11 years	199 (178 – 221)	114 (91.6 – 122)	202 (181 – 234)	323 (303 – 388)	293
12–19 years	189 (179 – 200)	115 (106 – 124)	197 (183 – 207)	292 (279 – 316)	645
20–39 years	203 (190 – 217)	111 (107 – 116)	209 (190 – 223)	366 (333 – 429)	449
40–59 years	218 (202 – 237)	114 (91.7 – 125)	226 (213 – 240)	410 (357 – 478)	246
60 years and older	210 (196 – 225)	99.7 (90.1 – 117)	211 (194 – 224)	406 (365 – 464)	208
Males					
Total, 6 years and older	206 (196 – 216)	114 (109 – 118)	210 (193 – 224)	363 (339 – 417)	881
6–11 years	196 (175 – 219)	116 (90.6 – 128)	189 (171 – 221)	329 (290 – 448)	143
12–19 years	180 (169 – 191)	109 (97.9 – 115)	187 (166 – 208)	282 (264 – 310)	313
20–39 years	207 (195 – 221)	112 (107 – 118)	216 (191 – 228)	375 (316 – 522)	198
40–59 years	226 (199 – 256)	118 (96.4 – 141)	227 (201 – 265)	376 (345 – 582)	122
60 years and older	213 (187 – 242)	100† (83.3 – 119)	205 (182 – 266)	412† (353 – 496)	105
Females					
Total, 6 years and older	202 (185 – 220)	112 (96.2 – 120)	207 (194 – 221)	363 (334 – 407)	960
6–11 years	201 (171 – 237)	113 (80.8 – 128)	219 (172 – 262)	322 (303 – 373)	150
12–19 years	199 (187 – 213)	128 (113 – 137)	202 (191 – 212)	308 (286 – 375)	332
20–39 years	197 (177 – 219)	109 (93.8 – 118)	202 (180 – 219)	362 (315 – 443)	251
40–59 years	211 (187 – 237)	103 (61.5 – 121)	223 (184 – 259)	423 (351 – 515)	124
60 years and older	208 (188 – 229)	98.8† (85.1 – 120)	213 (192 – 224)	398† (315 – 506)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.5.a.4. Serum gamma-tocopherol: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	214 (198 – 231)	119 (98.4 – 135)	219 (204 – 235)	383 (357 – 407)	1,865
6–11 years	198 (183 – 214)	128 (96.7 – 141)	198 (189 – 210)	317 (291 – 360)	240
12–19 years	197 (180 – 215)	126 (105 – 142)	198 (180 – 215)	308 (279 – 338)	654
20–39 years	213 (196 – 231)	114 (93.5 – 137)	216 (202 – 231)	379 (334 – 420)	359
40–59 years	221 (198 – 247)	115 (72.3 – 140)	233 (208 – 254)	404 (378 – 476)	331
60 years and older	231 (204 – 261)	109 (60.6 – 139)	255 (216 – 286)	413 (392 – 466)	281
Males					
Total, 6 years and older	209 (192 – 227)	120 (102 – 136)	210 (195 – 225)	362 (335 – 402)	935
6–11 years	191 (171 – 213)	116 (69.0 – 142)	193 (182 – 205)	297 (263 – 360)	128
12–19 years	192 (176 – 210)	127 (111 – 141)	187 (170 – 208)	302 (278 – 335)	337
20–39 years	218 (197 – 241)	119 (101 – 136)	220 (195 – 240)	386 (326 – 500)	166
40–59 years	209 (182 – 241)	109 (71.2 – 141)	213 (187 – 239)	401 (311 – 526)	153
60 years and older	223 (193 – 259)	122 (53.9 – 147)	234 (202 – 276)	393 (341 – 498)	151
Females					
Total, 6 years and older	218 (203 – 234)	116 (93.3 – 134)	228 (213 – 242)	396 (375 – 410)	930
6–11 years	205 (191 – 221)	131 (99.5 – 143)	204 (189 – 229)	327 (292 – 433)	112
12–19 years	202 (183 – 223)	123 (98.5 – 147)	205 (195 – 218)	314 (279 – 354)	317
20–39 years	209 (188 – 231)	110 (81.8 – 141)	213 (195 – 236)	377 (329 – 426)	193
40–59 years	231 (210 – 255)	116 (72.3 – 134)	249 (217 – 285)	404 (399 – 443)	178
60 years and older	236 (207 – 270)	103 (54.5 – 145)	261 (219 – 299)	448 (393 – 505)	130

Table 2.5.a.5. Serum gamma-tocopherol: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	182 (173 – 191)	86.4 (79.6 – 92.0)	190 (179 – 200)	356 (340 – 387)	2,965
6–11 years	175 (159 – 192)	105 (99.7 – 109)	170 (157 – 191)	304 (272 – 349)	231
12–19 years	174 (165 – 184)	102 (90.8 – 108)	179 (171 – 188)	284 (274 – 301)	499
20–39 years	191 (178 – 205)	105 (83.6 – 116)	196 (183 – 207)	349 (320 – 401)	710
40–59 years	196 (184 – 207)	91.6 (80.3 – 97.8)	207 (195 – 220)	396 (368 – 424)	680
60 years and older	158 (148 – 169)	65.9 (59.4 – 72.1)	168 (154 – 183)	353 (326 – 392)	845
Males					
Total, 6 years and older	187 (178 – 197)	94.7 (81.7 – 104)	194 (184 – 204)	355 (344 – 388)	1,469
6–11 years	174 (153 – 197)	105 (82.6 – 111)	170 (150 – 192)	307 (269 – 378)	112
12–19 years	167 (155 – 180)	95.0 (76.7 – 113)	173 (163 – 181)	280 (250 – 314)	254
20–39 years	200 (190 – 210)	117 (105 – 126)	201 (188 – 212)	370 (346 – 414)	307
40–59 years	201 (185 – 218)	95.5 (80.3 – 106)	214 (195 – 230)	398 (350 – 448)	350
60 years and older	165 (151 – 180)	71.6 (62.2 – 76.5)	177 (150 – 199)	351 (331 – 380)	446
Females					
Total, 6 years and older	177 (167 – 188)	79.9 (73.8 – 87.5)	186 (173 – 197)	359 (324 – 391)	1,496
6–11 years	177 (160 – 195)	104 (86.4 – 114)	171 (155 – 197)	300 (260 – 349)	119
12–19 years	182 (171 – 195)	103 (89.6 – 118)	187 (175 – 200)	289 (270 – 312)	245
20–39 years	183 (163 – 204)	92.8 (71.4 – 110)	191 (169 – 210)	323 (296 – 403)	403
40–59 years	190 (178 – 204)	83.6 (68.1 – 98.3)	203 (186 – 217)	392 (373 – 427)	330
60 years and older	153 (141 – 165)	61.1 (53.5 – 69.6)	161 (148 – 174)	357 (319 – 400)	399

Table 2.5.b. Serum gamma-tocopherol: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)				Sample size		
			5th	50th	95th				
Total, 6 years and older									
1999–2000	199	(184 – 216)	65.1	(58.2 – 71.7)	215	(197 – 230)	464	(432 – 529)	6,129
2001–2002	199	(191 – 207)	67.1	(59.4 – 73.8)	212	(204 – 220)	461	(436 – 485)	7,879
2005–2006	188	(180 – 196)	70.4	(62.9 – 75.4)	196	(187 – 204)	424	(408 – 446)	7,217
Age group									
3–5 years									
1999–2000	170	(140 – 206)	50.0	(16.2 – 90.8)	180	(158 – 200)	363	(308 – 455)	301
2001–2002	181	(170 – 193)	63.3	(52.2 – 82.2)	194	(178 – 205)	365	(342 – 430)	429
6–11 years									
1999–2000	202	(183 – 223)	93.3	(72.3 – 107)	213	(184 – 231)	407	(356 – 569)	725
2001–2002	211	(203 – 219)	102	(95.4 – 109)	218	(211 – 227)	380	(361 – 414)	1,005
2005–2006	182	(171 – 193)	91.5	(71.3 – 99.2)	179	(169 – 193)	353	(333 – 390)	858
12–19 years									
1999–2000	197	(183 – 211)	99.0	(80.4 – 112)	198	(186 – 214)	372	(363 – 389)	1,821
2001–2002	197	(190 – 205)	99.4	(90.2 – 107)	201	(191 – 209)	368	(346 – 391)	2,188
2005–2006	179	(171 – 188)	89.0	(79.8 – 93.8)	184	(175 – 194)	324	(311 – 343)	1,942
20–39 years									
1999–2000	205	(189 – 222)	75.6	(60.5 – 87.3)	220	(199 – 237)	438	(414 – 477)	1,299
2001–2002	206	(197 – 216)	85.6	(73.5 – 95.3)	217	(205 – 227)	445	(425 – 474)	1,706
2005–2006	194	(184 – 205)	81.9	(75.3 – 93.8)	200	(192 – 209)	423	(401 – 460)	1,675
40–59 years									
1999–2000	208	(185 – 232)	59.8	(51.9 – 70.0)	231	(204 – 253)	549	(507 – 631)	1,028
2001–2002	204	(192 – 217)	60.4	(52.2 – 68.3)	221	(208 – 238)	507	(463 – 576)	1,463
2005–2006	201	(192 – 212)	69.0	(56.1 – 80.0)	213	(203 – 221)	452	(437 – 498)	1,358
60 years and older									
1999–2000	178	(160 – 197)	47.6	(42.9 – 54.4)	196	(171 – 216)	496	(443 – 573)	1,256
2001–2002	172	(162 – 184)	48.2	(43.8 – 52.0)	185	(170 – 201)	497	(469 – 534)	1,517
2005–2006	165	(154 – 177)	52.4	(49.7 – 57.5)	176	(161 – 192)	422	(403 – 462)	1,384
Gender									
(6 years and older)									
Males									
1999–2000	199	(184 – 217)	65.3	(55.9 – 74.7)	213	(197 – 230)	462	(426 – 532)	2,974
2001–2002	202	(193 – 211)	66.5	(56.0 – 77.1)	213	(207 – 222)	472	(445 – 499)	3,815
2005–2006	192	(184 – 200)	74.5	(62.4 – 80.8)	198	(189 – 206)	434	(411 – 471)	3,528
Females									
1999–2000	200	(184 – 217)	64.8	(57.6 – 71.8)	217	(196 – 232)	468	(433 – 536)	3,155
2001–2002	196	(187 – 205)	67.6	(60.6 – 74.7)	210	(200 – 220)	447	(420 – 483)	4,064
2005–2006	184	(175 – 194)	67.7	(60.1 – 73.5)	194	(183 – 203)	419	(400 – 441)	3,689
Race/ethnicity									
(6 years and older)									
Mexican Americans									
1999–2000	222	(210 – 235)	104	(89.1 – 113)	225	(213 – 236)	468	(414 – 504)	1,772
2001–2002	198	(190 – 206)	89.8	(80.5 – 92.6)	203	(190 – 214)	422	(390 – 458)	1,987
2005–2006	204	(192 – 217)	93.8	(84.0 – 102)	209	(195 – 222)	437	(390 – 503)	1,841
Non-Hispanic Blacks									
1999–2000	213	(200 – 226)	94.5	(73.1 – 104)	217	(201 – 238)	437	(417 – 473)	1,515
2001–2002	235	(222 – 248)	107	(83.5 – 118)	248	(233 – 261)	450	(426 – 478)	1,843
2005–2006	214	(198 – 231)	92.0	(67.4 – 106)	219	(204 – 235)	429	(408 – 488)	1,865
Non-Hispanic Whites									
1999–2000	198	(179 – 219)	61.3	(52.8 – 70.1)	217	(192 – 234)	477	(439 – 542)	2,240
2001–2002	193	(183 – 205)	60.4	(51.4 – 68.0)	209	(198 – 220)	472	(442 – 495)	3,426
2005–2006	182	(173 – 191)	65.1	(57.4 – 72.3)	190	(179 – 200)	423	(407 – 445)	2,965

Figure 2.5.b. Serum gamma-tocopherol: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 1999–2002 and 2005–2006

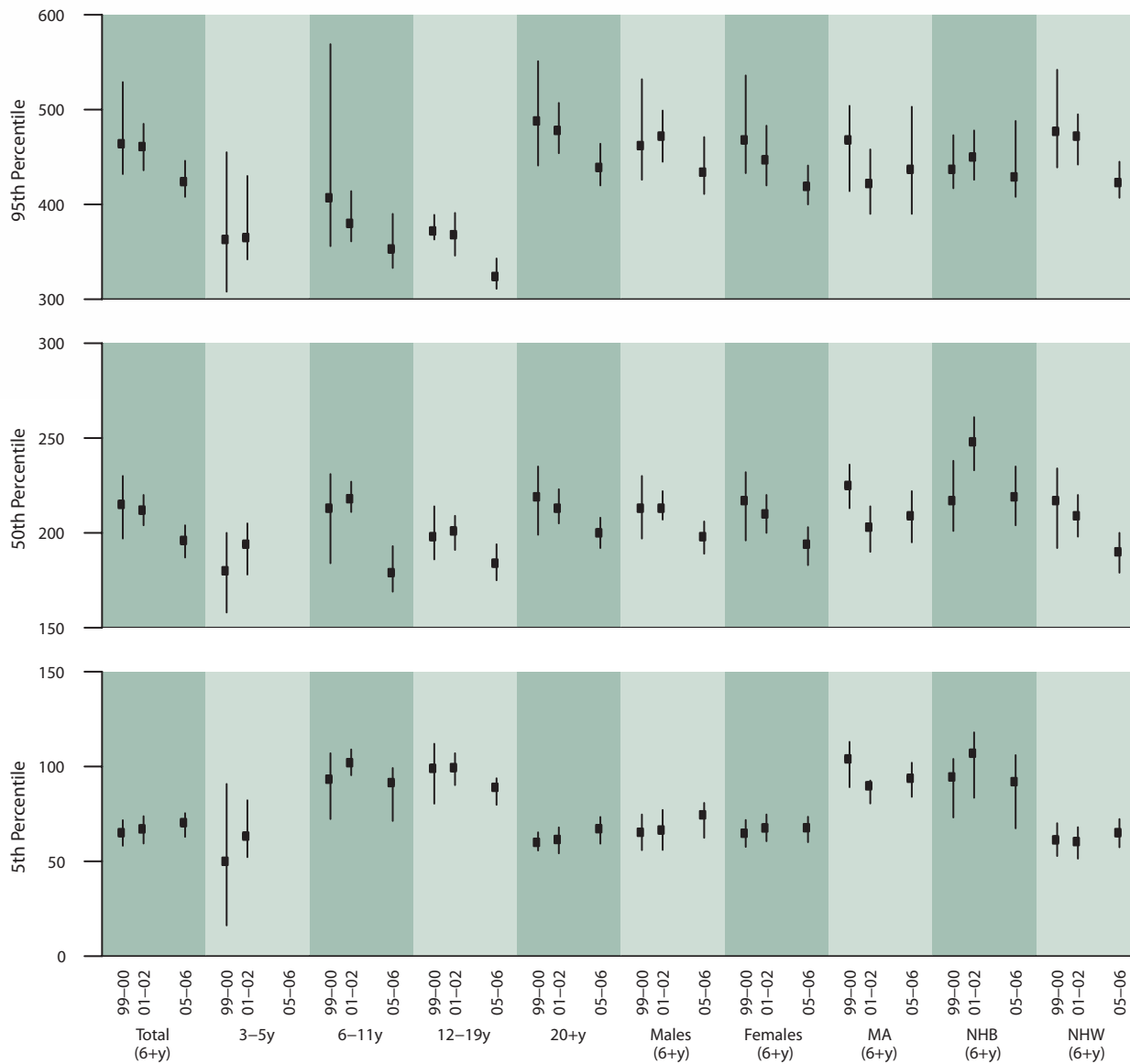


Table 2.6.a.1. Serum alpha-carotene: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	2.76 (2.54 – 2.99)	< LOD	< LOD	2.63 (2.40 – 2.84)	14.1 (12.4 – 16.5)	19.5 (17.6 – 23.7)	7,246
Age group							
6–11 years	2.64 (2.32 – 3.01)	< LOD	< LOD	2.59 (2.31 – 2.90)	11.5 (9.30 – 15.1)	15.7 (11.6 – 34.7)	860
12–19 years	1.85 (1.69 – 2.03)	< LOD	< LOD	1.72 (1.53 – 1.91)	7.91 (6.65 – 10.2)	10.8 (8.96 – 15.2)	1,950
20–39 years	2.48 (2.24 – 2.74)	< LOD	< LOD	2.36 (2.06 – 2.69)	11.3 (10.1 – 14.7)	16.3 (12.7 – 23.6)	1,684
40–59 years	3.15 (2.85 – 3.47)	< LOD	< LOD	3.01 (2.72 – 3.36)	17.0 (14.5 – 21.9)	27.1 (20.3 – 35.9)	1,365
60 years and older	3.42 (3.05 – 3.83)	< LOD	.711 (< LOD – .811)	3.33 (2.86 – 3.86)	17.0 (14.0 – 19.8)	21.6 (19.3 – 25.9)	1,387
Gender							
Males	2.37 (2.20 – 2.55)	< LOD	< LOD	2.23 (2.06 – 2.39)	11.5 (9.92 – 13.9)	16.1 (13.2 – 20.9)	3,544
Females	3.18 (2.89 – 3.50)	< LOD	< LOD	3.01 (2.74 – 3.32)	16.4 (14.6 – 18.4)	23.9 (19.4 – 30.0)	3,702
Race/ethnicity							
Mexican Americans	2.99 (2.79 – 3.21)	< LOD	.824 (.749 – .889)	2.87 (2.61 – 3.21)	10.8 (10.5 – 12.5)	14.8 (13.9 – 16.6)	1,844
Non-Hispanic Blacks	1.98 (1.74 – 2.26)	< LOD	< LOD	1.71 (1.49 – 1.99)	11.0 (8.83 – 14.8)	15.2 (12.4 – 33.1)	1,890
Non-Hispanic Whites	2.80 (2.60 – 3.02)	< LOD	< LOD	2.67 (2.47 – 2.89)	14.4 (12.8 – 16.7)	20.2 (18.1 – 24.2)	2,966

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Figure 2.6.a. Serum alpha-carotene: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

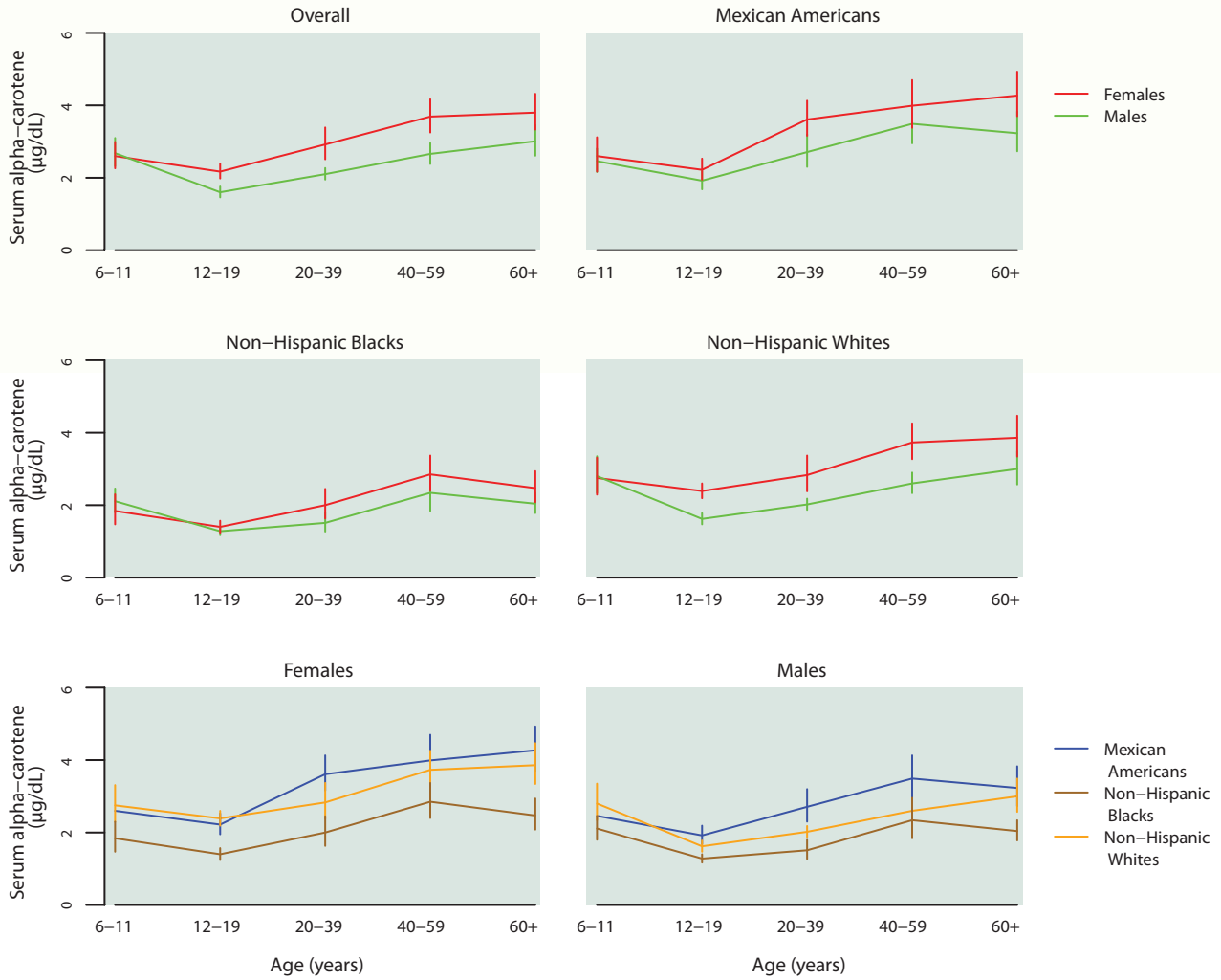


Table 2.6.a.2. Serum alpha-carotene: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.76 (2.54 – 2.99)	.772 (.718 – .823)	2.63 (2.40 – 2.84)	9.48 (8.58 – 10.6)	7,246
6–11 years	2.64 (2.32 – 3.01)	.865 (.766 – .966)	2.59 (2.31 – 2.90)	8.34 (6.74 – 10.9)	860
12–19 years	1.85 (1.69 – 2.03)	< LOD	1.72 (1.53 – 1.91)	5.55 (4.98 – 6.67)	1,950
20–39 years	2.48 (2.24 – 2.74)	.702 (< LOD – .793)	2.36 (2.06 – 2.69)	8.65 (7.55 – 9.72)	1,684
40–59 years	3.15 (2.85 – 3.47)	.836 (< LOD – .963)	3.01 (2.72 – 3.36)	11.8 (10.0 – 13.3)	1,365
60 years and older	3.42 (3.05 – 3.83)	1.02 (.832 – 1.17)	3.33 (2.86 – 3.86)	10.8 (9.64 – 13.1)	1,387
Males					
Total, 6 years and older	2.37 (2.20 – 2.55)	< LOD	2.23 (2.06 – 2.39)	7.74 (6.73 – 9.37)	3,544
6–11 years	2.68 (2.32 – 3.10)	.885 (.780 – .985)	2.59 (2.36 – 2.91)	8.27 (5.98 – 12.0)	427
12–19 years	1.60 (1.46 – 1.76)	< LOD	1.40 (1.29 – 1.61)	4.51 (3.69 – 5.54)	979
20–39 years	2.10 (1.95 – 2.27)	< LOD	2.00 (1.79 – 2.19)	6.91 (6.14 – 7.26)	736
40–59 years	2.66 (2.38 – 2.96)	.711 (< LOD – .910)	2.47 (2.24 – 2.76)	8.79 (7.13 – 11.5)	673
60 years and older	3.01 (2.61 – 3.46)	.838 (.754 – .923)	3.09 (2.55 – 3.54)	9.76 (7.73 – 12.9)	729
Females					
Total, 6 years and older	3.18 (2.89 – 3.50)	.895 (.807 – .983)	3.01 (2.74 – 3.32)	10.8 (9.83 – 12.3)	3,702
6–11 years	2.60 (2.26 – 2.99)	.854 (.712 – .972)	2.59 (2.14 – 2.97)	8.39 (6.99 – 11.1)	433
12–19 years	2.17 (1.98 – 2.39)	.709 (< LOD – .777)	2.08 (1.89 – 2.30)	6.43 (5.53 – 7.15)	971
20–39 years	2.92 (2.51 – 3.39)	.859 (< LOD – .969)	2.74 (2.41 – 3.31)	9.80 (8.53 – 11.9)	948
40–59 years	3.69 (3.25 – 4.17)	.992 (.764 – 1.23)	3.54 (3.07 – 3.97)	13.7 (11.7 – 16.7)	692
60 years and older	3.80 (3.33 – 4.32)	1.18 (1.01 – 1.32)	3.50 (2.94 – 4.36)	11.6 (10.2 – 15.0)	658

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Table 2.6.a.3. Serum alpha-carotene: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.99 (2.79 – 3.21)	1.07 (.952 – 1.21)	2.87 (2.61 – 3.21)	7.96 (7.58 – 8.67)	1,844
6–11 years	2.53 (2.21 – 2.89)	.918 (.702 – 1.14)	2.47 (2.03 – 3.00)	6.79 (5.10 – 9.28)	295
12–19 years	2.06 (1.82 – 2.33)	.847 (.723 – .952)	1.89 (1.70 – 2.22)	5.19 (4.56 – 5.91)	646
20–39 years	3.09 (2.78 – 3.42)	1.22 (1.07 – 1.33)	2.88 (2.56 – 3.37)	7.74 (7.18 – 8.74)	449
40–59 years	3.72 (3.31 – 4.19)	1.44 (.784 – 1.77)	3.57 (3.24 – 4.21)	10.5 (8.26 – 14.0)	246
60 years and older	3.76 (3.31 – 4.27)	1.28 (.767 – 1.60)	3.60 (3.22 – 4.31)	9.80 (8.51 – 16.0)	208
Males					
Total, 6 years and older	2.72 (2.50 – 2.95)	.997 (.890 – 1.09)	2.57 (2.22 – 3.00)	7.27 (6.99 – 7.73)	883
6–11 years	2.46 (2.16 – 2.81)	.904 (< LOD – 1.25)	2.49 (1.94 – 3.20)	5.58 (4.47 – 10.7)	145
12–19 years	1.92 (1.68 – 2.19)	.785 (< LOD – .874)	1.75 (1.50 – 2.05)	5.16 (3.85 – 6.20)	313
20–39 years	2.71 (2.30 – 3.20)	1.08 (.902 – 1.24)	2.47 (2.01 – 3.18)	7.32 (6.06 – 8.64)	198
40–59 years	3.49 (2.95 – 4.13)	1.43 (< LOD – 1.76)	3.35 (2.71 – 4.08)	9.79 (7.00 – 15.0)	122
60 years and older	3.23 (2.73 – 3.83)	.939† (< LOD – 1.50)	3.18 (2.62 – 4.23)	8.07† (6.41 – 20.8)	105
Females					
Total, 6 years and older	3.33 (3.07 – 3.61)	1.20 (1.06 – 1.30)	3.26 (2.95 – 3.50)	9.08 (8.35 – 9.84)	961
6–11 years	2.60 (2.17 – 3.12)	.923 (< LOD – 1.15)	2.43 (1.99 – 3.17)	7.44 (5.70 – 9.89)	150
12–19 years	2.22 (1.95 – 2.53)	.937 (.732 – 1.09)	2.08 (1.81 – 2.51)	5.21 (4.55 – 6.57)	333
20–39 years	3.61 (3.16 – 4.13)	1.47 (1.16 – 1.62)	3.45 (2.84 – 4.13)	9.06 (6.93 – 13.2)	251
40–59 years	3.99 (3.38 – 4.70)	1.39 (< LOD – 1.83)	3.82 (3.37 – 4.47)	10.6 (7.74 – 33.5)	124
60 years and older	4.27 (3.70 – 4.93)	1.52† (< LOD – 2.02)	4.13 (3.36 – 5.44)	9.87† (8.65 – 22.5)	103

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.6.a.4. Serum alpha-carotene: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	1.98 (1.74 – 2.26)	< LOD	1.71 (1.49 – 1.99)	6.99 (5.49 – 9.49)	1,890
6–11 years	1.97 (1.68 – 2.30)	.782 (< LOD – .865)	1.73 (1.47 – 2.11)	4.97 (3.84 – 7.31)	240
12–19 years	1.33 (1.22 – 1.46)	< LOD	1.17 (1.08 – 1.27)	3.23 (2.79 – 4.25)	664
20–39 years	1.76 (1.47 – 2.10)	< LOD	1.54 (1.27 – 1.85)	5.49 (3.81 – 10.9)	368
40–59 years	2.60 (2.18 – 3.10)	< LOD	2.40 (1.86 – 3.11)	9.63 (7.77 – 12.4)	335
60 years and older	2.28 (2.05 – 2.54)	.727 (< LOD – .860)	2.09 (1.72 – 2.38)	7.35 (6.25 – 9.09)	283
Males					
Total, 6 years and older	1.79 (1.56 – 2.06)	< LOD	1.55 (1.30 – 1.84)	6.12 (4.82 – 7.67)	948
6–11 years	2.11 (1.80 – 2.46)	.934 (.761 – 1.00)	1.90 (1.51 – 2.50)	5.11 (4.03 – 6.81)	128
12–19 years	1.28 (1.17 – 1.40)	< LOD	1.18 (1.10 – 1.27)	2.65 (2.27 – 3.64)	342
20–39 years	1.51 (1.27 – 1.80)	< LOD	1.26 (1.08 – 1.43)	4.23 (3.53 – 10.1)	170
40–59 years	2.34 (1.84 – 2.96)	< LOD	2.10 (1.65 – 3.05)	8.08 (6.39 – 18.0)	156
60 years and older	2.04 (1.78 – 2.34)	< LOD	1.75 (1.48 – 2.32)	6.11 (5.37 – 7.68)	152
Females					
Total, 6 years and older	2.17 (1.91 – 2.47)	< LOD	1.91 (1.61 – 2.24)	8.09 (6.12 – 10.9)	942
6–11 years	1.84 (1.47 – 2.30)	< LOD	1.56 (1.31 – 2.06)	4.55 (3.38 – 34.6)	112
12–19 years	1.40 (1.24 – 1.57)	< LOD	1.16 (1.01 – 1.35)	3.98 (3.08 – 4.95)	322
20–39 years	2.00 (1.63 – 2.45)	< LOD	1.83 (1.46 – 2.17)	7.48 (3.92 – 14.8)	198
40–59 years	2.85 (2.40 – 3.37)	.763 (< LOD – .998)	2.59 (1.91 – 3.59)	10.2 (7.96 – 12.8)	179
60 years and older	2.47 (2.08 – 2.94)	.778 (< LOD – .932)	2.28 (1.69 – 3.06)	8.43 (5.57 – 13.9)	131

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Table 2.6.a.5. Serum alpha-carotene: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	2.80 (2.60 – 3.02)	.770 (< LOD – .835)	2.67 (2.47 – 2.89)	9.64 (8.79 – 10.7)	2,966
6–11 years	2.78 (2.38 – 3.24)	.860 (.769 – .988)	2.77 (2.37 – 3.15)	8.80 (7.05 – 11.7)	231
12–19 years	1.95 (1.78 – 2.13)	< LOD	1.85 (1.65 – 2.02)	6.10 (5.30 – 7.19)	496
20–39 years	2.39 (2.16 – 2.65)	< LOD	2.31 (1.97 – 2.65)	8.10 (7.23 – 9.64)	710
40–59 years	3.12 (2.84 – 3.44)	.832 (< LOD – .971)	2.95 (2.63 – 3.36)	11.9 (10.1 – 13.5)	683
60 years and older	3.44 (3.05 – 3.88)	1.05 (.832 – 1.24)	3.34 (2.82 – 3.89)	10.7 (9.59 – 12.9)	846
Males					
Total, 6 years and older	2.38 (2.20 – 2.56)	< LOD	2.27 (2.08 – 2.42)	7.73 (6.50 – 9.42)	1,470
6–11 years	2.80 (2.34 – 3.35)	.853 (.749 – 1.02)	2.80 (2.40 – 2.99)	8.52 (5.74 – 23.7)	112
12–19 years	1.62 (1.47 – 1.78)	< LOD	1.46 (1.26 – 1.72)	4.33 (3.63 – 5.81)	254
20–39 years	2.02 (1.87 – 2.18)	< LOD	1.90 (1.65 – 2.22)	6.23 (5.68 – 7.29)	307
40–59 years	2.60 (2.33 – 2.90)	< LOD	2.42 (2.19 – 2.68)	8.71 (6.82 – 10.2)	351
60 years and older	3.00 (2.57 – 3.49)	.844 (.761 – .959)	3.09 (2.46 – 3.54)	9.36 (7.53 – 12.8)	446
Females					
Total, 6 years and older	3.28 (3.00 – 3.59)	.920 (.790 – 1.04)	3.10 (2.82 – 3.39)	11.2 (10.4 – 12.7)	1,496
6–11 years	2.75 (2.29 – 3.31)	.864 (< LOD – 1.10)	2.76 (1.93 – 3.26)	9.09 (7.10 – 12.4)	119
12–19 years	2.39 (2.19 – 2.60)	.723 (< LOD – .838)	2.22 (2.06 – 2.49)	6.93 (6.25 – 8.87)	242
20–39 years	2.83 (2.38 – 3.37)	.826 (< LOD – .962)	2.69 (2.20 – 3.36)	9.45 (7.82 – 11.8)	403
40–59 years	3.73 (3.27 – 4.26)	.964 (< LOD – 1.23)	3.57 (3.04 – 4.01)	14.4 (12.6 – 16.7)	332
60 years and older	3.86 (3.34 – 4.47)	1.24 (1.05 – 1.42)	3.54 (2.85 – 4.47)	12.0 (10.4 – 15.9)	400

Table 2.6.b. Serum alpha-carotene: Concentrations by survey cycle

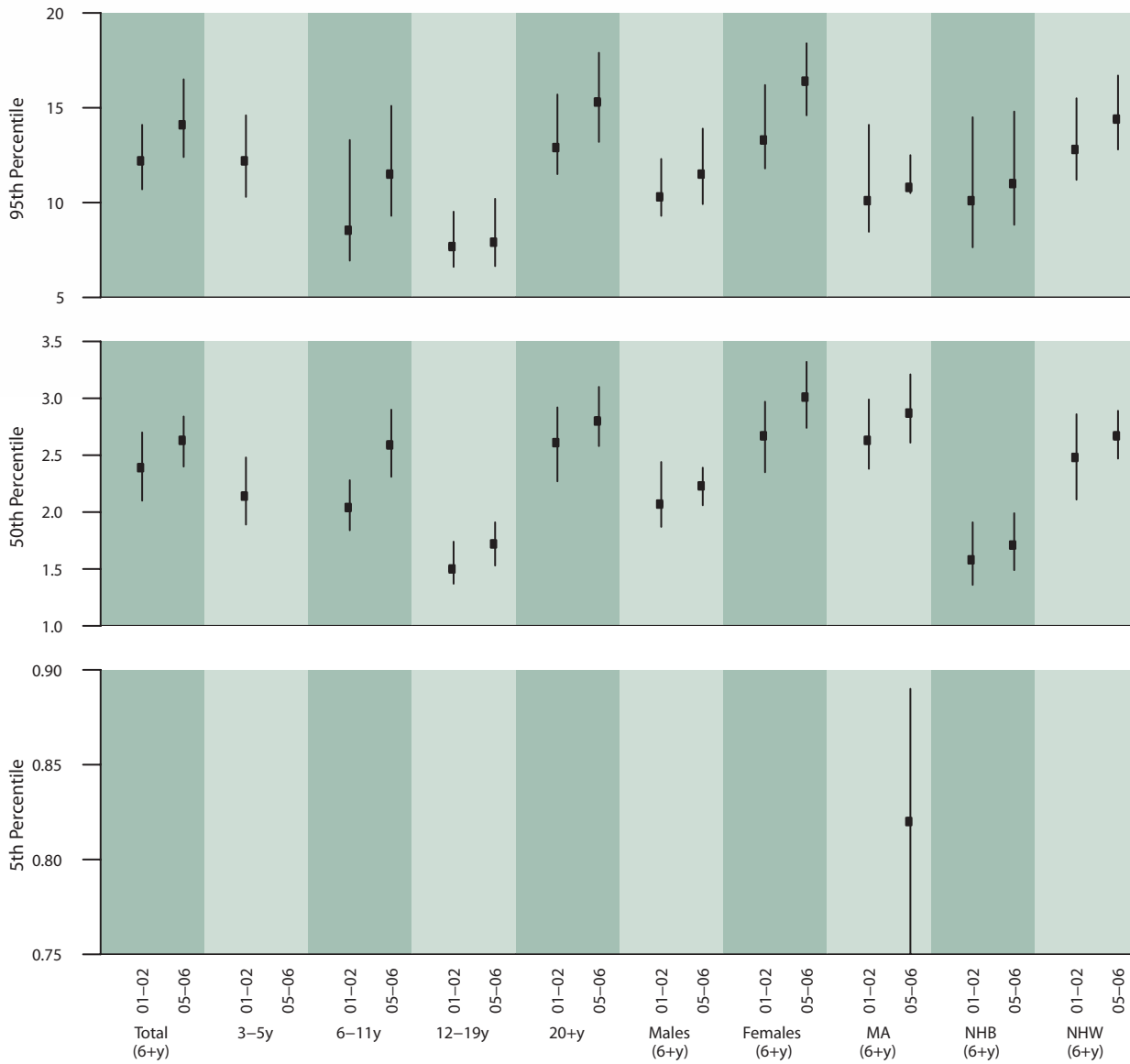
Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
2001–2002	2.48 (2.22 – 2.77)	< LOD	2.39 (2.10 – 2.70)	12.2 (10.7 – 14.1)	7,929
2005–2006	2.76 (2.54 – 2.99)	< LOD	2.63 (2.40 – 2.84)	14.1 (12.4 – 16.5)	7,246
Age group					
3–5 years					
2001–2002	2.41 (2.13 – 2.74)	< LOD	2.14 (1.89 – 2.48)	12.2 (10.3 – 14.6)	430
6–11 years					
2001–2002	2.24 (2.00 – 2.51)	< LOD	2.04 (1.84 – 2.28)	8.54 (6.94 – 13.3)	1,014
2005–2006	2.64 (2.32 – 3.01)	< LOD	2.59 (2.31 – 2.90)	11.5 (9.30 – 15.1)	860
12–19 years					
2001–2002	1.68 (1.52 – 1.86)	< LOD	1.50 (1.37 – 1.74)	7.68 (6.61 – 9.52)	2,206
2005–2006	1.85 (1.69 – 2.03)	< LOD	1.72 (1.53 – 1.91)	7.91 (6.65 – 10.2)	1,950
20–39 years					
2001–2002	2.22 (1.93 – 2.56)	< LOD	2.11 (1.82 – 2.49)	9.80 (8.96 – 12.6)	1,716
2005–2006	2.48 (2.24 – 2.74)	< LOD	2.36 (2.06 – 2.69)	11.3 (10.1 – 14.7)	1,684
40–59 years					
2001–2002	2.98 (2.60 – 3.42)	< LOD	2.85 (2.47 – 3.28)	16.0 (12.8 – 20.7)	1,470
2005–2006	3.15 (2.85 – 3.47)	< LOD	3.01 (2.72 – 3.36)	17.0 (14.5 – 21.9)	1,365
60 years and older					
2001–2002	3.08 (2.74 – 3.46)	< LOD	3.14 (2.71 – 3.61)	12.7 (12.0 – 13.7)	1,523
2005–2006	3.42 (3.05 – 3.83)	.711 (< LOD – .811)	3.33 (2.86 – 3.86)	17.0 (14.0 – 19.8)	1,387
Gender					
(6 years and older)					
Males					
2001–2002	2.22 (1.98 – 2.49)	< LOD	2.07 (1.87 – 2.44)	10.3 (9.30 – 12.3)	3,835
2005–2006	2.37 (2.20 – 2.55)	< LOD	2.23 (2.06 – 2.39)	11.5 (9.92 – 13.9)	3,544
Females					
2001–2002	2.76 (2.47 – 3.07)	< LOD	2.67 (2.35 – 2.97)	13.3 (11.8 – 16.2)	4,094
2005–2006	3.18 (2.89 – 3.50)	< LOD	3.01 (2.74 – 3.32)	16.4 (14.6 – 18.4)	3,702
Race/ethnicity					
(6 years and older)					
Mexican Americans					
2001–2002	2.73 (2.38 – 3.14)	.726 (< LOD – .805)	2.63 (2.38 – 2.99)	10.1 (8.46 – 14.1)	1,990
2005–2006	2.99 (2.79 – 3.21)	.824 (.749 – .889)	2.87 (2.61 – 3.21)	10.8 (10.5 – 12.5)	1,844
Non-Hispanic Blacks					
2001–2002	1.77 (1.50 – 2.09)	< LOD	1.58 (1.36 – 1.91)	10.1 (7.64 – 14.5)	1,864
2005–2006	1.98 (1.74 – 2.26)	< LOD	1.71 (1.49 – 1.99)	11.0 (8.83 – 14.8)	1,890
Non-Hispanic Whites					
2001–2002	2.57 (2.25 – 2.95)	< LOD	2.48 (2.11 – 2.86)	12.8 (11.2 – 15.5)	3,450
2005–2006	2.80 (2.60 – 3.02)	< LOD	2.67 (2.47 – 2.89)	14.4 (12.8 – 16.7)	2,966

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Figure 2.6.b. Serum alpha-carotene: Concentrations by survey cycle

Selected percentiles in µg/dL (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006



Values in the graph are suppressed if either the point estimate or the lower 95% confidence limit is noted as "< LOD" in the accompanying table.

Table 2.7.a.1. Serum trans-beta-carotene: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	12.1 (11.5 – 12.8)	2.32 (1.98 – 2.67)	3.18 (2.92 – 3.42)	11.6 (11.1 – 12.3)	53.3 (49.1 – 59.3)	74.1 (68.1 – 83.3)	7,254
Age group							
6–11 years	13.0 (12.1 – 14.0)	4.14 (2.67 – 5.05)	5.15 (4.11 – 5.61)	12.7 (11.8 – 13.6)	37.7 (29.9 – 49.2)	47.6 (39.6 – 100)	860
12–19 years	9.24 (8.76 – 9.75)	2.59 (2.05 – 2.96)	3.20 (2.87 – 3.52)	8.96 (8.30 – 9.66)	28.3 (26.3 – 30.7)	35.3 (31.3 – 41.8)	1,954
20–39 years	10.4 (9.63 – 11.3)	2.41 (1.40 – 2.81)	3.01 (2.79 – 3.23)	9.97 (9.14 – 10.9)	41.6 (36.9 – 53.3)	59.5 (48.7 – 85.1)	1,688
40–59 years	12.8 (11.9 – 13.9)	1.94 (1.36 – 2.20)	2.69 (2.15 – 3.41)	12.4 (11.6 – 13.4)	63.0 (53.5 – 73.8)	79.2 (73.3 – 97.9)	1,365
60 years and older	16.4 (15.1 – 17.7)	2.80 (2.64 – 3.20)	3.90 (3.43 – 4.17)	15.9 (14.5 – 17.8)	74.6 (66.3 – 83.4)	102 (85.9 – 143)	1,387
Gender							
Males	10.3 (9.89 – 10.8)	1.96 (1.40 – 2.25)	2.77 (2.28 – 3.06)	10.3 (9.62 – 10.9)	40.8 (36.8 – 46.4)	54.3 (49.4 – 66.2)	3,547
Females	14.2 (13.3 – 15.1)	2.93 (2.45 – 3.23)	3.77 (3.51 – 4.05)	13.2 (12.0 – 14.4)	64.5 (58.3 – 73.6)	84.7 (75.9 – 102)	3,707
Race/ethnicity							
Mexican Americans	11.5 (10.5 – 12.7)	2.67 (2.19 – 3.06)	3.49 (3.15 – 3.86)	11.3 (10.4 – 12.4)	39.2 (35.1 – 46.5)	48.6 (46.2 – 59.4)	1,844
Non-Hispanic Blacks	10.8 (9.72 – 12.0)	2.29 (2.00 – 2.54)	3.02 (2.57 – 3.36)	10.5 (9.31 – 11.4)	45.0 (38.3 – 53.7)	57.4 (51.4 – 73.5)	1,891
Non-Hispanic Whites	12.3 (11.6 – 13.1)	2.20 (1.90 – 2.65)	3.06 (2.80 – 3.41)	11.8 (11.2 – 12.6)	56.9 (50.4 – 64.9)	76.2 (72.3 – 93.3)	2,973

Figure 2.7.a. Serum trans-β-carotene: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

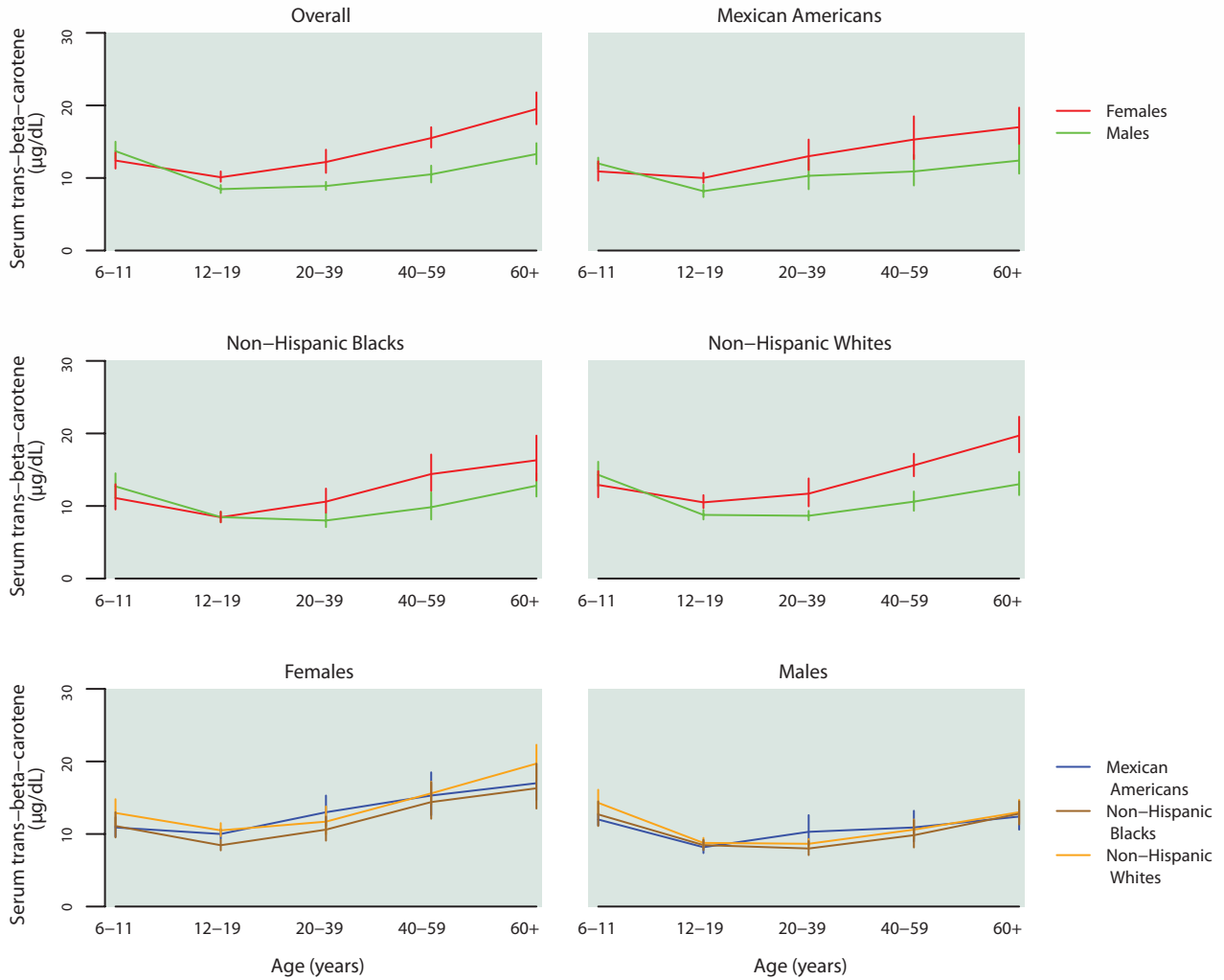


Table 2.7.a.2. Serum trans-beta-carotene: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	12.1 (11.5 – 12.8)	4.26 (4.02 – 4.53)	11.6 (11.1 – 12.3)	37.1 (34.2 – 40.7)	7,254
6–11 years	13.0 (12.1 – 14.0)	6.21 (5.49 – 6.89)	12.7 (11.8 – 13.6)	27.4 (25.1 – 31.7)	860
12–19 years	9.24 (8.76 – 9.75)	4.21 (3.86 – 4.52)	8.96 (8.30 – 9.66)	20.3 (18.9 – 22.7)	1,954
20–39 years	10.4 (9.63 – 11.3)	3.85 (3.50 – 4.19)	9.97 (9.14 – 10.9)	30.4 (26.5 – 35.8)	1,688
40–59 years	12.8 (11.9 – 13.9)	4.12 (3.59 – 4.55)	12.4 (11.6 – 13.4)	42.7 (39.1 – 47.5)	1,365
60 years and older	16.4 (15.1 – 17.7)	5.27 (4.47 – 6.08)	15.9 (14.5 – 17.8)	51.0 (45.9 – 59.1)	1,387
Males					
Total, 6 years and older	10.3 (9.89 – 10.8)	3.76 (3.48 – 4.02)	10.3 (9.62 – 10.9)	28.2 (26.4 – 31.4)	3,547
6–11 years	13.7 (12.6 – 15.0)	6.93 (5.62 – 7.94)	13.1 (12.1 – 14.3)	27.4 (23.5 – 34.7)	427
12–19 years	8.46 (7.93 – 9.03)	3.82 (3.27 – 4.29)	8.26 (7.75 – 8.90)	17.8 (17.2 – 18.7)	980
20–39 years	8.89 (8.36 – 9.46)	3.36 (3.02 – 3.80)	8.51 (7.91 – 9.14)	23.9 (22.2 – 26.7)	738
40–59 years	10.5 (9.38 – 11.7)	3.43 (2.20 – 4.20)	10.8 (9.45 – 12.3)	31.8 (27.9 – 36.0)	673
60 years and older	13.3 (11.9 – 14.8)	4.47 (3.75 – 5.33)	13.0 (11.5 – 14.4)	41.5 (33.8 – 51.1)	729
Females					
Total, 6 years and older	14.2 (13.3 – 15.1)	5.00 (4.60 – 5.30)	13.2 (12.0 – 14.4)	43.9 (41.2 – 48.9)	3,707
6–11 years	12.4 (11.3 – 13.5)	5.61 (4.56 – 6.75)	11.8 (10.5 – 13.6)	27.4 (24.6 – 33.5)	433
12–19 years	10.1 (9.48 – 10.9)	4.73 (4.26 – 4.95)	9.76 (8.95 – 10.7)	24.6 (20.9 – 29.1)	974
20–39 years	12.2 (10.7 – 13.9)	4.39 (3.79 – 5.08)	11.4 (10.2 – 12.9)	37.0 (28.6 – 50.2)	950
40–59 years	15.5 (14.2 – 17.0)	5.07 (4.61 – 5.33)	14.5 (12.7 – 16.2)	53.2 (44.0 – 64.4)	692
60 years and older	19.5 (17.4 – 21.8)	6.30 (5.12 – 7.04)	19.4 (16.5 – 23.1)	62.3 (50.5 – 75.2)	658

Table 2.7.a.3. Serum trans-beta-carotene: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	11.5 (10.5 – 12.7)	4.48 (4.14 – 4.81)	11.3 (10.4 – 12.4)	29.7 (25.9 – 35.0)	1,844
6–11 years	11.4 (10.6 – 12.4)	5.74 (4.57 – 6.28)	11.0 (9.92 – 12.0)	24.2 (21.0 – 31.1)	295
12–19 years	9.02 (8.39 – 9.70)	4.07 (3.59 – 4.64)	9.05 (8.35 – 10.1)	18.6 (17.3 – 22.7)	646
20–39 years	11.5 (9.84 – 13.3)	4.45 (4.01 – 4.85)	11.3 (9.45 – 13.7)	29.9 (23.5 – 37.2)	449
40–59 years	12.8 (11.1 – 14.8)	4.15 (3.63 – 5.03)	12.7 (11.1 – 14.7)	32.5 (27.7 – 47.1)	246
60 years and older	14.8 (13.2 – 16.5)	5.31 (3.02 – 7.79)	14.7 (12.7 – 15.6)	43.1 (37.9 – 47.4)	208
Males					
Total, 6 years and older	10.4 (9.29 – 11.6)	4.15 (3.63 – 4.46)	10.3 (9.20 – 11.5)	25.3 (22.6 – 30.4)	883
6–11 years	12.0 (11.2 – 12.8)	6.15 (4.40 – 7.62)	11.5 (10.4 – 12.6)	23.1 (19.7 – 34.4)	145
12–19 years	8.18 (7.37 – 9.07)	3.71 (3.32 – 4.25)	8.34 (6.90 – 9.63)	17.7 (15.3 – 19.6)	313
20–39 years	10.3 (8.45 – 12.6)	4.20 (3.00 – 4.71)	9.64 (7.83 – 12.8)	26.6 (22.0 – 36.9)	198
40–59 years	10.9 (8.97 – 13.2)	3.82 (2.55 – 4.31)	11.3 (9.45 – 13.4)	26.3 (21.6 – 35.9)	122
60 years and older	12.4 (10.6 – 14.6)	4.47† (2.51 – 6.70)	12.0 (9.45 – 15.9)	35.7† (19.8 – 154)	105
Females					
Total, 6 years and older	12.9 (11.9 – 14.1)	5.08 (4.51 – 5.60)	12.5 (11.6 – 13.7)	34.4 (30.2 – 39.3)	961
6–11 years	10.9 (9.63 – 12.3)	5.10 (3.98 – 5.96)	10.2 (8.54 – 11.9)	24.3 (19.4 – 32.8)	150
12–19 years	10.0 (9.35 – 10.7)	4.83 (4.12 – 5.13)	10.2 (9.47 – 10.6)	20.9 (18.0 – 28.7)	333
20–39 years	13.0 (11.1 – 15.3)	5.15 (3.69 – 6.18)	12.6 (11.2 – 15.5)	33.8 (24.6 – 45.8)	251
40–59 years	15.3 (12.6 – 18.5)	5.06 (3.42 – 6.68)	14.4 (12.2 – 18.3)	41.2 (29.2 – 108)	124
60 years and older	17.0 (14.7 – 19.7)	5.97† (3.10 – 8.19)	15.1 (14.3 – 19.4)	44.5† (39.3 – 50.9)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.7.a.4. Serum trans-beta-carotene: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	10.8 (9.72 – 12.0)	4.00 (3.53 – 4.34)	10.5 (9.31 – 11.4)	31.2 (26.5 – 38.3)	1,891
6–11 years	11.9 (10.6 – 13.3)	6.30 (4.86 – 7.03)	11.6 (10.9 – 12.6)	23.0 (18.3 – 37.7)	240
12–19 years	8.46 (7.85 – 9.11)	4.09 (3.71 – 4.35)	8.13 (7.88 – 8.42)	17.9 (15.7 – 21.3)	665
20–39 years	9.32 (8.28 – 10.5)	3.85 (3.27 – 4.22)	8.49 (7.61 – 10.2)	23.4 (19.5 – 30.8)	368
40–59 years	12.1 (10.3 – 14.1)	3.46 (2.33 – 4.66)	12.3 (10.3 – 15.2)	40.9 (34.3 – 50.2)	335
60 years and older	14.7 (12.8 – 16.9)	4.60 (3.81 – 5.04)	15.3 (12.1 – 18.7)	44.8 (37.0 – 51.5)	283
Males					
Total, 6 years and older	9.49 (8.62 – 10.4)	3.48 (3.00 – 3.95)	8.92 (8.05 – 9.95)	26.5 (23.0 – 32.4)	949
6–11 years	12.7 (11.1 – 14.5)	6.79 (5.53 – 7.49)	12.7 (10.7 – 14.9)	22.9 (18.7 – 55.1)	128
12–19 years	8.47 (7.78 – 9.21)	4.15 (3.18 – 4.70)	8.23 (7.85 – 8.76)	17.3 (15.8 – 19.7)	343
20–39 years	8.00 (7.09 – 9.02)	3.39 (2.51 – 3.99)	7.16 (6.35 – 7.95)	22.0 (19.3 – 26.4)	170
40–59 years	9.83 (8.14 – 11.9)	2.65 (1.98 – 3.42)	9.46 (7.15 – 13.1)	36.7 (26.2 – 66.7)	156
60 years and older	12.8 (11.3 – 14.5)	3.77 (3.46 – 4.61)	12.4 (10.7 – 15.1)	35.3 (29.1 – 52.0)	152
Females					
Total, 6 years and older	12.1 (10.7 – 13.6)	4.49 (4.05 – 4.88)	11.5 (10.3 – 13.4)	35.5 (27.7 – 46.1)	942
6–11 years	11.1 (9.52 – 13.0)	5.32 (3.52 – 6.63)	11.3 (9.67 – 12.5)	22.3 (16.9 – 37.0)	112
12–19 years	8.45 (7.74 – 9.22)	4.00 (3.50 – 4.37)	8.03 (7.59 – 8.49)	18.6 (15.5 – 24.3)	322
20–39 years	10.6 (9.08 – 12.4)	4.27 (3.46 – 5.15)	10.8 (8.50 – 12.2)	25.4 (18.6 – 46.1)	198
40–59 years	14.4 (12.1 – 17.1)	4.85 (2.70 – 6.42)	14.5 (11.6 – 18.4)	44.9 (39.3 – 49.0)	179
60 years and older	16.3 (13.5 – 19.7)	4.83 (3.86 – 5.68)	17.6 (11.6 – 25.6)	46.5 (38.7 – 55.7)	131

Table 2.7.a.5. Serum trans-beta-carotene: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	12.3 (11.6 – 13.1)	4.21 (3.81 – 4.60)	11.8 (11.2 – 12.6)	39.0 (34.8 – 43.4)	2,973
6–11 years	13.6 (12.4 – 14.9)	6.31 (5.42 – 7.09)	13.2 (12.1 – 14.3)	27.8 (24.9 – 36.2)	231
12–19 years	9.58 (8.94 – 10.3)	4.36 (3.85 – 4.71)	9.14 (8.12 – 10.5)	20.9 (19.0 – 26.6)	499
20–39 years	10.1 (9.08 – 11.1)	3.53 (3.18 – 3.94)	9.78 (8.70 – 10.6)	30.5 (25.2 – 39.1)	714
40–59 years	12.9 (11.8 – 14.0)	4.10 (3.54 – 4.59)	12.4 (11.4 – 13.5)	43.4 (39.4 – 48.4)	683
60 years and older	16.3 (14.9 – 17.8)	5.29 (4.22 – 6.19)	15.9 (14.2 – 18.1)	50.9 (44.8 – 64.2)	846
Males					
Total, 6 years and older	10.4 (9.87 – 11.0)	3.71 (3.35 – 4.02)	10.5 (9.56 – 11.4)	28.6 (26.0 – 33.0)	1,472
6–11 years	14.3 (12.7 – 16.1)	7.16 (4.60 – 9.03)	13.4 (12.1 – 14.7)	26.3 (23.2 – 48.8)	112
12–19 years	8.77 (8.14 – 9.46)	3.91 (2.92 – 4.60)	8.49 (7.53 – 9.58)	17.9 (16.6 – 20.4)	254
20–39 years	8.65 (8.03 – 9.32)	3.13 (2.85 – 3.48)	8.30 (7.47 – 9.44)	23.8 (20.9 – 26.9)	309
40–59 years	10.6 (9.34 – 12.0)	3.45 (2.06 – 4.26)	11.0 (9.61 – 12.4)	30.6 (26.6 – 35.9)	351
60 years and older	13.0 (11.5 – 14.7)	4.39 (3.31 – 5.39)	12.6 (11.0 – 14.3)	41.0 (32.8 – 51.7)	446
Females					
Total, 6 years and older	14.5 (13.5 – 15.6)	4.95 (4.33 – 5.45)	13.4 (12.2 – 15.0)	46.4 (41.5 – 53.3)	1,501
6–11 years	12.9 (11.2 – 14.8)	5.61 (2.70 – 7.13)	12.6 (9.76 – 15.1)	27.7 (24.8 – 40.6)	119
12–19 years	10.5 (9.71 – 11.5)	4.86 (4.27 – 5.37)	9.87 (8.71 – 11.3)	26.8 (21.8 – 30.1)	245
20–39 years	11.7 (9.95 – 13.8)	4.15 (3.18 – 4.99)	10.9 (9.35 – 12.7)	36.5 (26.6 – 60.7)	405
40–59 years	15.6 (14.1 – 17.2)	5.00 (4.17 – 5.44)	14.2 (12.0 – 17.1)	57.1 (44.0 – 69.2)	332
60 years and older	19.7 (17.4 – 22.3)	6.35 (5.12 – 7.18)	19.5 (16.2 – 23.5)	64.3 (50.2 – 75.5)	400

Table 2.7.b. Serum trans-beta-carotene: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

	Geometric mean		Selected percentiles (95% conf. interval)						Sample size
	(95% conf. interval)		5th		50th		95th		
Total, 6 years and older									
2001–2002	12.2	(11.5 – 12.9)	3.21	(2.95 – 3.46)	12.0	(11.3 – 12.6)	47.7	(44.2 – 52.1)	7,929
2005–2006	12.1	(11.5 – 12.8)	3.18	(2.92 – 3.42)	11.6	(11.1 – 12.3)	53.3	(49.1 – 59.3)	7,254
Age group									
3–5 years									
2001–2002	13.6	(12.5 – 14.6)	4.60	(3.79 – 5.00)	13.6	(12.1 – 15.2)	45.1	(35.8 – 56.3)	429
6–11 years									
2001–2002	13.3	(12.7 – 13.9)	5.44	(5.00 – 5.96)	13.2	(12.5 – 13.9)	32.9	(30.4 – 38.8)	1,012
2005–2006	13.0	(12.1 – 14.0)	5.15	(4.11 – 5.61)	12.7	(11.8 – 13.6)	37.7	(29.9 – 49.2)	860
12–19 years									
2001–2002	9.69	(9.20 – 10.2)	3.34	(2.97 – 3.59)	9.63	(8.97 – 10.4)	28.2	(25.4 – 32.5)	2,206
2005–2006	9.24	(8.76 – 9.75)	3.20	(2.87 – 3.52)	8.96	(8.30 – 9.66)	28.3	(26.3 – 30.7)	1,954
20–39 years									
2001–2002	10.3	(9.38 – 11.2)	2.90	(2.13 – 3.20)	9.81	(9.10 – 10.8)	39.8	(35.2 – 42.6)	1,716
2005–2006	10.4	(9.63 – 11.3)	3.01	(2.79 – 3.23)	9.97	(9.14 – 10.9)	41.6	(36.9 – 53.3)	1,688
40–59 years									
2001–2002	13.3	(12.1 – 14.7)	3.30	(2.74 – 3.65)	13.0	(12.0 – 14.2)	60.0	(49.9 – 79.7)	1,471
2005–2006	12.8	(11.9 – 13.9)	2.69	(2.15 – 3.41)	12.4	(11.6 – 13.4)	63.0	(53.5 – 73.8)	1,365
60 years and older									
2001–2002	16.5	(14.9 – 18.3)	3.51	(2.88 – 4.13)	17.5	(15.3 – 19.6)	61.4	(56.0 – 66.1)	1,524
2005–2006	16.4	(15.1 – 17.7)	3.90	(3.43 – 4.17)	15.9	(14.5 – 17.8)	74.6	(66.3 – 83.4)	1,387
Gender									
(6 years and older)									
Males									
2001–2002	10.9	(10.2 – 11.6)	3.01	(2.68 – 3.25)	11.0	(10.3 – 11.6)	42.1	(37.5 – 45.5)	3,837
2005–2006	10.3	(9.89 – 10.8)	2.77	(2.28 – 3.06)	10.3	(9.62 – 10.9)	40.8	(36.8 – 46.4)	3,547
Females									
2001–2002	13.6	(12.7 – 14.6)	3.57	(3.37 – 3.83)	13.1	(12.2 – 14.2)	54.1	(47.6 – 62.0)	4,092
2005–2006	14.2	(13.3 – 15.1)	3.77	(3.51 – 4.05)	13.2	(12.0 – 14.4)	64.5	(58.3 – 73.6)	3,707
Race/ethnicity									
(6 years and older)									
Mexican Americans									
2001–2002	12.5	(11.6 – 13.4)	3.56	(3.12 – 3.83)	12.9	(11.6 – 13.9)	38.5	(34.5 – 47.5)	1,990
2005–2006	11.5	(10.5 – 12.7)	3.49	(3.15 – 3.86)	11.3	(10.4 – 12.4)	39.2	(35.1 – 46.5)	1,844
Non-Hispanic Blacks									
2001–2002	10.8	(9.90 – 11.8)	2.83	(2.42 – 3.22)	10.7	(9.93 – 11.6)	40.3	(35.4 – 45.6)	1,864
2005–2006	10.8	(9.72 – 12.0)	3.02	(2.57 – 3.36)	10.5	(9.31 – 11.4)	45.0	(38.3 – 53.7)	1,891
Non-Hispanic Whites									
2001–2002	12.5	(11.5 – 13.6)	3.35	(3.06 – 3.61)	12.1	(11.3 – 13.0)	50.8	(45.8 – 56.9)	3,450
2005–2006	12.3	(11.6 – 13.1)	3.06	(2.80 – 3.41)	11.8	(11.2 – 12.6)	56.9	(50.4 – 64.9)	2,973

Figure 2.7.b. Serum trans-beta-carotene: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006

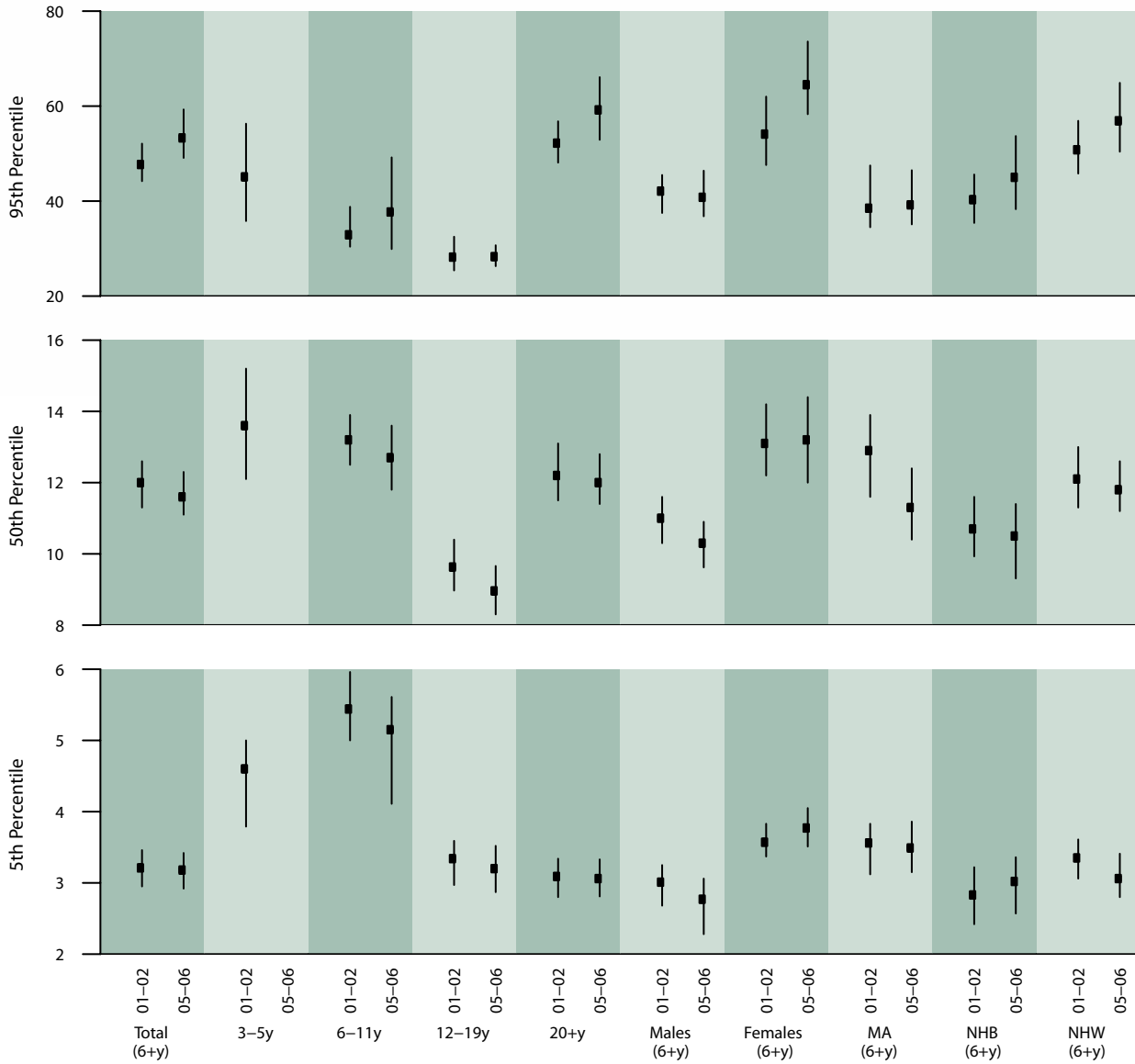


Table 2.8.a.1. Serum cis-beta-carotene: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	*	< LOD	< LOD	< LOD	3.20 (2.87 – 3.64)	4.48 (3.93 – 5.11)	6,616
Age group							
6–11 years	*	< LOD	< LOD	< LOD	1.95 (1.63 – 2.68)	2.67 (2.16 – 4.22)	779
12–19 years	*	< LOD	< LOD	< LOD	1.47 (1.33 – 1.81)	1.87 (1.58 – 2.39)	1,785
20–39 years	*	< LOD	< LOD	< LOD	2.51 (2.08 – 3.19)	3.74 (2.88 – 5.09)	1,528
40–59 years	*	< LOD	< LOD	.730 (< LOD – .783)	3.73 (3.21 – 4.44)	4.84 (4.34 – 5.50)	1,254
60 years and older	1.08 (.985 – 1.17)	< LOD	< LOD	.903 (.811 – .992)	4.59 (3.93 – 5.32)	6.53 (5.17 – 8.65)	1,270
Gender							
Males	*	< LOD	< LOD	< LOD	2.26 (1.99 – 2.60)	3.09 (2.67 – 3.91)	3,204
Females	*	< LOD	< LOD	.759 (.708 – .816)	3.88 (3.60 – 4.48)	5.27 (4.71 – 6.32)	3,412
Race/ethnicity							
Mexican Americans	*	< LOD	< LOD	< LOD	2.26 (1.97 – 2.59)	2.80 (2.48 – 3.46)	1,707
Non-Hispanic Blacks	*	< LOD	< LOD	< LOD	2.81 (2.37 – 3.38)	3.51 (3.17 – 4.61)	1,673
Non-Hispanic Whites	*	< LOD	< LOD	< LOD	3.44 (3.06 – 3.82)	4.71 (4.11 – 5.20)	2,725

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

No *cis-beta*-carotene figure for concentrations by age group is presented because the geometric means were not calculated due to the proportion of results below the limit of detection being too high for valid results (see Table 2.8.a.1).

Table 2.8.a.2. Serum cis-beta-carotene: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	2.10 (1.92 – 2.39)	6,616
6–11 years	*	< LOD	< LOD	1.47 (1.28 – 1.78)	779
12–19 years	*	< LOD	< LOD	1.12 (.995 – 1.26)	1,785
20–39 years	*	< LOD	< LOD	1.78 (1.55 – 2.03)	1,528
40–59 years	*	< LOD	.730 (< LOD – .783)	2.49 (2.18 – 2.86)	1,254
60 years and older	1.08 (.985 – 1.17)	< LOD	.903 (.811 – .992)	3.09 (2.62 – 3.64)	1,270
Males					
Total, 6 years and older	*	< LOD	< LOD	1.59 (1.43 – 1.86)	3,204
6–11 years	*	< LOD	.704 (< LOD – .757)	1.52 (1.26 – 2.33)	386
12–19 years	*	< LOD	< LOD	.935 (.878 – 1.02)	886
20–39 years	*	< LOD	< LOD	1.37 (1.23 – 1.59)	652
40–59 years	*	< LOD	< LOD	1.75 (1.50 – 2.05)	616
60 years and older	*	< LOD	.726 (< LOD – .817)	2.37 (1.91 – 2.99)	664
Females					
Total, 6 years and older	*	< LOD	.759 (.708 – .816)	2.70 (2.35 – 3.10)	3,412
6–11 years	*	< LOD	< LOD	1.44 (1.21 – 1.74)	393
12–19 years	*	< LOD	< LOD	1.35 (1.13 – 1.59)	899
20–39 years	*	< LOD	< LOD	2.15 (1.77 – 3.04)	876
40–59 years	1.04 (.954 – 1.13)	< LOD	.827 (.745 – .963)	3.30 (2.72 – 3.78)	638
60 years and older	1.26 (1.11 – 1.41)	< LOD	1.15 (.904 – 1.36)	3.69 (3.23 – 4.71)	606

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

Table 2.8.a.3. Serum cis-beta-carotene: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	1.70 (1.52 – 1.91)	1,707
6–11 years	*	< LOD	< LOD	1.34 (1.09 – 1.67)	269
12–19 years	*	< LOD	< LOD	.975 (.899 – 1.15)	609
20–39 years	*	< LOD	< LOD	1.73 (1.42 – 2.02)	402
40–59 years	.880 (.780 – .992)	< LOD	.751 (< LOD – .864)	1.97 (1.65 – 2.75)	228
60 years and older	.964 (.878 – 1.06)	< LOD	.854 (.778 – .919)	2.48 (2.05 – 3.55)	199
Males					
Total, 6 years and older	*	< LOD	< LOD	1.47 (1.21 – 1.71)	814
6–11 years	*	< LOD	< LOD	1.34 (1.06 – 1.98)	131
12–19 years	*	< LOD	< LOD	.900 (.833 – 1.09)	299
20–39 years	*	< LOD	< LOD	1.58 (1.16 – 2.07)	171
40–59 years	*	< LOD	< LOD	1.57 (1.29 – 2.19)	114
60 years and older	*	< LOD†	.718 (< LOD – .904)	1.61† (1.08 – 10.8)	99
Females					
Total, 6 years and older	*	< LOD	.720 (< LOD – .789)	1.95 (1.76 – 2.24)	893
6–11 years	*	< LOD	< LOD	1.35 (1.06 – 1.72)	138
12–19 years	*	< LOD	< LOD	1.10 (.944 – 1.46)	310
20–39 years	*	< LOD	.774 (< LOD – .960)	1.88 (1.57 – 2.36)	231
40–59 years	1.00 (.839 – 1.19)	< LOD	.870 (.703 – 1.06)	2.23 (1.71 – 6.40)	114
60 years and older	1.09 (.959 – 1.24)	< LOD†	.923 (.853 – 1.06)	2.85† (2.37 – 4.06)	100

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.8.a.4. Serum cis-beta-carotene: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	1.87 (1.59 – 2.49)	1,673
6–11 years	*	< LOD	< LOD	1.33 (1.12 – 2.11)	208
12–19 years	*	< LOD	< LOD	1.05 (.916 – 1.20)	580
20–39 years	*	< LOD	< LOD	1.41 (1.24 – 1.84)	327
40–59 years	*	< LOD	.778 (< LOD – .937)	2.54 (2.16 – 3.11)	298
60 years and older	1.04 (.906 – 1.19)	< LOD	.965 (.778 – 1.09)	2.80 (2.23 – 3.45)	260
Males					
Total, 6 years and older	*	< LOD	< LOD	1.61 (1.33 – 1.94)	827
6–11 years	.807 (.695 – .937)	< LOD	.738 (< LOD – .876)	1.45 (1.13 – 6.80)	112
12–19 years	*	< LOD	< LOD	.997 (.882 – 1.17)	290
20–39 years	*	< LOD	< LOD	1.27 (.962 – 1.84)	149
40–59 years	*	< LOD	< LOD	2.28 (1.51 – 3.29)	136
60 years and older	*	< LOD	.784 (< LOD – .927)	1.95 (1.64 – 3.14)	140
Females					
Total, 6 years and older	*	< LOD	.717 (< LOD – .832)	2.20 (1.83 – 2.77)	846
6–11 years	*	< LOD†	< LOD	1.19† (1.03 – 1.99)	96
12–19 years	*	< LOD	< LOD	1.08 (.914 – 1.42)	290
20–39 years	*	< LOD	< LOD	1.62 (1.25 – 2.76)	178
40–59 years	1.01 (.886 – 1.16)	< LOD	.877 (.765 – 1.03)	2.82 (2.25 – 3.43)	162
60 years and older	1.17 (.947 – 1.44)	< LOD	1.10 (.720 – 1.58)	3.16 (2.59 – 3.84)	120

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.8.a.5. Serum cis-beta-carotene: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	*	< LOD	< LOD	2.17 (1.92 – 2.55)	2,725
6–11 years	*	< LOD	< LOD	1.46 (1.21 – 2.42)	212
12–19 years	*	< LOD	< LOD	1.16 (.979 – 1.39)	462
20–39 years	*	< LOD	< LOD	1.74 (1.44 – 2.15)	653
40–59 years	*	< LOD	.720 (< LOD – .779)	2.50 (2.11 – 3.14)	634
60 years and older	1.07 (.967 – 1.18)	< LOD	.892 (.783 – 1.00)	3.09 (2.57 – 3.70)	764
Males					
Total, 6 years and older	*	< LOD	< LOD	1.59 (1.42 – 1.92)	1,336
6–11 years	*	< LOD†	< LOD	1.49† (1.16 – 5.17)	102
12–19 years	*	< LOD	< LOD	.926 (.842 – 1.19)	231
20–39 years	*	< LOD	< LOD	1.35 (1.18 – 1.59)	278
40–59 years	*	< LOD	< LOD	1.69 (1.46 – 1.99)	324
60 years and older	*	< LOD	< LOD	2.39 (1.82 – 3.14)	401
Females					
Total, 6 years and older	*	< LOD	.761 (.704 – .828)	2.79 (2.34 – 3.48)	1,389
6–11 years	*	< LOD†	< LOD	1.43† (1.19 – 1.98)	110
12–19 years	*	< LOD	< LOD	1.39 (1.12 – 1.85)	231
20–39 years	*	< LOD	< LOD	2.14 (1.62 – 3.70)	375
40–59 years	1.03 (.941 – 1.13)	< LOD	.795 (.718 – .966)	3.55 (2.73 – 3.96)	310
60 years and older	1.26 (1.10 – 1.45)	< LOD	1.16 (.875 – 1.38)	3.70 (3.16 – 4.80)	363

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.8.b. Serum cis-beta-carotene: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

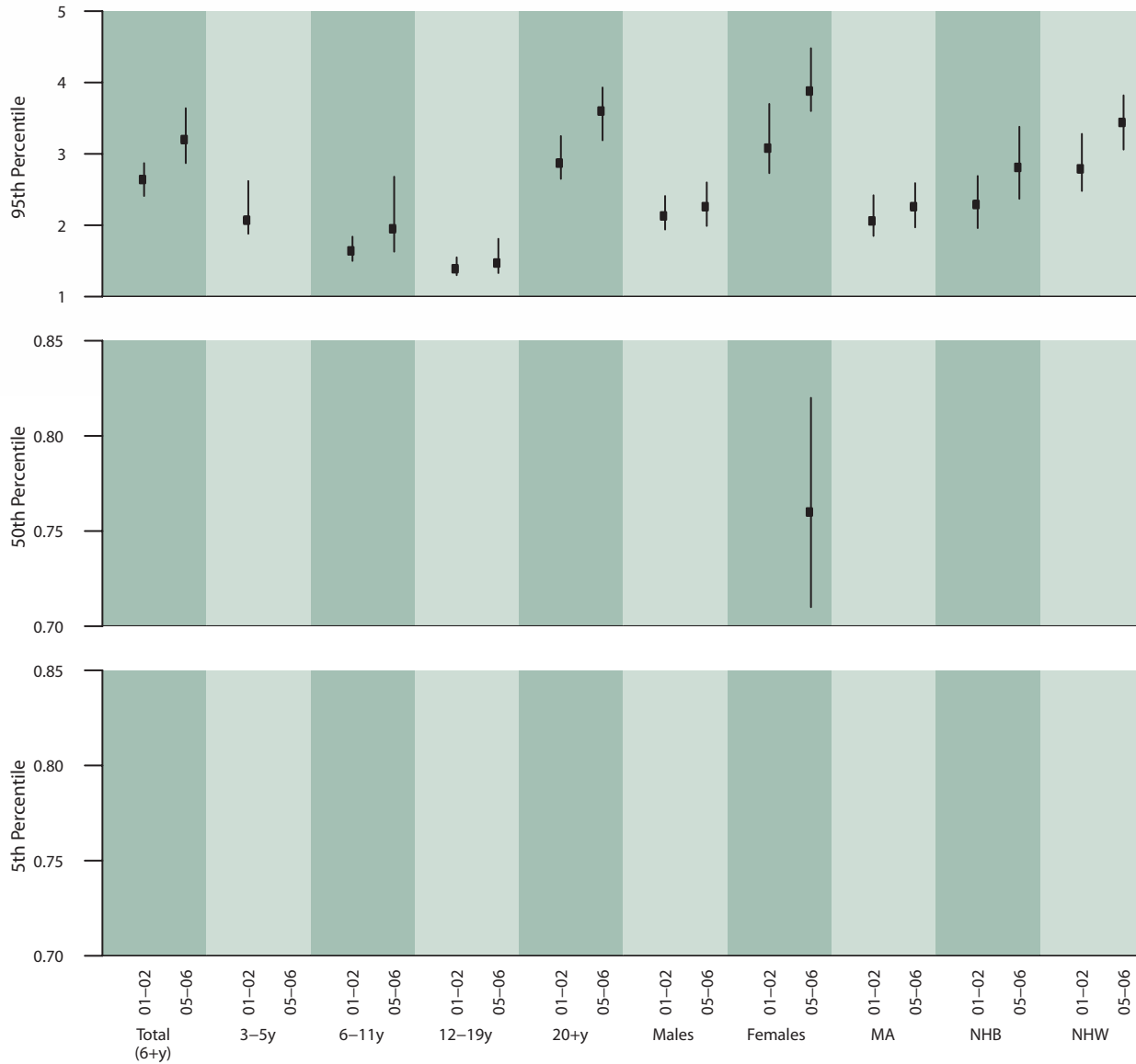
	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
2001–2002	*	< LOD	< LOD	2.64 (2.41 – 2.87)	7,929
2005–2006	*	< LOD	< LOD	3.20 (2.87 – 3.64)	6,616
Age group					
3–5 years					
2001–2002	*	< LOD	< LOD	2.07 (1.88 – 2.62)	430
6–11 years					
2001–2002	*	< LOD	< LOD	1.64 (1.50 – 1.84)	1,014
2005–2006	*	< LOD	< LOD	1.95 (1.63 – 2.68)	779
12–19 years					
2001–2002	*	< LOD	< LOD	1.39 (1.30 – 1.55)	2,206
2005–2006	*	< LOD	< LOD	1.47 (1.33 – 1.81)	1,785
20–39 years					
2001–2002	*	< LOD	< LOD	2.05 (1.82 – 2.46)	1,716
2005–2006	*	< LOD	< LOD	2.51 (2.08 – 3.19)	1,528
40–59 years					
2001–2002	*	< LOD	< LOD	3.30 (2.77 – 4.39)	1,470
2005–2006	*	< LOD	.730 (< LOD – .783)	3.73 (3.21 – 4.44)	1,254
60 years and older					
2001–2002	1.02 (.943 – 1.11)	< LOD	.899 (.803 – 1.02)	3.50 (3.11 – 3.94)	1,523
2005–2006	1.08 (.985 – 1.17)	< LOD	.903 (.811 – .992)	4.59 (3.93 – 5.32)	1,270
Gender					
(6 years and older)					
Males					
2001–2002	*	< LOD	< LOD	2.13 (1.94 – 2.41)	3,835
2005–2006	*	< LOD	< LOD	2.26 (1.99 – 2.60)	3,204
Females					
2001–2002	*	< LOD	< LOD	3.08 (2.73 – 3.70)	4,094
2005–2006	*	< LOD	.759 (.708 – .816)	3.88 (3.60 – 4.48)	3,412
Race/ethnicity					
(6 years and older)					
Mexican Americans					
2001–2002	*	< LOD	< LOD	2.06 (1.85 – 2.42)	1,990
2005–2006	*	< LOD	< LOD	2.26 (1.97 – 2.59)	1,707
Non-Hispanic Blacks					
2001–2002	*	< LOD	< LOD	2.29 (1.96 – 2.69)	1,864
2005–2006	*	< LOD	< LOD	2.81 (2.37 – 3.38)	1,673
Non-Hispanic Whites					
2001–2002	*	< LOD	< LOD	2.79 (2.48 – 3.28)	3,450
2005–2006	*	< LOD	< LOD	3.44 (3.06 – 3.82)	2,725

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

* Not calculated. Proportion of results below limit of detection was too high to provide a valid result.

Figure 2.8.b. Serum cis-beta-carotene: Concentrations by survey cycle

Selected percentiles in $\mu\text{g/dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006



Values in the graph are suppressed if either the point estimate or the lower 95% confidence limit is noted as "< LOD" in the accompanying table.

Table 2.9.a.1. Serum beta-cryptoxanthin: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	7.70 (7.34 – 8.08)	1.90 (1.63 – 2.06)	2.46 (2.26 – 2.63)	7.62 (7.24 – 7.99)	24.1 (22.5 – 26.4)	30.5 (28.7 – 33.2)	7,195
Age group							
6–11 years	9.47 (8.88 – 10.1)	3.41 (2.68 – 3.69)	3.90 (3.32 – 4.23)	9.14 (8.52 – 9.66)	24.9 (23.0 – 28.7)	30.4 (27.1 – 42.3)	855
12–19 years	7.82 (7.42 – 8.23)	2.56 (2.13 – 2.97)	3.20 (2.91 – 3.50)	7.49 (7.01 – 7.99)	20.3 (18.8 – 23.4)	25.5 (23.6 – 27.2)	1,924
20–39 years	7.95 (7.52 – 8.40)	2.33 (1.84 – 2.53)	2.78 (2.50 – 2.97)	7.81 (7.31 – 8.18)	24.5 (21.7 – 28.8)	31.7 (28.8 – 38.0)	1,679
40–59 years	7.24 (6.60 – 7.94)	1.48 (1.14 – 1.92)	2.16 (1.80 – 2.40)	7.03 (6.50 – 7.82)	24.8 (21.5 – 29.2)	30.3 (27.7 – 41.1)	1,357
60 years and older	7.39 (6.86 – 7.97)	1.52 (1.38 – 1.62)	1.98 (1.62 – 2.25)	7.48 (7.03 – 8.13)	24.2 (22.7 – 27.6)	31.9 (27.8 – 35.2)	1,380
Gender							
Males	7.51 (7.10 – 7.94)	1.86 (1.42 – 2.14)	2.41 (2.10 – 2.70)	7.49 (7.12 – 7.88)	22.8 (21.5 – 25.0)	28.4 (26.4 – 30.9)	3,514
Females	7.89 (7.53 – 8.27)	1.93 (1.68 – 2.10)	2.54 (2.24 – 2.69)	7.74 (7.28 – 8.14)	25.5 (23.4 – 28.1)	32.5 (30.0 – 37.1)	3,681
Race/ethnicity							
Mexican Americans	13.0 (11.8 – 14.3)	3.45 (3.15 – 3.89)	4.42 (3.87 – 4.86)	12.9 (11.9 – 14.2)	36.2 (32.4 – 45.4)	46.2 (40.7 – 63.0)	1,842
Non-Hispanic Blacks	8.34 (7.88 – 8.84)	2.32 (2.02 – 2.51)	2.89 (2.59 – 3.11)	8.23 (7.80 – 8.81)	23.6 (20.8 – 27.8)	29.8 (26.9 – 35.6)	1,848
Non-Hispanic Whites	6.94 (6.59 – 7.32)	1.66 (1.47 – 1.92)	2.26 (2.07 – 2.44)	6.96 (6.62 – 7.38)	20.5 (19.7 – 21.9)	25.5 (23.3 – 28.2)	2,960

Figure 2.9.a. Serum beta-cryptoxanthin: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

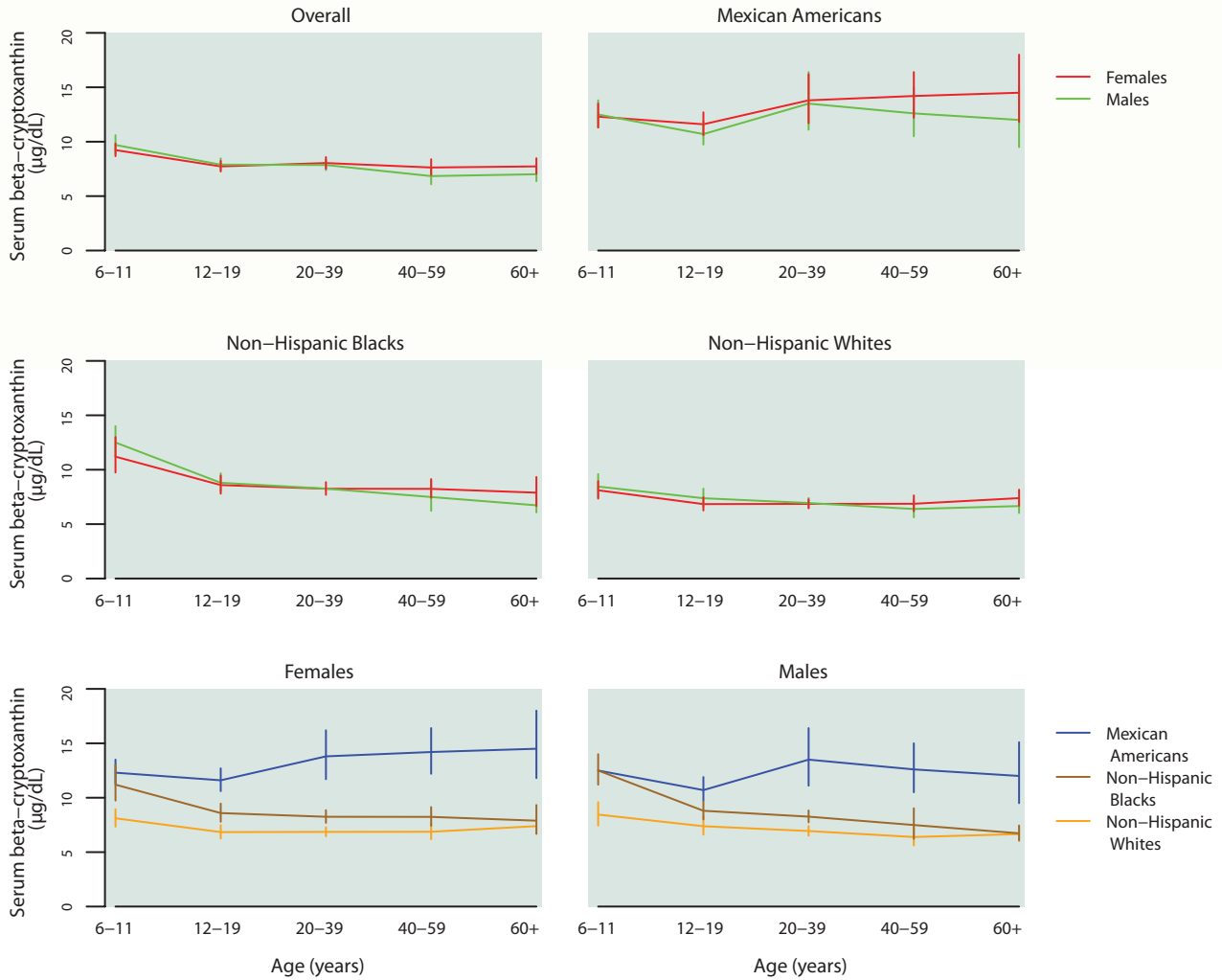


Table 2.9.a.2. Serum beta-cryptoxanthin: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	7.70 (7.34 – 8.08)	3.17 (2.95 – 3.36)	7.62 (7.24 – 7.99)	18.5 (17.5 – 19.7)	7,195
6–11 years	9.47 (8.88 – 10.1)	4.47 (3.95 – 5.23)	9.14 (8.52 – 9.66)	19.5 (17.8 – 21.7)	855
12–19 years	7.82 (7.42 – 8.23)	3.86 (3.64 – 4.01)	7.49 (7.01 – 7.99)	16.5 (15.2 – 17.8)	1,924
20–39 years	7.95 (7.52 – 8.40)	3.42 (3.06 – 3.76)	7.81 (7.31 – 8.18)	18.2 (16.7 – 20.0)	1,679
40–59 years	7.24 (6.60 – 7.94)	2.76 (2.48 – 3.06)	7.03 (6.50 – 7.82)	19.3 (17.2 – 21.2)	1,357
60 years and older	7.39 (6.86 – 7.97)	2.82 (2.40 – 3.01)	7.48 (7.03 – 8.13)	19.0 (17.4 – 20.7)	1,380
Males					
Total, 6 years and older	7.51 (7.10 – 7.94)	3.13 (2.87 – 3.38)	7.49 (7.12 – 7.88)	18.0 (17.1 – 19.3)	3,514
6–11 years	9.70 (8.87 – 10.6)	4.86 (3.91 – 5.70)	9.33 (8.48 – 10.2)	19.2 (17.3 – 21.7)	426
12–19 years	7.89 (7.36 – 8.46)	3.95 (3.55 – 4.37)	7.65 (7.02 – 8.42)	16.9 (15.0 – 18.6)	961
20–39 years	7.86 (7.38 – 8.38)	3.49 (3.11 – 3.88)	7.74 (7.16 – 8.22)	17.9 (16.0 – 19.5)	735
40–59 years	6.84 (6.09 – 7.69)	2.58 (2.16 – 2.91)	6.74 (6.12 – 7.68)	18.8 (16.7 – 21.9)	668
60 years and older	7.01 (6.37 – 7.70)	2.87 (2.36 – 3.05)	7.16 (6.44 – 7.89)	17.6 (16.7 – 20.5)	724
Females					
Total, 6 years and older	7.89 (7.53 – 8.27)	3.21 (2.99 – 3.40)	7.74 (7.28 – 8.14)	19.1 (17.9 – 20.2)	3,681
6–11 years	9.23 (8.67 – 9.83)	4.21 (3.49 – 4.98)	8.82 (8.30 – 9.60)	19.7 (17.8 – 23.4)	429
12–19 years	7.73 (7.26 – 8.23)	3.77 (3.48 – 3.96)	7.32 (6.78 – 8.01)	16.3 (14.9 – 17.8)	963
20–39 years	8.04 (7.52 – 8.59)	3.32 (2.93 – 3.81)	7.87 (7.27 – 8.51)	19.3 (17.0 – 23.4)	944
40–59 years	7.63 (6.94 – 8.39)	3.08 (2.66 – 3.33)	7.35 (6.62 – 8.25)	19.7 (17.2 – 20.9)	689
60 years and older	7.73 (7.04 – 8.48)	2.79 (2.34 – 3.03)	7.73 (7.23 – 8.79)	20.0 (18.1 – 22.9)	656

Table 2.9.a.3. Serum beta-cryptoxanthin: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	13.0 (11.8 – 14.3)	5.53 (5.21 – 5.91)	12.9 (11.9 – 14.2)	29.7 (25.9 – 34.0)	1,842
6–11 years	12.4 (11.4 – 13.5)	6.01 (4.82 – 6.78)	12.3 (11.0 – 14.0)	24.8 (23.0 – 27.8)	295
12–19 years	11.1 (10.3 – 12.1)	5.77 (5.11 – 6.34)	11.0 (10.2 – 12.1)	22.8 (19.2 – 26.1)	646
20–39 years	13.6 (11.7 – 16.0)	5.47 (4.92 – 6.41)	13.5 (11.7 – 15.7)	31.9 (26.5 – 45.3)	448
40–59 years	13.3 (11.7 – 15.2)	5.34 (4.80 – 5.81)	13.6 (11.9 – 15.8)	29.8 (25.8 – 35.3)	245
60 years and older	13.3 (11.4 – 15.6)	5.60 (2.79 – 7.53)	13.4 (11.3 – 15.8)	29.7 (24.7 – 42.9)	208
Males					
Total, 6 years and older	12.6 (11.2 – 14.1)	5.38 (4.94 – 5.92)	12.7 (11.4 – 14.4)	27.9 (24.5 – 32.7)	881
6–11 years	12.5 (11.3 – 13.8)	6.02 (3.82 – 6.86)	12.5 (11.2 – 14.4)	24.3 (22.2 – 32.0)	145
12–19 years	10.7 (9.74 – 11.9)	6.00 (5.02 – 6.51)	10.5 (9.42 – 11.6)	21.7 (18.5 – 26.0)	313
20–39 years	13.5 (11.1 – 16.4)	5.38 (4.43 – 6.71)	13.8 (11.6 – 16.0)	29.6 (22.6 – 45.6)	197
40–59 years	12.6 (10.5 – 15.0)	5.06 (3.45 – 5.65)	13.0 (10.4 – 15.5)	30.6 (25.0 – 45.0)	121
60 years and older	12.0 (9.50 – 15.1)	4.24† (1.40 – 7.66)	11.4 (9.88 – 15.0)	26.9† (21.1 – 37.5)	105
Females					
Total, 6 years and older	13.4 (12.2 – 14.6)	5.64 (5.31 – 6.10)	13.1 (12.2 – 14.2)	30.8 (26.8 – 39.3)	961
6–11 years	12.3 (11.3 – 13.5)	5.87 (4.89 – 6.83)	11.8 (10.9 – 13.3)	26.0 (21.9 – 28.8)	150
12–19 years	11.6 (10.6 – 12.7)	5.49 (4.35 – 6.31)	12.1 (10.9 – 13.0)	23.4 (19.9 – 30.4)	333
20–39 years	13.8 (11.7 – 16.2)	5.49 (4.69 – 6.54)	13.0 (11.0 – 16.0)	34.7 (29.7 – 47.2)	251
40–59 years	14.2 (12.2 – 16.4)	5.67 (3.59 – 7.24)	13.7 (12.5 – 16.3)	29.5 (24.9 – 36.5)	124
60 years and older	14.5 (11.8 – 18.0)	5.79† (3.11 – 7.70)	15.4 (12.2 – 17.4)	30.1† (25.5 – 59.9)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.9.a.4. Serum beta-cryptoxanthin: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	8.34 (7.88 – 8.84)	3.72 (3.51 – 4.02)	8.23 (7.80 – 8.81)	18.1 (17.2 – 19.3)	1,848
6–11 years	11.9 (11.1 – 12.8)	6.05 (5.13 – 6.76)	11.7 (10.6 – 13.2)	22.8 (19.7 – 25.0)	237
12–19 years	8.69 (7.99 – 9.46)	4.54 (4.16 – 4.92)	8.47 (7.65 – 9.40)	17.4 (15.7 – 19.0)	637
20–39 years	8.26 (7.76 – 8.78)	3.97 (3.62 – 4.26)	7.95 (7.47 – 8.71)	16.3 (15.0 – 18.9)	363
40–59 years	7.89 (6.95 – 8.97)	2.90 (2.54 – 3.55)	7.98 (6.88 – 9.10)	18.8 (17.2 – 22.3)	332
60 years and older	7.38 (6.55 – 8.31)	3.16 (2.61 – 3.71)	7.31 (6.35 – 8.23)	16.8 (15.5 – 21.8)	279
Males					
Total, 6 years and older	8.23 (7.64 – 8.87)	3.58 (3.20 – 3.89)	8.03 (7.38 – 8.90)	19.0 (17.7 – 20.9)	922
6–11 years	12.5 (11.2 – 14.0)	6.69 (4.92 – 7.69)	12.6 (10.6 – 14.7)	23.9 (21.5 – 25.6)	127
12–19 years	8.80 (8.01 – 9.67)	4.43 (3.92 – 4.96)	8.50 (7.75 – 9.40)	18.2 (15.8 – 20.7)	325
20–39 years	8.26 (7.73 – 8.83)	4.00 (3.65 – 4.31)	7.41 (7.04 – 7.98)	18.2 (15.3 – 21.6)	168
40–59 years	7.49 (6.22 – 9.03)	2.63 (2.42 – 2.81)	7.64 (6.42 – 9.09)	19.0 (17.1 – 24.6)	153
60 years and older	6.73 (6.08 – 7.45)	2.92 (2.43 – 3.29)	6.06 (5.09 – 7.20)	17.0 (15.6 – 17.8)	149
Females					
Total, 6 years and older	8.44 (8.04 – 8.86)	3.87 (3.56 – 4.40)	8.39 (8.01 – 8.86)	17.3 (16.4 – 18.5)	926
6–11 years	11.2 (9.74 – 13.0)	5.33† (4.18 – 6.55)	10.8 (9.90 – 12.2)	19.6† (17.8 – 30.0)	110
12–19 years	8.59 (7.79 – 9.46)	4.66 (4.22 – 5.04)	8.46 (7.40 – 9.63)	16.6 (14.9 – 18.0)	312
20–39 years	8.25 (7.69 – 8.86)	3.73 (3.50 – 4.18)	8.14 (7.80 – 8.94)	15.6 (13.7 – 20.1)	195
40–59 years	8.24 (7.42 – 9.14)	3.64 (2.54 – 4.52)	8.22 (6.90 – 9.23)	18.5 (16.3 – 21.5)	179
60 years and older	7.89 (6.67 – 9.33)	3.67 (2.29 – 4.00)	7.96 (6.64 – 9.20)	16.5 (14.7 – 26.2)	130

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.9.a.5. Serum beta-cryptoxanthin: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	6.94 (6.59 – 7.32)	2.93 (2.72 – 3.14)	6.96 (6.62 – 7.38)	16.3 (15.3 – 17.4)	2,960
6–11 years	8.29 (7.73 – 8.89)	4.21 (3.43 – 4.88)	8.12 (7.60 – 8.69)	15.7 (14.5 – 17.9)	230
12–19 years	7.12 (6.60 – 7.68)	3.72 (3.31 – 3.93)	6.82 (6.07 – 7.64)	14.2 (13.1 – 16.1)	497
20–39 years	6.90 (6.60 – 7.21)	3.01 (2.73 – 3.40)	6.93 (6.69 – 7.24)	15.1 (13.3 – 16.5)	711
40–59 years	6.63 (5.99 – 7.33)	2.63 (2.35 – 2.88)	6.61 (6.11 – 7.28)	17.2 (14.6 – 20.0)	679
60 years and older	7.05 (6.51 – 7.64)	2.75 (2.28 – 2.96)	7.26 (6.66 – 7.79)	17.7 (16.8 – 19.6)	843
Males					
Total, 6 years and older	6.83 (6.42 – 7.28)	2.92 (2.50 – 3.23)	6.90 (6.58 – 7.29)	15.9 (14.6 – 17.5)	1,468
6–11 years	8.45 (7.44 – 9.60)	4.43 (3.50 – 5.65)	7.99 (7.29 – 9.15)	15.9 (14.0 – 21.0)	112
12–19 years	7.38 (6.60 – 8.26)	3.87 (3.20 – 4.40)	7.10 (6.14 – 8.39)	14.5 (12.6 – 17.5)	253
20–39 years	6.94 (6.51 – 7.40)	3.15 (2.80 – 3.53)	7.06 (6.75 – 7.53)	14.0 (12.1 – 16.7)	309
40–59 years	6.39 (5.62 – 7.26)	2.42 (1.99 – 2.82)	6.31 (5.75 – 6.96)	17.6 (14.6 – 21.6)	350
60 years and older	6.66 (6.02 – 7.37)	2.78 (2.23 – 3.04)	6.94 (5.82 – 7.73)	17.0 (15.2 – 18.8)	444
Females					
Total, 6 years and older	7.05 (6.69 – 7.43)	2.94 (2.70 – 3.20)	7.04 (6.59 – 7.55)	16.6 (15.4 – 18.1)	1,492
6–11 years	8.11 (7.34 – 8.95)	3.85 (3.04 – 4.45)	8.14 (7.69 – 8.60)	15.0 (13.3 – 22.0)	118
12–19 years	6.84 (6.25 – 7.48)	3.57 (2.93 – 3.86)	6.57 (5.73 – 7.38)	14.0 (12.8 – 16.4)	244
20–39 years	6.86 (6.45 – 7.28)	2.92 (2.53 – 3.38)	6.73 (6.29 – 7.41)	15.7 (13.5 – 18.2)	402
40–59 years	6.87 (6.18 – 7.64)	2.84 (2.52 – 3.24)	6.84 (6.09 – 7.85)	16.5 (14.4 – 19.9)	329
60 years and older	7.39 (6.69 – 8.17)	2.73 (2.26 – 2.94)	7.50 (6.74 – 8.69)	19.5 (17.0 – 21.2)	399

Table 2.9.b. Serum beta-cryptoxanthin: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)						Sample size
			5th		50th		95th		
Total, 6 years and older									
2001–2002	7.46	(7.06 – 7.87)	2.45	(2.20 – 2.68)	7.40	(7.00 – 7.82)	23.0	(20.9 – 25.5)	7,890
2005–2006	7.70	(7.34 – 8.08)	2.46	(2.26 – 2.63)	7.62	(7.24 – 7.99)	24.1	(22.5 – 26.4)	7,195
Age group									
3–5 years									
2001–2002	9.43	(8.40 – 10.6)	3.30	(1.88 – 3.96)	9.09	(7.81 – 10.4)	30.7	(25.3 – 43.1)	427
6–11 years									
2001–2002	9.40	(8.71 – 10.2)	3.92	(3.28 – 4.22)	9.05	(8.29 – 10.2)	26.1	(21.9 – 31.6)	1,006
2005–2006	9.47	(8.88 – 10.1)	3.90	(3.32 – 4.23)	9.14	(8.52 – 9.66)	24.9	(23.0 – 28.7)	855
12–19 years									
2001–2002	7.63	(7.20 – 8.08)	3.05	(2.58 – 3.31)	7.45	(7.00 – 7.99)	19.8	(18.5 – 22.3)	2,199
2005–2006	7.82	(7.42 – 8.23)	3.20	(2.91 – 3.50)	7.49	(7.01 – 7.99)	20.3	(18.8 – 23.4)	1,924
20–39 years									
2001–2002	7.11	(6.57 – 7.69)	2.40	(2.04 – 2.73)	6.83	(6.25 – 7.50)	22.9	(20.0 – 26.6)	1,707
2005–2006	7.95	(7.52 – 8.40)	2.78	(2.50 – 2.97)	7.81	(7.31 – 8.18)	24.5	(21.7 – 28.8)	1,679
40–59 years									
2001–2002	7.28	(6.75 – 7.86)	2.39	(2.02 – 2.71)	7.16	(6.66 – 7.77)	23.2	(20.4 – 26.1)	1,459
2005–2006	7.24	(6.60 – 7.94)	2.16	(1.80 – 2.40)	7.03	(6.50 – 7.82)	24.8	(21.5 – 29.2)	1,357
60 years and older									
2001–2002	7.44	(6.84 – 8.09)	1.94	(1.71 – 2.22)	7.64	(7.06 – 8.28)	23.5	(20.9 – 27.8)	1,519
2005–2006	7.39	(6.86 – 7.97)	1.98	(1.62 – 2.25)	7.48	(7.03 – 8.13)	24.2	(22.7 – 27.6)	1,380
Gender									
(6 years and older)									
Males									
2001–2002	7.28	(6.89 – 7.69)	2.41	(2.10 – 2.66)	7.32	(6.82 – 7.81)	22.3	(20.4 – 25.0)	3,815
2005–2006	7.51	(7.10 – 7.94)	2.41	(2.10 – 2.70)	7.49	(7.12 – 7.88)	22.8	(21.5 – 25.0)	3,514
Females									
2001–2002	7.63	(7.20 – 8.08)	2.48	(2.29 – 2.75)	7.45	(7.05 – 7.84)	23.8	(21.1 – 26.2)	4,075
2005–2006	7.89	(7.53 – 8.27)	2.54	(2.24 – 2.69)	7.74	(7.28 – 8.14)	25.5	(23.4 – 28.1)	3,681
Race/ethnicity									
(6 years and older)									
Mexican Americans									
2001–2002	12.1	(11.2 – 13.2)	4.14	(3.71 – 4.53)	12.1	(10.9 – 13.5)	34.5	(32.1 – 38.5)	1,988
2005–2006	13.0	(11.8 – 14.3)	4.42	(3.87 – 4.86)	12.9	(11.9 – 14.2)	36.2	(32.4 – 45.4)	1,842
Non-Hispanic Blacks									
2001–2002	8.03	(7.38 – 8.74)	2.99	(2.66 – 3.27)	7.92	(7.32 – 8.55)	23.0	(19.9 – 27.7)	1,859
2005–2006	8.34	(7.88 – 8.84)	2.89	(2.59 – 3.11)	8.23	(7.80 – 8.81)	23.6	(20.8 – 27.8)	1,848
Non-Hispanic Whites									
2001–2002	6.80	(6.43 – 7.19)	2.36	(2.05 – 2.53)	6.71	(6.29 – 7.16)	19.6	(18.2 – 22.2)	3,422
2005–2006	6.94	(6.59 – 7.32)	2.26	(2.07 – 2.44)	6.96	(6.62 – 7.38)	20.5	(19.7 – 21.9)	2,960

Figure 2.9.b. Serum beta-cryptoxanthin: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006

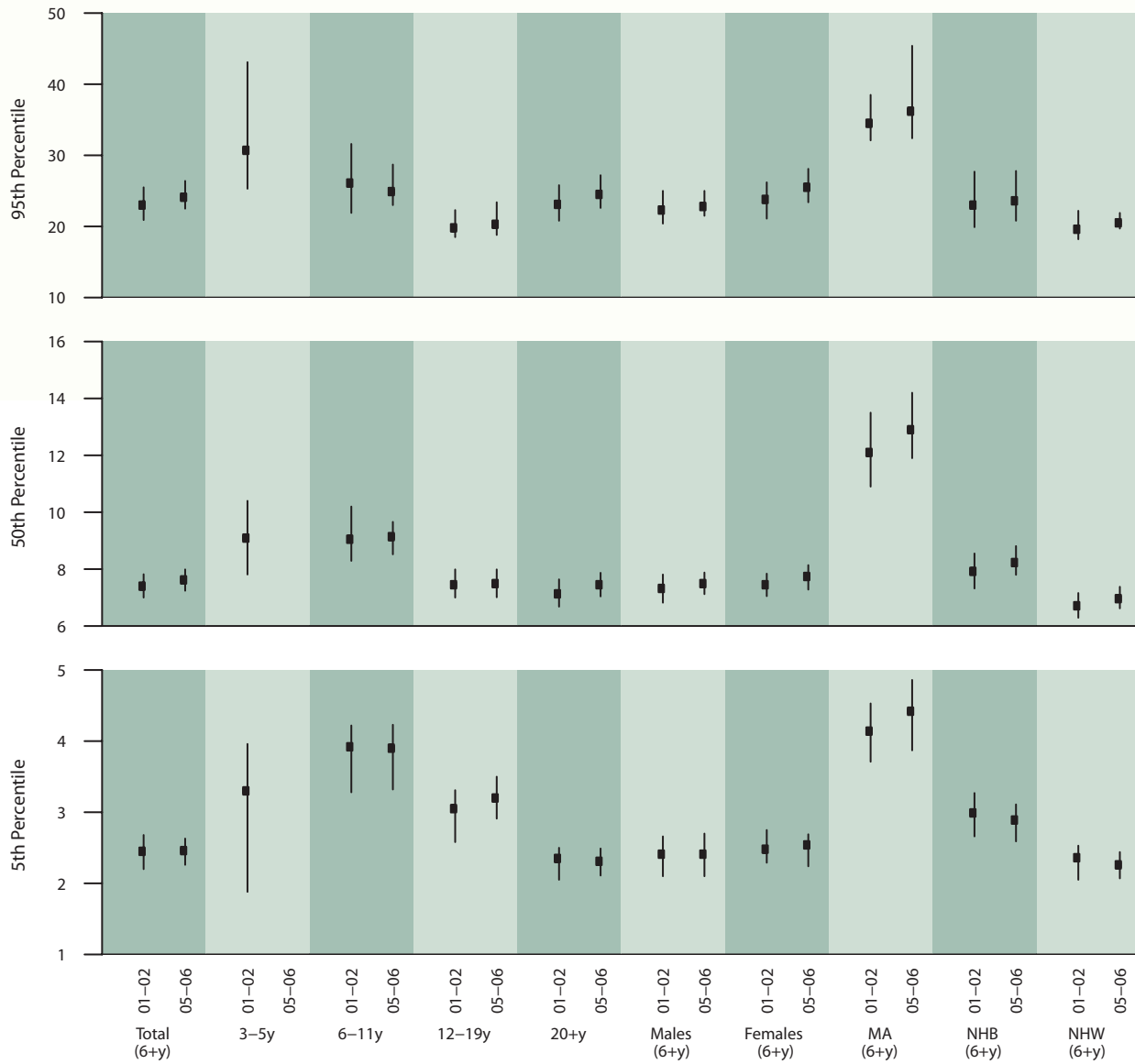


Table 2.10.a.1. Serum lutein/zeaxanthin: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	13.8 (13.4 – 14.2)	4.95 (4.69 – 5.19)	5.90 (5.68 – 6.18)	13.7 (13.2 – 14.1)	31.3 (30.3 – 33.2)	38.5 (37.0 – 40.0)	7,254
Age group							
6–11 years	13.1 (12.6 – 13.7)	5.74 (4.13 – 6.47)	6.70 (5.50 – 7.67)	13.3 (12.8 – 13.9)	24.5 (23.5 – 27.4)	29.0 (27.3 – 30.2)	860
12–19 years	10.7 (10.3 – 11.1)	4.91 (4.39 – 5.18)	5.67 (5.21 – 5.91)	10.6 (10.0 – 11.1)	20.0 (19.1 – 21.1)	22.7 (21.4 – 25.1)	1,954
20–39 years	13.6 (13.1 – 14.1)	4.94 (4.24 – 5.46)	5.91 (5.19 – 6.41)	13.6 (12.9 – 14.4)	29.3 (27.7 – 32.1)	35.2 (31.7 – 40.0)	1,688
40–59 years	14.5 (13.8 – 15.2)	4.62 (4.02 – 5.31)	5.82 (5.28 – 6.13)	14.5 (13.7 – 15.2)	35.7 (33.3 – 37.8)	40.8 (38.5 – 46.1)	1,365
60 years and older	15.5 (14.9 – 16.2)	5.27 (4.72 – 5.83)	6.44 (6.02 – 6.69)	15.7 (15.0 – 16.5)	35.9 (32.8 – 40.3)	42.5 (39.7 – 51.2)	1,387
Gender							
Males	13.6 (13.1 – 14.0)	4.92 (4.48 – 5.30)	5.93 (5.42 – 6.35)	13.5 (13.0 – 14.1)	30.7 (28.7 – 31.4)	35.7 (33.3 – 39.0)	3,547
Females	14.0 (13.5 – 14.4)	4.98 (4.62 – 5.26)	5.89 (5.69 – 6.13)	13.8 (13.3 – 14.4)	32.8 (31.0 – 35.7)	39.9 (38.4 – 41.5)	3,707
Race/ethnicity							
Mexican Americans	15.1 (14.5 – 15.8)	6.36 (5.62 – 6.79)	7.41 (6.79 – 7.83)	15.0 (14.4 – 15.6)	31.3 (29.2 – 34.1)	35.5 (33.2 – 40.8)	1,844
Non-Hispanic Blacks	15.3 (14.8 – 15.8)	5.88 (5.20 – 6.37)	7.03 (6.33 – 7.71)	15.4 (15.0 – 15.8)	31.5 (29.4 – 35.1)	38.0 (34.8 – 41.7)	1,891
Non-Hispanic Whites	13.2 (12.8 – 13.6)	4.74 (4.46 – 4.96)	5.70 (5.33 – 5.88)	12.9 (12.5 – 13.4)	30.9 (29.1 – 32.8)	37.5 (34.4 – 39.9)	2,973

Figure 2.10.a. Serum lutein/zeaxanthin: Concentrations by age group

Geometric Mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

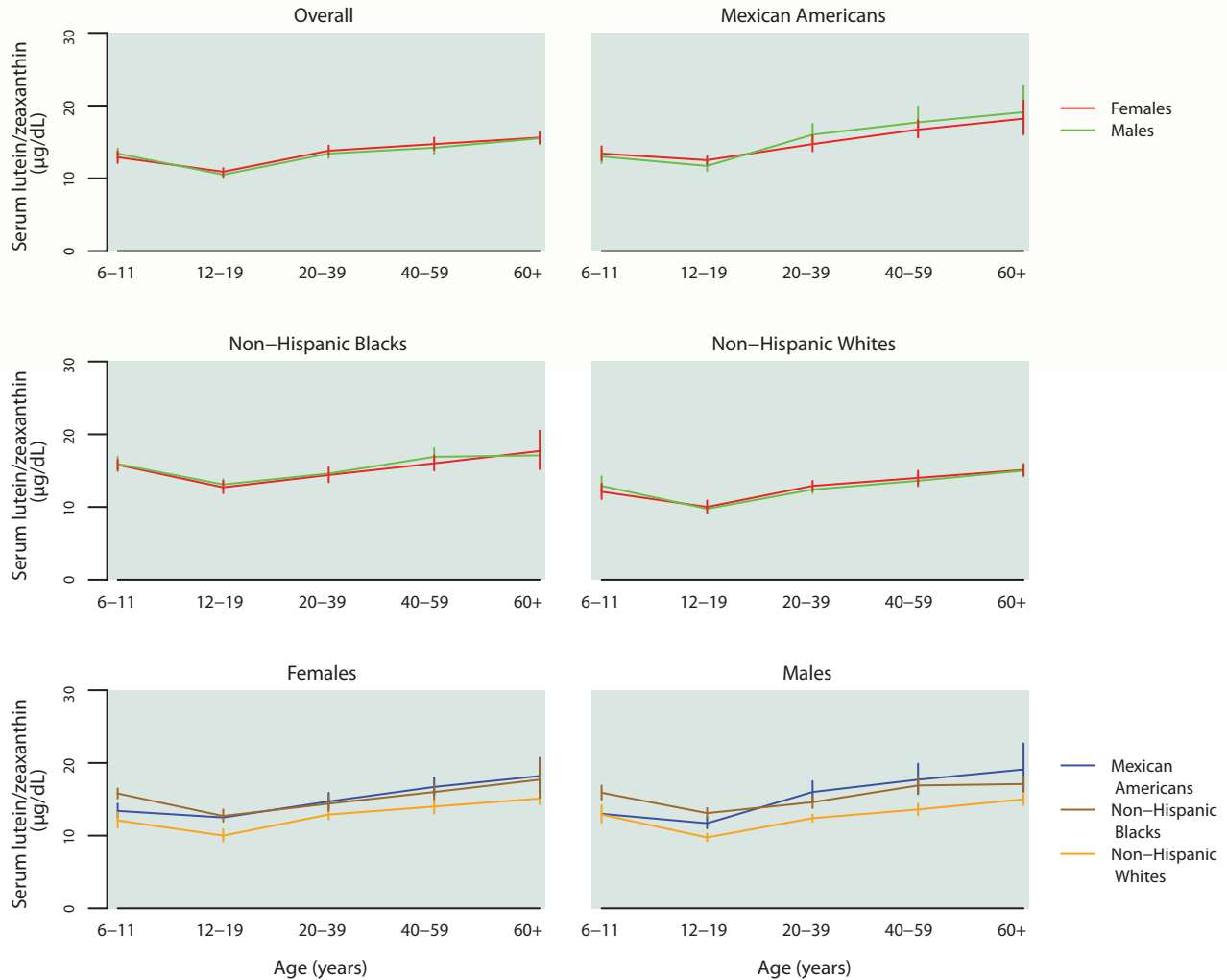


Table 2.10.a.2. Serum lutein/zeaxanthin: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	13.8 (13.4 – 14.2)	7.24 (6.91 – 7.49)	13.7 (13.2 – 14.1)	26.5 (25.7 – 27.3)	7,254
6–11 years	13.1 (12.6 – 13.7)	7.93 (6.84 – 8.54)	13.3 (12.8 – 13.9)	20.7 (20.1 – 22.0)	860
12–19 years	10.7 (10.3 – 11.1)	6.50 (6.19 – 6.74)	10.6 (10.0 – 11.1)	17.6 (16.9 – 18.4)	1,954
20–39 years	13.6 (13.1 – 14.1)	7.40 (6.64 – 7.83)	13.6 (12.9 – 14.4)	25.1 (23.4 – 27.1)	1,688
40–59 years	14.5 (13.8 – 15.2)	7.23 (6.70 – 7.58)	14.5 (13.7 – 15.2)	29.4 (27.5 – 31.0)	1,365
60 years and older	15.5 (14.9 – 16.2)	7.89 (7.52 – 8.13)	15.7 (15.0 – 16.5)	29.0 (27.3 – 31.9)	1,387
Males					
Total, 6 years and older	13.6 (13.1 – 14.0)	7.22 (6.78 – 7.61)	13.5 (13.0 – 14.1)	25.6 (24.5 – 26.2)	3,547
6–11 years	13.4 (12.7 – 14.1)	8.08 (7.62 – 8.69)	13.6 (12.5 – 14.2)	20.5 (19.0 – 22.5)	427
12–19 years	10.5 (10.1 – 10.9)	6.49 (6.06 – 6.86)	10.3 (9.91 – 10.9)	17.3 (16.7 – 18.3)	980
20–39 years	13.4 (12.8 – 14.0)	7.26 (6.51 – 7.96)	13.4 (12.8 – 14.2)	23.8 (22.4 – 26.0)	738
40–59 years	14.2 (13.4 – 15.0)	7.22 (5.99 – 7.90)	14.1 (13.1 – 15.1)	27.6 (26.6 – 31.0)	673
60 years and older	15.5 (14.7 – 16.4)	7.94 (7.26 – 8.26)	15.9 (15.2 – 17.0)	27.8 (26.2 – 31.2)	729
Females					
Total, 6 years and older	14.0 (13.5 – 14.4)	7.27 (6.77 – 7.56)	13.8 (13.3 – 14.4)	27.5 (26.7 – 28.5)	3,707
6–11 years	12.9 (12.1 – 13.7)	7.63 (5.98 – 8.50)	13.1 (12.6 – 13.7)	21.4 (19.9 – 23.6)	433
12–19 years	10.9 (10.3 – 11.4)	6.52 (5.98 – 6.93)	10.8 (10.1 – 11.5)	18.0 (16.9 – 19.1)	974
20–39 years	13.8 (13.2 – 14.5)	7.42 (6.59 – 7.80)	13.8 (12.9 – 14.8)	25.7 (23.9 – 28.0)	950
40–59 years	14.7 (13.9 – 15.6)	7.17 (6.76 – 7.56)	15.0 (13.8 – 16.2)	29.6 (28.9 – 32.2)	692
60 years and older	15.6 (14.8 – 16.4)	7.80 (7.40 – 8.17)	15.6 (14.1 – 16.7)	29.8 (28.0 – 32.8)	658

Table 2.10.a.3. Serum lutein/zeaxanthin: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	15.1 (14.5 – 15.8)	8.60 (8.07 – 9.17)	15.0 (14.4 – 15.6)	26.8 (25.2 – 28.6)	1,844
6–11 years	13.2 (12.4 – 14.0)	8.43 (6.89 – 9.35)	13.3 (12.2 – 14.1)	21.1 (19.3 – 23.5)	295
12–19 years	12.1 (11.5 – 12.7)	7.64 (7.22 – 8.01)	12.3 (11.7 – 12.9)	18.9 (18.0 – 20.0)	646
20–39 years	15.4 (14.3 – 16.6)	8.96 (8.09 – 9.65)	15.4 (14.2 – 17.3)	26.2 (23.4 – 30.5)	449
40–59 years	17.2 (16.0 – 18.5)	9.78 (7.36 – 11.0)	17.2 (16.2 – 18.5)	30.4 (27.3 – 36.3)	246
60 years and older	18.6 (16.7 – 20.7)	9.96 (7.59 – 12.0)	18.7 (16.9 – 20.3)	32.2 (30.1 – 34.4)	208
Males					
Total, 6 years and older	15.4 (14.5 – 16.3)	8.81 (8.00 – 9.51)	15.1 (14.4 – 16.0)	28.1 (25.6 – 31.1)	883
6–11 years	13.0 (12.1 – 13.9)	8.75 (6.33 – 9.71)	13.1 (12.1 – 13.9)	19.6 (17.5 – 22.0)	145
12–19 years	11.7 (11.0 – 12.5)	7.62 (6.85 – 8.20)	12.0 (10.9 – 12.9)	18.2 (17.4 – 19.2)	313
20–39 years	16.0 (14.6 – 17.5)	9.47 (8.02 – 10.1)	15.8 (14.9 – 17.4)	28.5 (24.2 – 33.1)	198
40–59 years	17.7 (15.7 – 19.9)	8.69 (5.55 – 11.6)	17.6 (16.1 – 19.9)	31.1 (27.0 – 52.1)	122
60 years and older	19.1 (16.0 – 22.7)	10.7† (6.38 – 12.2)	18.5 (14.5 – 25.4)	34.1† (29.9 – 45.4)	105
Females					
Total, 6 years and older	14.9 (14.2 – 15.6)	8.46 (7.68 – 9.34)	14.7 (14.1 – 15.5)	24.4 (23.3 – 27.0)	961
6–11 years	13.4 (12.5 – 14.4)	7.94 (6.66 – 8.97)	13.6 (11.9 – 14.4)	23.4 (19.8 – 27.1)	150
12–19 years	12.5 (11.9 – 13.1)	7.61 (7.08 – 8.14)	12.8 (12.3 – 13.1)	19.7 (18.3 – 20.8)	333
20–39 years	14.7 (13.7 – 15.9)	8.18 (7.42 – 9.74)	14.7 (13.1 – 16.9)	23.1 (22.2 – 27.0)	251
40–59 years	16.7 (15.6 – 18.0)	10.1 (7.40 – 10.9)	16.6 (14.5 – 18.4)	28.6 (23.7 – 44.2)	124
60 years and older	18.2 (16.1 – 20.7)	9.82† (7.45 – 11.7)	18.8 (16.2 – 21.7)	30.6† (28.3 – 33.6)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.10.a.4. Serum lutein/zeaxanthin: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	15.3 (14.8 – 15.8)	8.61 (8.21 – 9.04)	15.4 (15.0 – 15.8)	26.6 (25.2 – 28.4)	1,891
6–11 years	15.8 (15.3 – 16.4)	10.5 (9.30 – 11.0)	16.2 (15.6 – 16.8)	23.9 (22.5 – 27.4)	240
12–19 years	12.9 (12.3 – 13.5)	7.94 (7.37 – 8.38)	13.0 (12.1 – 13.7)	20.9 (19.5 – 22.1)	665
20–39 years	14.5 (13.7 – 15.3)	8.29 (6.74 – 9.45)	14.4 (13.5 – 15.4)	25.3 (24.0 – 28.3)	368
40–59 years	16.4 (15.5 – 17.4)	8.77 (7.81 – 9.51)	17.0 (15.8 – 18.2)	28.6 (26.6 – 30.2)	335
60 years and older	17.4 (16.0 – 19.1)	8.99 (8.24 – 10.1)	17.7 (16.0 – 19.1)	31.5 (27.1 – 36.5)	283
Males					
Total, 6 years and older	15.4 (14.9 – 15.9)	8.69 (8.26 – 9.42)	15.6 (14.9 – 16.3)	26.6 (25.6 – 28.4)	949
6–11 years	15.9 (14.9 – 16.9)	11.1 (10.3 – 11.9)	15.9 (15.0 – 17.2)	23.1 (21.9 – 26.9)	128
12–19 years	13.1 (12.4 – 13.8)	8.08 (7.27 – 8.68)	13.3 (12.2 – 14.6)	20.8 (19.6 – 21.9)	343
20–39 years	14.6 (13.8 – 15.5)	8.48 (6.56 – 9.65)	14.2 (13.1 – 15.7)	26.3 (23.2 – 29.1)	170
40–59 years	16.9 (15.8 – 18.1)	9.21 (7.66 – 9.97)	18.2 (15.6 – 19.3)	30.6 (27.5 – 36.0)	156
60 years and older	17.1 (16.2 – 18.1)	8.83 (7.79 – 9.64)	17.9 (17.2 – 18.8)	29.0 (25.9 – 34.0)	152
Females					
Total, 6 years and older	15.2 (14.5 – 15.8)	8.51 (7.69 – 9.12)	15.3 (14.8 – 15.9)	26.4 (24.6 – 29.1)	942
6–11 years	15.8 (15.1 – 16.5)	9.57 (7.86 – 10.7)	16.5 (14.8 – 17.1)	24.0 (22.3 – 28.9)	112
12–19 years	12.7 (11.9 – 13.6)	7.70 (6.62 – 8.68)	12.7 (11.4 – 13.6)	21.1 (19.1 – 23.5)	322
20–39 years	14.4 (13.4 – 15.5)	8.03 (5.21 – 9.63)	14.7 (13.6 – 15.4)	24.6 (23.2 – 28.5)	198
40–59 years	16.0 (15.0 – 17.1)	8.72 (7.23 – 9.34)	16.6 (15.6 – 17.6)	26.9 (24.6 – 29.9)	179
60 years and older	17.7 (15.2 – 20.5)	9.08 (7.95 – 10.6)	17.3 (15.1 – 20.2)	33.2 (26.3 – 57.9)	131

Table 2.10.a.5. Serum lutein/zeaxanthin: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	13.2 (12.8 – 13.6)	6.80 (6.48 – 7.16)	12.9 (12.5 – 13.4)	25.8 (25.1 – 26.9)	2,973
6–11 years	12.5 (11.8 – 13.3)	7.68 (6.04 – 8.34)	12.7 (12.2 – 13.6)	19.8 (18.3 – 23.1)	231
12–19 years	9.88 (9.46 – 10.3)	6.16 (5.75 – 6.48)	9.80 (9.34 – 10.3)	16.2 (15.0 – 17.1)	499
20–39 years	12.7 (12.2 – 13.1)	6.56 (5.93 – 7.39)	12.4 (11.7 – 13.2)	23.6 (22.1 – 26.9)	714
40–59 years	13.8 (13.0 – 14.6)	6.87 (6.26 – 7.25)	13.7 (12.6 – 15.1)	27.9 (26.7 – 30.2)	683
60 years and older	15.0 (14.4 – 15.7)	7.59 (7.25 – 7.97)	15.2 (14.2 – 15.8)	28.5 (26.4 – 31.4)	846
Males					
Total, 6 years and older	13.0 (12.5 – 13.4)	6.87 (6.45 – 7.22)	12.8 (12.2 – 13.5)	24.4 (23.5 – 25.7)	1,472
6–11 years	12.9 (11.8 – 14.2)	7.95 (5.77 – 8.67)	13.0 (12.2 – 14.1)	18.9 (17.1 – 31.9)	112
12–19 years	9.75 (9.24 – 10.3)	6.23 (5.55 – 6.75)	9.71 (9.33 – 10.0)	15.6 (14.3 – 16.9)	254
20–39 years	12.4 (11.9 – 12.9)	6.55 (5.75 – 7.69)	12.3 (11.7 – 13.0)	22.7 (21.8 – 24.8)	309
40–59 years	13.6 (12.8 – 14.4)	6.96 (5.83 – 7.71)	13.4 (12.3 – 14.9)	26.6 (24.5 – 29.9)	351
60 years and older	15.0 (14.2 – 15.9)	7.59 (7.11 – 8.05)	15.4 (14.4 – 16.5)	26.6 (25.5 – 30.6)	446
Females					
Total, 6 years and older	13.4 (12.9 – 13.8)	6.75 (6.20 – 7.26)	13.0 (12.4 – 13.7)	27.4 (26.0 – 28.1)	1,501
6–11 years	12.1 (11.1 – 13.2)	6.73 (5.07 – 8.32)	12.4 (11.1 – 13.2)	19.9 (18.2 – 28.1)	119
12–19 years	10.0 (9.21 – 10.9)	6.08 (5.23 – 6.57)	9.90 (9.18 – 11.1)	16.5 (15.3 – 18.1)	245
20–39 years	12.9 (12.2 – 13.6)	6.60 (5.82 – 7.42)	12.6 (11.2 – 14.4)	25.0 (22.3 – 28.5)	405
40–59 years	14.0 (13.0 – 15.0)	6.78 (5.98 – 7.28)	14.0 (12.5 – 15.7)	29.2 (27.5 – 30.7)	332
60 years and older	15.1 (14.3 – 15.9)	7.58 (6.96 – 8.05)	14.7 (13.6 – 16.2)	29.2 (27.6 – 32.6)	400

Table 2.10.b. Serum lutein/zeaxanthin: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)						Sample size
			5th		50th		95th		
Total, 6 years and older									
2001–2002	13.1	(12.5 – 13.6)	5.77	(5.53 – 6.00)	12.9	(12.2 – 13.5)	30.4	(28.6 – 32.2)	7,923
2005–2006	13.8	(13.4 – 14.2)	5.90	(5.68 – 6.18)	13.7	(13.2 – 14.1)	31.3	(30.3 – 33.2)	7,254
Age group									
3–5 years									
2001–2002	12.5	(11.8 – 13.2)	6.38	(5.82 – 7.04)	12.5	(12.0 – 13.1)	24.6	(22.2 – 31.5)	430
6–11 years									
2001–2002	12.5	(11.9 – 13.2)	6.61	(5.88 – 7.06)	12.3	(11.6 – 13.1)	24.8	(22.4 – 26.0)	1,014
2005–2006	13.1	(12.6 – 13.7)	6.70	(5.50 – 7.67)	13.3	(12.8 – 13.9)	24.5	(23.5 – 27.4)	860
12–19 years									
2001–2002	10.4	(9.91 – 11.0)	4.99	(4.64 – 5.54)	10.4	(9.80 – 11.0)	20.9	(19.4 – 23.2)	2,205
2005–2006	10.7	(10.3 – 11.1)	5.67	(5.21 – 5.91)	10.6	(10.0 – 11.1)	20.0	(19.1 – 21.1)	1,954
20–39 years									
2001–2002	12.1	(11.5 – 12.9)	5.47	(5.16 – 5.73)	12.0	(11.2 – 12.7)	27.1	(25.7 – 30.7)	1,714
2005–2006	13.6	(13.1 – 14.1)	5.91	(5.19 – 6.41)	13.6	(12.9 – 14.4)	29.3	(27.7 – 32.1)	1,688
40–59 years									
2001–2002	14.4	(13.6 – 15.2)	6.47	(5.69 – 7.04)	14.1	(13.5 – 14.9)	32.6	(31.0 – 35.5)	1,468
2005–2006	14.5	(13.8 – 15.2)	5.82	(5.28 – 6.13)	14.5	(13.7 – 15.2)	35.7	(33.3 – 37.8)	1,365
60 years and older									
2001–2002	15.2	(14.3 – 16.2)	6.14	(5.54 – 6.68)	15.3	(14.3 – 16.6)	35.1	(33.3 – 41.0)	1,522
2005–2006	15.5	(14.9 – 16.2)	6.44	(6.02 – 6.69)	15.7	(15.0 – 16.5)	35.9	(32.8 – 40.3)	1,387
Gender									
(6 years and older)									
Males									
2001–2002	13.0	(12.5 – 13.6)	5.67	(5.35 – 6.01)	13.0	(12.4 – 13.6)	29.8	(28.3 – 31.7)	3,832
2005–2006	13.6	(13.1 – 14.0)	5.93	(5.42 – 6.35)	13.5	(13.0 – 14.1)	30.7	(28.7 – 31.4)	3,547
Females									
2001–2002	13.1	(12.5 – 13.7)	5.87	(5.59 – 6.03)	12.7	(12.1 – 13.5)	31.4	(28.8 – 33.0)	4,091
2005–2006	14.0	(13.5 – 14.4)	5.89	(5.69 – 6.13)	13.8	(13.3 – 14.4)	32.8	(31.0 – 35.7)	3,707
Race/ethnicity									
(6 years and older)									
Mexican Americans									
2001–2002	13.7	(13.3 – 14.2)	6.58	(6.15 – 6.84)	13.6	(13.2 – 14.1)	28.5	(26.8 – 30.7)	1,988
2005–2006	15.1	(14.5 – 15.8)	7.41	(6.79 – 7.83)	15.0	(14.4 – 15.6)	31.3	(29.2 – 34.1)	1,844
Non-Hispanic Blacks									
2001–2002	14.2	(13.1 – 15.5)	6.80	(6.20 – 7.20)	14.1	(12.8 – 15.5)	30.7	(28.5 – 34.6)	1,864
2005–2006	15.3	(14.8 – 15.8)	7.03	(6.33 – 7.71)	15.4	(15.0 – 15.8)	31.5	(29.4 – 35.1)	1,891
Non-Hispanic Whites									
2001–2002	12.6	(12.0 – 13.2)	5.60	(5.14 – 5.90)	12.4	(11.7 – 13.1)	28.8	(27.2 – 31.8)	3,447
2005–2006	13.2	(12.8 – 13.6)	5.70	(5.33 – 5.88)	12.9	(12.5 – 13.4)	30.9	(29.1 – 32.8)	2,973

Figure 2.10.b. Serum lutein/zeaxanthin: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006

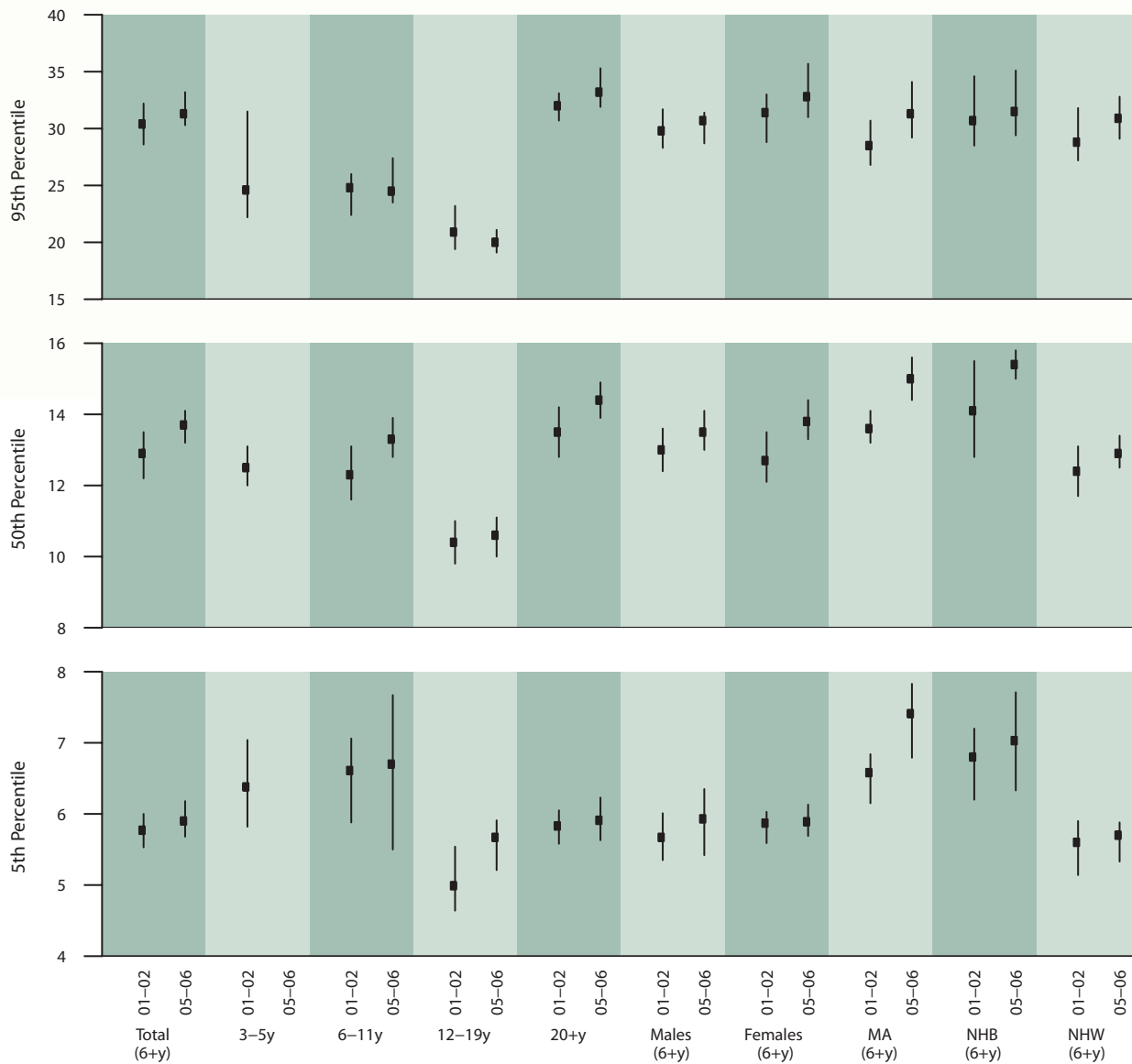


Table 2.11.a.1. Serum trans-lycopene: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	21.2 (20.7 – 21.7)	5.64 (4.99 – 6.25)	7.81 (7.33 – 8.40)	22.7 (22.2 – 23.2)	43.6 (42.4 – 44.9)	48.4 (47.5 – 49.8)	7,254
Age group							
6–11 years	21.7 (20.5 – 22.9)	7.67 (5.27 – 9.29)	9.48 (7.38 – 10.9)	22.5 (21.1 – 23.7)	42.8 (40.0 – 46.0)	46.1 (44.0 – 54.8)	860
12–19 years	21.9 (21.1 – 22.6)	8.42 (7.31 – 8.78)	9.91 (8.98 – 11.0)	22.3 (21.8 – 22.9)	42.6 (40.2 – 45.1)	46.8 (44.4 – 52.7)	1,954
20–39 years	23.9 (23.3 – 24.4)	8.24 (7.38 – 8.96)	10.7 (8.97 – 11.4)	25.1 (24.3 – 25.6)	46.1 (44.1 – 47.2)	51.6 (48.9 – 53.5)	1,688
40–59 years	21.6 (20.4 – 22.8)	5.13 (3.76 – 6.34)	7.69 (6.02 – 8.98)	23.2 (22.1 – 24.4)	44.6 (42.5 – 47.1)	50.0 (47.2 – 55.9)	1,365
60 years and older	16.4 (15.4 – 17.4)	3.75 (2.69 – 4.36)	5.19 (4.32 – 5.97)	17.8 (16.8 – 19.0)	38.8 (37.3 – 40.7)	44.4 (40.7 – 46.5)	1,387
Gender							
Males	21.8 (21.0 – 22.6)	5.79 (4.54 – 6.70)	7.85 (6.99 – 8.89)	23.4 (22.6 – 24.3)	44.7 (43.7 – 47.0)	52.1 (49.0 – 55.7)	3,547
Females	20.6 (20.0 – 21.2)	5.47 (4.93 – 6.39)	7.76 (7.09 – 8.40)	22.2 (21.5 – 22.6)	42.3 (41.2 – 43.9)	46.3 (45.1 – 48.8)	3,707
Race/ethnicity							
Mexican Americans	19.5 (19.1 – 20.0)	7.04 (6.09 – 7.33)	8.80 (7.83 – 9.29)	20.2 (19.6 – 20.9)	38.0 (36.4 – 40.2)	42.5 (39.8 – 49.9)	1,844
Non-Hispanic Blacks	22.0 (20.9 – 23.2)	6.29 (5.46 – 6.99)	8.11 (7.39 – 8.77)	23.5 (22.6 – 24.7)	47.0 (44.7 – 49.5)	53.5 (51.0 – 57.3)	1,891
Non-Hispanic Whites	21.3 (20.8 – 21.9)	5.46 (4.83 – 6.26)	7.69 (7.04 – 8.47)	23.0 (22.4 – 23.5)	43.8 (42.4 – 45.2)	48.5 (47.3 – 50.6)	2,973

Figure 2.11.a. Serum trans-lycopene: Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

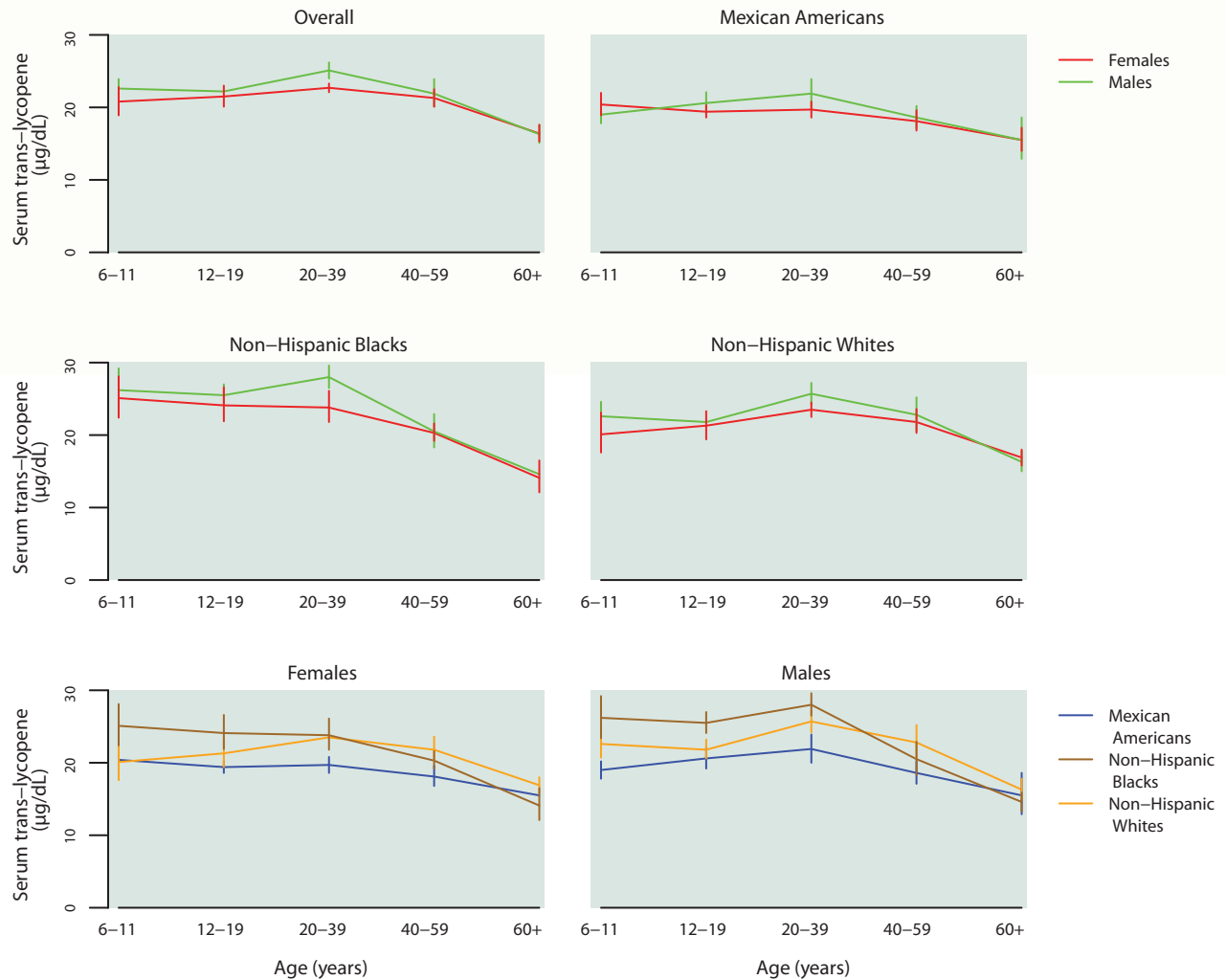


Table 2.11.a.2. Serum trans-lycopene: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	21.2 (20.7 – 21.7)	10.7 (10.1 – 11.3)	22.7 (22.2 – 23.2)	38.9 (37.7 – 39.8)	7,254
6–11 years	21.7 (20.5 – 22.9)	11.6 (10.5 – 12.9)	22.5 (21.1 – 23.7)	38.3 (36.3 – 40.3)	860
12–19 years	21.9 (21.1 – 22.6)	12.9 (12.2 – 13.6)	22.3 (21.8 – 22.9)	37.2 (35.8 – 39.1)	1,954
20–39 years	23.9 (23.3 – 24.4)	13.4 (11.8 – 14.8)	25.1 (24.3 – 25.6)	40.2 (39.5 – 41.2)	1,688
40–59 years	21.6 (20.4 – 22.8)	11.0 (9.50 – 11.9)	23.2 (22.1 – 24.4)	39.9 (38.4 – 41.8)	1,365
60 years and older	16.4 (15.4 – 17.4)	7.14 (6.48 – 7.69)	17.8 (16.8 – 19.0)	33.7 (32.3 – 36.1)	1,387
Males					
Total, 6 years and older	21.8 (21.0 – 22.6)	11.2 (10.3 – 11.8)	23.4 (22.6 – 24.3)	39.6 (38.1 – 41.0)	3,547
6–11 years	22.6 (21.4 – 23.9)	12.8 (11.0 – 14.4)	23.1 (21.8 – 24.3)	38.6 (36.9 – 40.8)	427
12–19 years	22.2 (21.4 – 23.0)	13.4 (11.5 – 14.2)	22.7 (22.0 – 23.6)	37.2 (36.3 – 38.7)	980
20–39 years	25.1 (24.0 – 26.2)	14.6 (11.9 – 15.8)	26.2 (24.9 – 27.4)	41.4 (40.0 – 43.7)	738
40–59 years	21.9 (20.1 – 23.9)	10.9 (8.58 – 12.4)	23.9 (22.3 – 25.6)	40.6 (37.3 – 43.9)	673
60 years and older	16.3 (15.1 – 17.6)	7.44 (6.33 – 7.78)	17.8 (16.4 – 19.1)	33.5 (31.3 – 36.8)	729
Females					
Total, 6 years and older	20.6 (20.0 – 21.2)	10.3 (9.56 – 11.1)	22.2 (21.5 – 22.6)	38.2 (36.7 – 39.5)	3,707
6–11 years	20.8 (18.9 – 22.8)	10.4 (8.68 – 12.8)	21.7 (20.3 – 23.5)	37.3 (35.2 – 41.9)	433
12–19 years	21.5 (20.1 – 23.0)	12.8 (10.7 – 13.7)	21.9 (21.0 – 23.2)	37.1 (34.6 – 40.6)	974
20–39 years	22.7 (22.1 – 23.3)	12.9 (11.1 – 14.2)	23.7 (23.0 – 24.6)	39.0 (35.9 – 41.3)	950
40–59 years	21.3 (20.1 – 22.5)	11.0 (9.50 – 11.9)	22.4 (21.0 – 24.3)	39.3 (38.6 – 40.8)	692
60 years and older	16.4 (15.3 – 17.6)	6.89 (6.29 – 7.73)	17.9 (16.6 – 19.3)	34.2 (31.5 – 38.3)	658

Table 2.11.a.3. Serum trans-lycopene: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	19.5 (19.1 – 20.0)	10.7 (10.1 – 11.2)	20.2 (19.6 – 20.9)	33.7 (32.8 – 34.4)	1,844
6–11 years	19.6 (18.5 – 20.8)	11.0 (9.47 – 13.0)	20.1 (19.1 – 21.2)	32.4 (31.2 – 34.0)	295
12–19 years	20.0 (19.2 – 20.9)	12.0 (10.1 – 12.8)	20.9 (19.8 – 22.1)	33.5 (32.3 – 35.2)	646
20–39 years	20.9 (19.7 – 22.1)	11.6 (9.65 – 13.5)	22.0 (21.0 – 23.3)	34.7 (33.4 – 38.1)	449
40–59 years	18.4 (17.3 – 19.5)	10.0 (9.04 – 11.0)	18.8 (18.2 – 19.4)	32.8 (30.6 – 37.0)	246
60 years and older	15.5 (14.0 – 17.1)	7.71 (5.24 – 8.87)	16.1 (14.7 – 17.7)	28.6 (26.1 – 33.2)	208
Males					
Total, 6 years and older	20.1 (19.4 – 20.8)	11.0 (9.96 – 12.0)	21.1 (20.1 – 22.2)	34.4 (32.2 – 37.6)	883
6–11 years	19.0 (17.8 – 20.2)	10.9 (9.33 – 12.7)	19.5 (18.2 – 20.5)	32.1 (28.9 – 36.1)	145
12–19 years	20.6 (19.2 – 22.1)	12.3 (8.72 – 13.6)	22.1 (19.9 – 23.4)	34.0 (32.7 – 35.5)	313
20–39 years	21.9 (20.0 – 23.9)	13.2 (8.92 – 15.1)	23.1 (21.5 – 24.9)	35.1 (32.1 – 44.4)	198
40–59 years	18.6 (17.1 – 20.2)	10.1 (7.36 – 11.3)	19.3 (17.8 – 20.7)	32.7 (28.9 – 39.9)	122
60 years and older	15.5 (12.9 – 18.6)	7.41† (2.71 – 8.77)	16.2 (13.9 – 19.3)	31.3† (25.2 – 56.0)	105
Females					
Total, 6 years and older	19.0 (18.4 – 19.5)	10.5 (10.0 – 11.0)	19.4 (18.5 – 20.2)	33.3 (32.1 – 34.1)	961
6–11 years	20.4 (18.9 – 22.0)	11.4 (9.53 – 13.4)	21.2 (19.3 – 23.0)	32.5 (31.2 – 35.0)	150
12–19 years	19.4 (18.6 – 20.3)	11.8 (10.1 – 12.2)	20.0 (19.4 – 20.9)	32.9 (31.5 – 35.7)	333
20–39 years	19.7 (18.6 – 20.8)	10.8 (9.95 – 12.7)	20.0 (18.5 – 23.4)	34.1 (32.5 – 36.7)	251
40–59 years	18.1 (16.8 – 19.6)	10.0 (9.01 – 11.0)	18.0 (16.9 – 19.1)	32.8 (30.5 – 34.5)	124
60 years and older	15.5 (14.0 – 17.2)	7.98† (5.24 – 10.5)	16.0 (13.3 – 18.1)	26.7† (25.0 – 31.2)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.11.a.4. Serum trans-lycopene: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	22.0 (20.9 – 23.2)	10.8 (9.77 – 11.8)	23.5 (22.6 – 24.7)	40.0 (39.1 – 41.7)	1,891
6–11 years	25.6 (23.3 – 28.2)	13.7 (11.1 – 17.0)	27.0 (24.6 – 28.9)	41.8 (38.7 – 45.9)	240
12–19 years	24.8 (23.5 – 26.2)	14.3 (12.9 – 15.4)	25.8 (23.6 – 27.4)	41.6 (39.1 – 44.9)	665
20–39 years	25.7 (24.2 – 27.2)	14.5 (12.4 – 15.6)	26.3 (25.0 – 27.8)	42.4 (39.6 – 47.1)	368
40–59 years	20.4 (19.1 – 21.8)	9.89 (8.68 – 10.8)	21.3 (19.9 – 23.3)	38.6 (36.2 – 43.4)	335
60 years and older	14.3 (13.1 – 15.7)	6.20 (4.94 – 6.93)	15.3 (14.5 – 16.5)	31.2 (27.5 – 35.7)	283
Males					
Total, 6 years and older	23.1 (21.9 – 24.3)	11.2 (9.87 – 12.4)	24.9 (23.3 – 26.4)	41.8 (39.8 – 44.9)	949
6–11 years	26.2 (23.4 – 29.2)	16.4 (10.4 – 18.0)	27.0 (23.4 – 29.8)	40.1 (38.4 – 46.3)	128
12–19 years	25.5 (24.1 – 27.0)	14.9 (13.5 – 16.1)	26.2 (23.9 – 27.8)	43.2 (39.5 – 51.7)	343
20–39 years	28.0 (26.5 – 29.6)	15.3 (13.6 – 16.8)	27.9 (26.2 – 30.2)	47.8 (42.5 – 52.7)	170
40–59 years	20.5 (18.3 – 22.9)	9.19 (6.70 – 10.9)	22.1 (18.9 – 26.4)	38.6 (35.6 – 51.3)	156
60 years and older	14.6 (13.3 – 15.9)	5.56 (4.94 – 6.14)	15.5 (15.0 – 17.1)	32.1 (30.0 – 38.1)	152
Females					
Total, 6 years and older	21.2 (19.8 – 22.7)	10.6 (9.30 – 11.6)	22.5 (21.1 – 23.7)	39.0 (37.2 – 41.0)	942
6–11 years	25.1 (22.4 – 28.1)	12.4 (9.15 – 15.1)	26.7 (24.9 – 28.9)	42.1 (38.4 – 49.7)	112
12–19 years	24.1 (21.9 – 26.6)	13.9 (10.5 – 15.5)	24.8 (22.1 – 27.6)	39.8 (36.6 – 43.9)	322
20–39 years	23.8 (21.8 – 26.1)	13.6 (10.9 – 15.7)	25.0 (22.1 – 27.2)	39.1 (37.4 – 41.6)	198
40–59 years	20.3 (19.2 – 21.6)	9.99 (9.03 – 11.3)	20.9 (18.1 – 23.3)	39.0 (34.8 – 44.3)	179
60 years and older	14.1 (12.1 – 16.5)	6.71 (3.54 – 7.89)	15.0 (13.0 – 17.4)	28.1 (24.6 – 39.1)	131

Table 2.11.a.5. Serum trans-lycopene: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	21.3 (20.8 – 21.9)	10.8 (10.1 – 11.3)	23.0 (22.4 – 23.5)	39.1 (37.5 – 40.6)	2,973
6–11 years	21.4 (19.6 – 23.4)	11.1 (9.63 – 12.9)	22.1 (20.4 – 24.0)	37.5 (33.7 – 42.4)	231
12–19 years	21.6 (20.6 – 22.6)	13.0 (11.1 – 13.7)	22.1 (21.4 – 22.7)	37.0 (35.0 – 39.9)	499
20–39 years	24.6 (23.6 – 25.6)	13.7 (11.4 – 16.4)	25.6 (24.8 – 26.4)	40.7 (39.6 – 42.3)	714
40–59 years	22.3 (20.9 – 23.9)	11.7 (9.54 – 13.0)	24.2 (22.9 – 25.3)	40.5 (38.3 – 42.2)	683
60 years and older	16.6 (15.6 – 17.6)	7.32 (6.45 – 8.11)	18.0 (16.9 – 19.2)	34.2 (32.3 – 37.0)	846
Males					
Total, 6 years and older	21.9 (21.0 – 22.9)	11.3 (10.3 – 11.9)	23.6 (22.7 – 24.8)	39.6 (37.9 – 41.6)	1,472
6–11 years	22.6 (20.7 – 24.6)	12.8 (8.41 – 14.9)	23.0 (21.1 – 24.8)	38.3 (33.4 – 43.2)	112
12–19 years	21.8 (20.6 – 23.2)	13.2 (10.0 – 14.3)	22.5 (21.1 – 24.3)	36.6 (35.8 – 38.4)	254
20–39 years	25.7 (24.2 – 27.2)	14.8 (11.8 – 17.1)	26.5 (25.1 – 28.4)	41.5 (39.6 – 46.1)	309
40–59 years	22.8 (20.6 – 25.2)	11.8 (8.02 – 14.0)	25.0 (23.2 – 27.0)	41.2 (38.1 – 44.0)	351
60 years and older	16.3 (15.0 – 17.8)	7.49 (6.36 – 8.08)	17.7 (16.0 – 19.2)	33.7 (31.3 – 37.0)	446
Females					
Total, 6 years and older	20.8 (20.0 – 21.7)	10.2 (9.48 – 11.1)	22.4 (21.5 – 23.1)	38.5 (36.5 – 40.3)	1,501
6–11 years	20.1 (17.6 – 23.1)	9.66 (4.60 – 12.9)	20.7 (19.2 – 23.2)	36.7 (30.8 – 50.0)	119
12–19 years	21.3 (19.4 – 23.3)	12.7 (9.21 – 14.2)	21.6 (20.3 – 23.5)	37.2 (33.9 – 41.5)	245
20–39 years	23.5 (22.5 – 24.5)	13.0 (10.2 – 16.2)	24.6 (23.3 – 25.3)	40.2 (35.9 – 42.7)	405
40–59 years	21.8 (20.3 – 23.6)	11.7 (9.46 – 12.9)	23.4 (21.4 – 25.3)	39.7 (37.9 – 41.1)	332
60 years and older	16.9 (15.8 – 18.0)	7.00 (6.17 – 8.28)	18.3 (17.1 – 20.1)	34.4 (32.1 – 38.5)	400

Table 2.11.b. Serum trans-lycopene: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
2001–2002	20.6 (19.9 – 21.3)	7.87 (7.49 – 8.27)	22.2 (21.3 – 23.1)	42.5 (41.0 – 43.9)	7,921
2005–2006	21.2 (20.7 – 21.7)	7.81 (7.33 – 8.40)	22.7 (22.2 – 23.2)	43.6 (42.4 – 44.9)	7,254
Age group					
3–5 years					
2001–2002	16.1 (15.2 – 17.1)	6.16 (3.73 – 7.47)	17.3 (16.2 – 18.1)	33.9 (32.8 – 37.9)	427
6–11 years					
2001–2002	21.6 (20.7 – 22.5)	9.31 (8.20 – 9.83)	22.7 (21.4 – 23.6)	40.5 (37.7 – 47.0)	1,012
2005–2006	21.7 (20.5 – 22.9)	9.48 (7.38 – 10.9)	22.5 (21.1 – 23.7)	42.8 (40.0 – 46.0)	860
12–19 years					
2001–2002	21.6 (21.1 – 22.1)	10.5 (9.69 – 11.1)	22.2 (21.8 – 22.7)	40.5 (38.1 – 43.2)	2,205
2005–2006	21.9 (21.1 – 22.6)	9.91 (8.98 – 11.0)	22.3 (21.8 – 22.9)	42.6 (40.2 – 45.1)	1,954
20–39 years					
2001–2002	22.7 (21.5 – 23.9)	10.3 (9.02 – 11.5)	23.7 (22.5 – 24.9)	44.9 (42.4 – 47.1)	1,714
2005–2006	23.9 (23.3 – 24.4)	10.7 (8.97 – 11.4)	25.1 (24.3 – 25.6)	46.1 (44.1 – 47.2)	1,688
40–59 years					
2001–2002	21.1 (20.1 – 22.1)	7.82 (7.02 – 8.61)	22.7 (21.4 – 24.1)	42.6 (41.2 – 43.8)	1,468
2005–2006	21.6 (20.4 – 22.8)	7.69 (6.02 – 8.98)	23.2 (22.1 – 24.4)	44.6 (42.5 – 47.1)	1,365
60 years and older					
2001–2002	15.4 (14.6 – 16.3)	4.15 (2.92 – 5.13)	17.1 (16.1 – 17.9)	39.0 (36.4 – 41.3)	1,522
2005–2006	16.4 (15.4 – 17.4)	5.19 (4.32 – 5.97)	17.8 (16.8 – 19.0)	38.8 (37.3 – 40.7)	1,387
Gender					
(6 years and older)					
Males					
2001–2002	21.4 (20.6 – 22.3)	8.02 (7.31 – 8.80)	23.3 (22.3 – 24.2)	44.2 (42.8 – 46.3)	3,832
2005–2006	21.8 (21.0 – 22.6)	7.85 (6.99 – 8.89)	23.4 (22.6 – 24.3)	44.7 (43.7 – 47.0)	3,547
Females					
2001–2002	19.8 (19.2 – 20.5)	7.82 (7.13 – 8.34)	21.2 (20.4 – 22.0)	40.3 (38.9 – 42.1)	4,089
2005–2006	20.6 (20.0 – 21.2)	7.76 (7.09 – 8.40)	22.2 (21.5 – 22.6)	42.3 (41.2 – 43.9)	3,707
Race/ethnicity					
(6 years and older)					
Mexican Americans					
2001–2002	20.0 (19.2 – 20.8)	8.89 (7.84 – 9.62)	20.7 (20.1 – 21.7)	39.8 (38.1 – 42.0)	1,987
2005–2006	19.5 (19.1 – 20.0)	8.80 (7.83 – 9.29)	20.2 (19.6 – 20.9)	38.0 (36.4 – 40.2)	1,844
Non-Hispanic Blacks					
2001–2002	21.7 (21.0 – 22.3)	8.03 (6.83 – 9.11)	23.4 (22.2 – 24.3)	46.6 (44.9 – 49.0)	1,864
2005–2006	22.0 (20.9 – 23.2)	8.11 (7.39 – 8.77)	23.5 (22.6 – 24.7)	47.0 (44.7 – 49.5)	1,891
Non-Hispanic Whites					
2001–2002	20.8 (20.1 – 21.6)	8.17 (7.55 – 8.72)	22.4 (21.3 – 23.5)	42.5 (40.9 – 44.0)	3,446
2005–2006	21.3 (20.8 – 21.9)	7.69 (7.04 – 8.47)	23.0 (22.4 – 23.5)	43.8 (42.4 – 45.2)	2,973

Figure 2.11.b. Serum trans-lycopene: Concentrations by survey cycle

Selected percentiles in $\mu\text{g}/\text{dL}$ (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2002 and 2005–2006

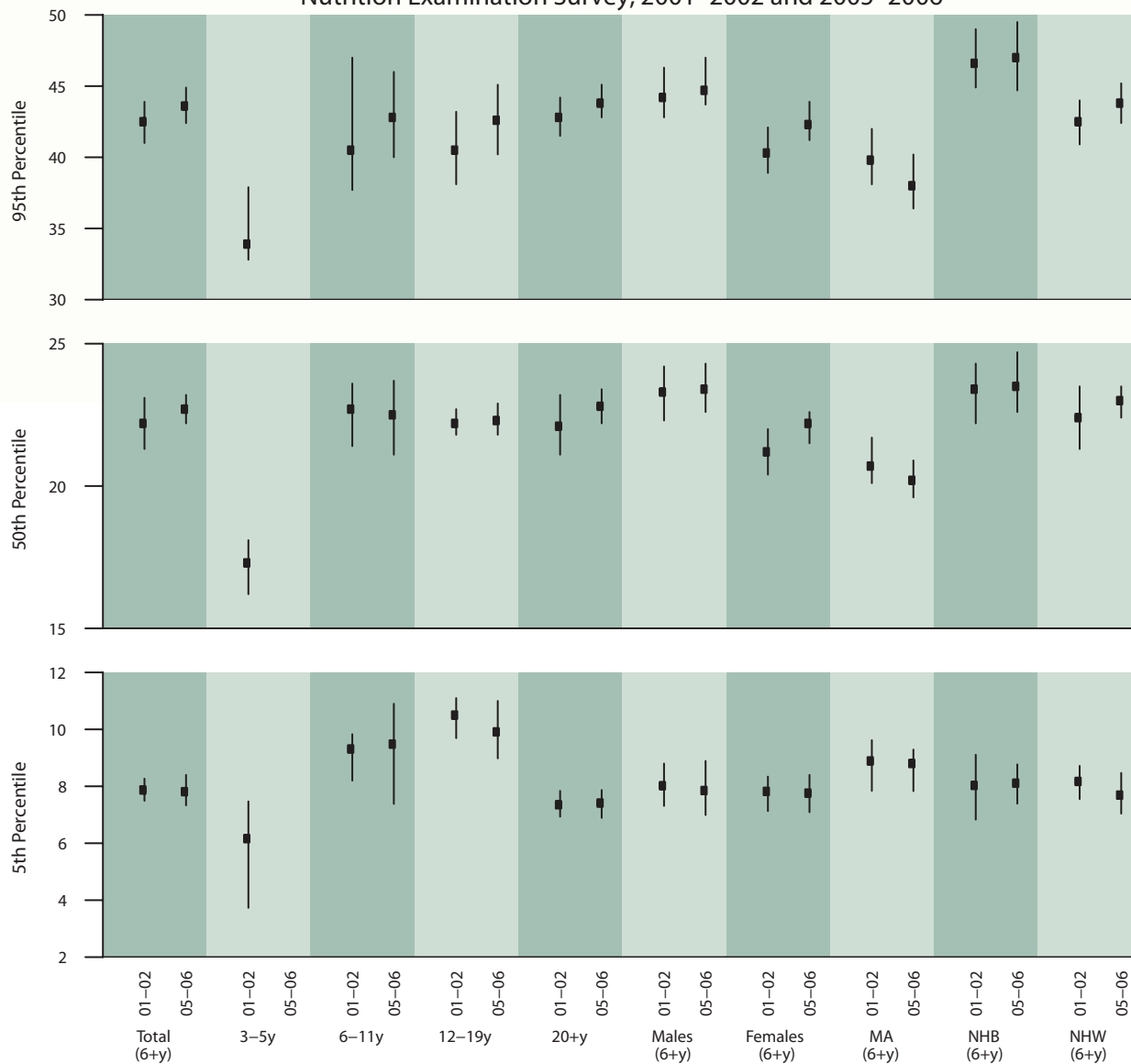


Table 2.12.a.1. Serum total lycopene: Concentrations

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 6 years and older	39.4 (38.5 – 40.2)	11.3 (10.4 – 12.6)	15.4 (14.6 – 16.1)	41.8 (41.0 – 42.6)	80.8 (78.8 – 82.5)	90.7 (87.9 – 94.7)	7,149
Age group							
6–11 years	39.7 (37.5 – 42.0)	14.9 (10.7 – 17.8)	18.8 (15.1 – 19.9)	40.9 (38.5 – 44.1)	78.4 (74.8 – 82.5)	83.0 (80.6 – 105)	851
12–19 years	39.5 (38.2 – 40.8)	15.4 (12.9 – 17.4)	19.1 (17.2 – 20.9)	40.6 (39.6 – 42.0)	73.9 (71.5 – 79.0)	82.8 (78.1 – 93.4)	1,907
20–39 years	43.8 (42.7 – 44.9)	15.9 (14.0 – 17.8)	20.0 (17.0 – 21.8)	45.2 (43.8 – 46.6)	83.3 (81.4 – 86.1)	92.7 (87.4 – 99.3)	1,667
40–59 years	40.5 (38.2 – 42.9)	10.6 (7.35 – 13.2)	15.0 (12.4 – 17.1)	43.1 (41.1 – 45.3)	84.1 (79.9 – 89.2)	97.2 (90.7 – 103)	1,346
60 years and older	31.5 (29.8 – 33.2)	8.08 (6.96 – 9.57)	10.7 (9.50 – 12.4)	33.5 (31.4 – 35.9)	72.8 (69.5 – 76.4)	81.7 (76.3 – 89.4)	1,378
Gender							
Males	40.6 (39.3 – 42.0)	11.4 (9.28 – 13.2)	15.6 (13.9 – 17.3)	43.5 (42.2 – 44.7)	84.5 (81.6 – 86.9)	95.2 (89.9 – 103)	3,493
Females	38.2 (37.1 – 39.3)	11.1 (10.3 – 12.9)	15.3 (14.2 – 16.4)	40.1 (38.9 – 41.6)	77.6 (75.1 – 80.5)	86.0 (81.9 – 92.1)	3,656
Race/ethnicity							
Mexican Americans	36.2 (35.3 – 37.1)	13.7 (11.8 – 14.3)	16.6 (15.3 – 17.9)	37.4 (36.1 – 38.9)	70.5 (67.0 – 74.0)	79.3 (74.1 – 91.3)	1,818
Non-Hispanic Blacks	41.3 (39.2 – 43.5)	12.9 (10.9 – 14.2)	16.7 (14.3 – 18.0)	43.1 (41.1 – 45.5)	86.4 (83.0 – 89.5)	97.2 (91.5 – 107)	1,846
Non-Hispanic Whites	39.6 (38.6 – 40.6)	10.9 (9.72 – 12.5)	15.1 (14.2 – 16.0)	42.4 (41.3 – 43.3)	81.1 (78.9 – 82.9)	89.7 (87.2 – 94.8)	2,943

Figure 2.12.a. Serum total lycopene: Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2005–2006

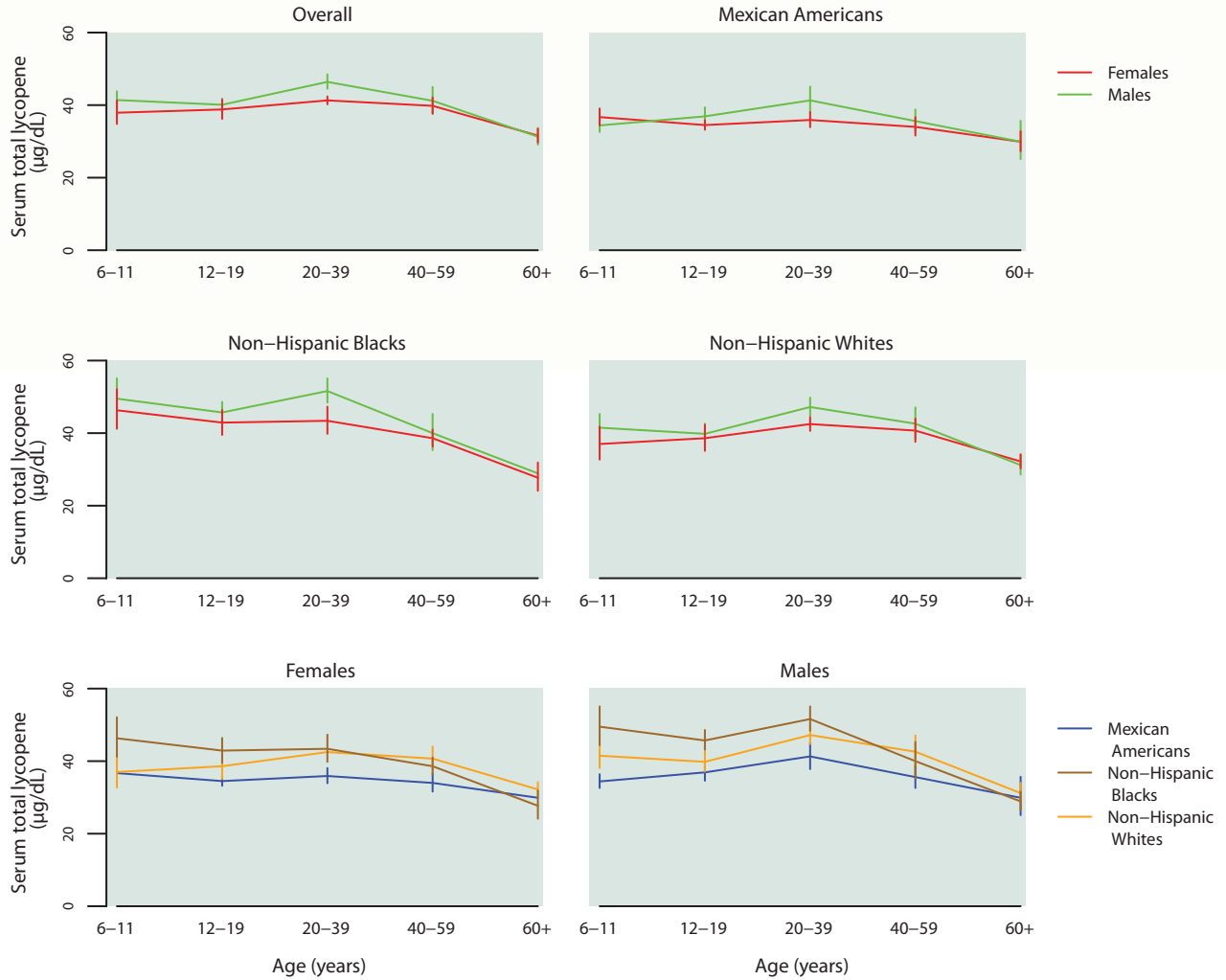


Table 2.12.a.2. Serum total lycopene: Total population

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	39.4 (38.5 – 40.2)	20.5 (19.5 – 21.3)	41.8 (41.0 – 42.6)	71.2 (69.5 – 72.7)	7,149
6–11 years	39.7 (37.5 – 42.0)	21.5 (19.3 – 25.4)	40.9 (38.5 – 44.1)	67.6 (63.5 – 74.9)	851
12–19 years	39.5 (38.2 – 40.8)	23.5 (21.8 – 24.6)	40.6 (39.6 – 42.0)	66.3 (63.1 – 69.6)	1,907
20–39 years	43.8 (42.7 – 44.9)	24.6 (21.9 – 27.2)	45.2 (43.8 – 46.6)	74.0 (72.5 – 75.8)	1,667
40–59 years	40.5 (38.2 – 42.9)	21.0 (18.6 – 22.9)	43.1 (41.1 – 45.3)	72.8 (70.3 – 77.1)	1,346
60 years and older	31.5 (29.8 – 33.2)	14.3 (13.3 – 15.9)	33.5 (31.4 – 35.9)	62.8 (60.2 – 67.5)	1,378
Males					
Total, 6 years and older	40.6 (39.3 – 42.0)	21.2 (20.1 – 22.2)	43.5 (42.2 – 44.7)	72.9 (70.9 – 75.6)	3,493
6–11 years	41.4 (39.2 – 43.8)	23.7 (20.3 – 26.4)	42.1 (39.7 – 44.9)	69.5 (63.4 – 78.2)	421
12–19 years	40.1 (38.5 – 41.8)	23.8 (21.3 – 26.0)	41.1 (40.0 – 42.5)	66.3 (64.6 – 69.4)	955
20–39 years	46.4 (44.5 – 48.5)	26.8 (22.9 – 30.6)	48.3 (45.5 – 51.0)	78.5 (74.6 – 81.9)	730
40–59 years	41.2 (37.7 – 45.0)	20.9 (15.2 – 23.9)	44.9 (42.6 – 47.1)	75.0 (71.0 – 81.4)	663
60 years and older	31.3 (29.1 – 33.7)	14.3 (12.6 – 15.9)	34.4 (31.6 – 36.4)	62.0 (59.0 – 69.3)	724
Females					
Total, 6 years and older	38.2 (37.1 – 39.3)	19.9 (18.8 – 21.1)	40.1 (38.9 – 41.6)	69.3 (67.0 – 71.7)	3,656
6–11 years	37.9 (34.8 – 41.3)	19.4 (16.3 – 24.7)	39.8 (35.7 – 43.9)	66.2 (59.8 – 74.0)	430
12–19 years	38.8 (36.2 – 41.5)	23.4 (20.0 – 24.6)	40.1 (37.8 – 42.7)	65.3 (60.1 – 72.6)	952
20–39 years	41.3 (40.2 – 42.4)	22.6 (20.7 – 26.2)	42.7 (41.5 – 43.7)	71.6 (66.4 – 74.0)	937
40–59 years	39.8 (37.6 – 42.1)	20.9 (18.9 – 22.8)	41.1 (37.8 – 45.0)	71.3 (68.8 – 75.6)	683
60 years and older	31.6 (29.7 – 33.5)	14.2 (12.9 – 16.4)	33.0 (30.8 – 35.8)	64.6 (58.0 – 69.7)	654

Table 2.12.a.3. Serum total lycopene: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	36.2 (35.3 – 37.1)	20.5 (19.5 – 21.7)	37.4 (36.1 – 38.9)	61.5 (58.8 – 63.5)	1,818
6–11 years	35.5 (33.8 – 37.3)	21.0 (18.7 – 22.5)	35.5 (33.8 – 37.3)	58.4 (55.7 – 63.1)	292
12–19 years	35.7 (34.5 – 37.0)	21.8 (19.6 – 23.4)	37.4 (36.0 – 38.7)	58.5 (55.6 – 61.8)	639
20–39 years	38.8 (36.5 – 41.1)	22.7 (18.7 – 24.7)	41.0 (39.1 – 42.5)	63.8 (58.8 – 71.2)	441
40–59 years	34.8 (32.7 – 37.1)	19.6 (17.4 – 21.1)	35.1 (32.6 – 38.5)	60.7 (57.3 – 65.5)	240
60 years and older	29.9 (27.3 – 32.8)	14.7 (11.9 – 17.9)	30.1 (27.9 – 33.8)	54.7 (48.8 – 65.8)	206
Males					
Total, 6 years and older	37.6 (36.3 – 39.0)	21.4 (19.9 – 23.0)	39.2 (36.9 – 40.8)	63.1 (59.5 – 68.0)	867
6–11 years	34.4 (32.6 – 36.4)	20.2 (17.8 – 22.4)	34.3 (31.7 – 36.1)	57.4 (50.5 – 73.4)	142
12–19 years	36.9 (34.6 – 39.4)	22.5 (19.2 – 24.6)	39.1 (36.8 – 40.7)	59.7 (55.9 – 63.9)	310
20–39 years	41.3 (37.8 – 45.1)	24.6 (16.6 – 27.7)	42.6 (40.6 – 45.6)	66.1 (58.3 – 94.4)	192
40–59 years	35.6 (32.6 – 38.8)	19.0 (14.4 – 22.6)	36.4 (33.4 – 40.5)	58.7 (56.0 – 74.3)	120
60 years and older	29.9 (25.1 – 35.7)	14.5† (5.80 – 18.2)	30.2 (26.0 – 36.1)	61.9† (48.0 – 86.3)	103
Females					
Total, 6 years and older	34.8 (33.8 – 35.8)	20.0 (18.7 – 21.4)	35.3 (33.5 – 37.3)	59.5 (56.8 – 62.0)	951
6–11 years	36.7 (34.4 – 39.1)	21.1 (17.7 – 24.4)	36.7 (34.3 – 40.4)	58.8 (56.3 – 62.2)	150
12–19 years	34.5 (33.2 – 35.8)	20.6 (19.0 – 22.6)	34.8 (33.8 – 36.8)	57.8 (51.9 – 62.0)	329
20–39 years	35.9 (33.9 – 38.1)	20.2 (17.5 – 22.7)	37.4 (33.3 – 41.9)	61.4 (56.1 – 68.6)	249
40–59 years	34.0 (31.6 – 36.7)	19.6 (16.1 – 21.4)	33.0 (30.2 – 38.3)	61.0 (55.9 – 67.8)	120
60 years and older	29.9 (27.3 – 32.8)	16.1† (12.1 – 20.5)	29.2 (26.6 – 35.7)	52.7† (48.0 – 59.9)	103

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.12.a.4. Serum total lycopene: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	41.3 (39.2 – 43.5)	21.4 (19.5 – 23.1)	43.1 (41.1 – 45.5)	75.5 (72.1 – 79.6)	1,846
6–11 years	47.9 (43.3 – 52.9)	27.4 (20.5 – 31.8)	49.6 (44.6 – 56.3)	78.5 (73.9 – 84.4)	236
12–19 years	44.3 (42.3 – 46.4)	26.9 (23.9 – 29.0)	45.8 (42.8 – 47.8)	73.1 (69.2 – 78.2)	636
20–39 years	47.0 (44.2 – 50.1)	26.4 (23.2 – 29.6)	49.0 (45.5 – 52.3)	79.6 (76.1 – 82.9)	363
40–59 years	39.2 (36.4 – 42.2)	20.0 (17.1 – 21.4)	40.8 (37.7 – 43.4)	73.7 (66.9 – 84.2)	331
60 years and older	28.2 (26.0 – 30.6)	12.7 (10.4 – 15.4)	29.1 (26.6 – 32.7)	59.0 (53.0 – 68.4)	280
Males					
Total, 6 years and older	43.6 (41.0 – 46.3)	22.9 (19.5 – 24.5)	45.8 (42.8 – 48.4)	81.2 (76.4 – 87.8)	922
6–11 years	49.5 (44.4 – 55.1)	30.6 (15.3 – 35.9)	50.4 (42.4 – 58.7)	76.8 (70.9 – 91.8)	126
12–19 years	45.7 (43.1 – 48.6)	28.9 (25.6 – 30.2)	46.7 (43.6 – 50.4)	76.3 (69.3 – 90.2)	324
20–39 years	51.6 (48.4 – 55.1)	29.7 (25.9 – 31.9)	51.4 (48.1 – 54.9)	86.3 (81.2 – 90.5)	169
40–59 years	40.0 (35.3 – 45.3)	18.4 (13.2 – 22.9)	41.1 (36.8 – 47.4)	82.9 (67.2 – 97.5)	153
60 years and older	28.9 (26.5 – 31.6)	12.5 (11.1 – 13.0)	31.1 (28.3 – 34.7)	59.5 (52.9 – 66.0)	150
Females					
Total, 6 years and older	39.3 (37.0 – 41.8)	20.8 (18.5 – 22.2)	41.0 (39.4 – 43.0)	71.4 (68.7 – 74.1)	924
6–11 years	46.3 (41.2 – 52.1)	24.6† (17.9 – 27.5)	48.5 (44.6 – 54.8)	78.5† (72.8 – 84.6)	110
12–19 years	42.9 (39.5 – 46.4)	25.6 (20.1 – 28.1)	44.1 (39.8 – 48.0)	70.4 (67.3 – 75.3)	312
20–39 years	43.4 (39.8 – 47.3)	23.6 (21.0 – 28.0)	44.5 (40.4 – 50.6)	72.6 (68.4 – 76.7)	194
40–59 years	38.6 (36.3 – 41.0)	20.1 (17.1 – 21.5)	40.2 (36.7 – 43.0)	68.6 (63.6 – 75.8)	178
60 years and older	27.7 (24.1 – 31.9)	12.8 (8.09 – 17.2)	28.6 (24.8 – 32.4)	57.6 (45.4 – 82.2)	130

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.12.a.5. Serum total lycopene: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in µg/dL) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2005–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	39.6 (38.6 – 40.6)	20.4 (19.4 – 21.3)	42.4 (41.3 – 43.3)	71.5 (69.4 – 73.8)	2,943
6–11 years	39.3 (35.9 – 43.1)	20.7 (18.9 – 24.9)	40.6 (37.7 – 44.9)	64.8 (58.7 – 78.0)	230
12–19 years	39.2 (37.5 – 40.9)	23.3 (20.8 – 24.8)	40.7 (39.3 – 42.1)	66.2 (62.8 – 70.2)	489
20–39 years	44.8 (43.2 – 46.5)	25.3 (21.5 – 29.3)	45.9 (44.0 – 48.4)	75.4 (72.5 – 77.8)	706
40–59 years	41.6 (38.8 – 44.6)	22.2 (17.8 – 24.4)	44.7 (42.6 – 47.0)	73.9 (70.4 – 78.5)	674
60 years and older	31.7 (30.0 – 33.5)	14.4 (13.3 – 16.2)	33.9 (31.7 – 36.7)	62.9 (60.2 – 67.4)	844
Males					
Total, 6 years and older	40.7 (39.2 – 42.3)	21.0 (19.7 – 22.0)	43.9 (42.5 – 45.2)	73.2 (70.9 – 76.0)	1,461
6–11 years	41.5 (38.1 – 45.3)	23.6† (19.7 – 26.4)	42.3 (39.5 – 45.7)	66.0† (58.8 – 81.5)	111
12–19 years	39.8 (37.1 – 42.6)	23.2 (19.9 – 27.0)	41.0 (38.4 – 43.0)	66.3 (63.5 – 69.8)	251
20–39 years	47.2 (44.7 – 49.8)	26.8 (21.7 – 31.6)	49.4 (45.9 – 52.3)	78.7 (73.9 – 85.0)	308
40–59 years	42.6 (38.4 – 47.1)	22.4 (15.0 – 27.3)	46.3 (44.0 – 49.0)	75.3 (70.9 – 82.7)	346
60 years and older	31.2 (28.6 – 34.0)	14.4 (12.3 – 16.1)	33.9 (30.8 – 36.5)	62.0 (58.8 – 69.7)	445
Females					
Total, 6 years and older	38.5 (36.9 – 40.1)	19.7 (18.2 – 21.3)	40.7 (38.9 – 42.5)	69.6 (66.8 – 72.6)	1,482
6–11 years	37.0 (32.7 – 41.8)	19.1 (13.7 – 25.3)	39.1 (33.8 – 43.3)	61.9 (54.6 – 78.0)	119
12–19 years	38.6 (35.1 – 42.3)	23.6 (18.0 – 25.6)	40.4 (37.0 – 43.4)	64.4 (57.9 – 75.6)	238
20–39 years	42.5 (40.6 – 44.4)	22.9 (19.9 – 28.7)	43.2 (41.9 – 44.2)	72.1 (66.5 – 77.0)	398
40–59 years	40.7 (37.6 – 44.0)	21.6 (17.5 – 24.5)	42.4 (39.0 – 47.4)	72.1 (68.7 – 78.7)	328
60 years and older	32.2 (30.3 – 34.2)	14.3 (12.9 – 16.6)	33.8 (31.6 – 37.1)	64.5 (59.0 – 68.7)	399

† Estimate is subject to greater uncertainty due to small cell size.

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Vitamin D

Background Information

Sources and Physiological Functions. Vitamin D (calciferol) comprises a group of fat soluble seco-sterols found naturally in only a few foods, such as fish-liver oils, fatty fishes, mushrooms, egg yolks, and liver. The two major physiologically relevant forms of vitamin D are D₂ (ergocalciferol) and D₃ (cholecalciferol). Vitamin D₃ is photosynthesized in the skin of vertebrates by the action of solar ultraviolet (UV) B radiation on 7-dehydrocholesterol present in the skin (Fieser 1959). Vitamin D₂ is produced by UV irradiation of ergosterol, which occurs in molds, yeast, and higher-order plants. Under conditions of regular sun exposure, dietary vitamin D intake is of minor importance. However, latitude, season, aging, sunscreen use, and skin pigmentation influence the production of vitamin D₃ by the skin (Institute of Medicine 2011). In the United States, most of the dietary intake of vitamin D comes from fortified milk products and other fortified foods such as breakfast cereals and orange juice (Institute of Medicine 2011). Both vitamin D₂ and D₃ are used in nonprescription vitamin D supplements, but vitamin D₂ is the only form available by prescription in the United States (Holick 2007).

Vitamin D without a subscript represents either D₂ or D₃ or both. Vitamin D, *per se*, is biologically inert. Whether derived from the skin or diet, vitamin D is only short-lived in circulation (with a half-life of 1–2 days), as it is either stored in fat cells or metabolized in the liver (Mawer 1972). In circulation, vitamin D is bound to vitamin D-binding protein and transported to the liver, where it is converted to 25-hydroxyvitamin D [25(OH)D] (DeLuca 1984). This major circulating form of vitamin D is a good reflection of cumulative effects of exposure to sunlight and dietary intake of vitamin D (Haddad 1973; Holick 1995) and is therefore used by clinicians to determine vitamin D status. To be biologically activated at physiologic concentrations, 25(OH)D must be converted in the kidneys to 1,25-dihydroxyvitamin D [1,25(OH)₂D], which is thought to be responsible for most, if not all, of the biologic functions of vitamin D (DeLuca 1988; Reichel 1989). The production of 25(OH)D in the liver is a function of vitamin D availability from dietary intake and sun exposure whereas production of 1,25(OH)₂D in the kidney is tightly regulated by mineral requirements. In the liver, vitamin D-25-hydroxylase is down-regulated by vitamin D and its metabolites, thereby limiting any increase in the circulating concentration of 25(OH)D following intakes or following production of vitamin D after exposure to sunlight. In the kidney, in response to serum calcium and phosphorus concentrations, the production of 1,25(OH)₂D is regulated through the action of parathyroid hormone (PTH) (DeLuca 1988; Reichel 1989).

Health Effects. Active vitamin D (1,25-dihydroxyvitamin D) functions as a hormone, and its main biologic function in people is to maintain serum calcium and phosphorus concentrations within the normal range by enhancing the efficiency of the small intestine to absorb these minerals from the diet (DeLuca 1988; Reichel 1989). When dietary calcium intake is inadequate to satisfy the body's calcium requirement, 1,25(OH)₂D, along with PTH, mobilizes calcium stores from the bone. In the kidney, 1,25(OH)₂D increases calcium reabsorption by the distal renal tubules. Apart from these traditional calcium-related actions, 1,25(OH)₂D and its synthetic analogs are increasingly recognized for their potent anti-proliferative, pro-differentiative, and immunomodulatory activities (Nagpal 2005).

Vitamin D deficiency is characterized by inadequate mineralization or by demineralization of the skeleton. Among children, vitamin D deficiency is a common cause of bone deformities known as rickets. Vitamin D deficiency in adults leads to a mineralization defect in the skeleton,

causing osteomalacia, and it induces secondary hyperparathyroidism with consequent bone loss and osteoporosis. Potential roles for vitamin D beyond bone health, such as effects on muscle strength, the risk for cancer, and the risk for type 2 diabetes, are under intense investigation. The Agency for Healthcare Research and Quality (AHRQ) reviewed the effectiveness and safety of vitamin D on outcomes related to bone health (Cranney 2007). The report suggests that vitamin D supplementation has positive effects on bone health in postmenopausal women and older men. Another AHRQ systematic review of vitamin D status and health outcomes found no significant associations between vitamin D status and total cancer mortality, nor did it find any conclusive evidence for the association of vitamin D status with cancer risk or cancer outcome (Chung 2009). It also found no clear association between vitamin D status and cardiometabolic outcomes including fasting glucose, blood pressure, myocardial infarction or stroke. Randomized trials showed no clinically significant consistent effects of vitamin D supplementation at the dosages given (Pittas 2010).

Intake Recommendations. What constitutes the optimal intake of vitamin D remains a matter of some disagreement. Current recommendations from the Institute of Medicine (2011) call for 400 international units (IU) [10 micrograms (μg)] of vitamin D daily from birth through age 1 year for adequate intake (AI). The Recommended Dietary Allowance (RDA) for those aged 1–70 years is 600 IU (15 μg) and 800 IU (20 μg) for those older than 70 years. According to the Dietary Guidelines for Americans (U.S. Department of Agriculture and U.S. Department of Health Human Services 2010), moderate evidence shows that intake of milk and milk products is linked to improved bone health, especially in children and adolescents. In the United States, most dietary vitamin D is obtained from fortified foods, especially milk. The Tolerable Upper Intake Level for vitamin D is 4000 IU (100 μg) per day in North America for individuals 9 years of age and older and ranges from 1000 IU to 3000 IU for infants and children less than 9 years of age; as intake increases above this amount, the potential risk for adverse consequences increases.

Biochemical Indicators and Methods. To assess vitamin D status, one measures the concentration of 25(OH)D in serum, using either antibody-based methods such as radioisotope-, enzyme-linked- or chemiluminescence- immunoassays, or using chemistry-based methods such as HPLC separation with UV or tandem mass spectrometry detection. Studies have shown that standardized chemistry-based methods are equivalent but that antibody-based methods may show significant bias. Some clinical laboratories use conventional units for 25(OH)D (nanogram per milliliter [ng/mL]), whereas other laboratories use international system (SI) units (nanomole per liter [nmol/L]). The conversion factor to SI units is: 1 ng/mL = 2.5 nmol/L.

The Institute of Medicine (2011) committee to review dietary reference intakes for vitamin D and calcium suggested that persons with serum 25(OH)D concentrations of less than 30 nmol/L (12 ng/mL) are at risk for deficiency; those with concentrations of at least 30 but less than 50 nmol/L (12 to less than 20 ng/mL) are at risk for inadequacy; and those with concentrations between 50–75 nmol/L (20–30 ng/mL) are considered sufficient. The Committee indicated that concentrations greater than 125 nmol/L (50 ng/mL) may be reason for concern. Of interest



to public health scientists, the report indicated that a serum 25(OH)D level consistent with the Estimated Average Requirement for dietary intake (EAR) lies between 30 and 50 nmol/L and that 40 nmol/L was selected from the middle of the range to serve as the targeted level for median dietary requirements (Institute of Medicine 2011).

A number of external quality assurance programs exist for serum or plasma 25(OH)D concentration measurements, including those sponsored by DEQAS (Vitamin D External Quality Assessment Scheme), College of American Pathologists (Bone and Growth Survey and Accuracy-Based Vitamin D Survey), and NIST/NIH (Vitamin D Metabolites Quality Assurance Program). Standard reference materials (SRM 972) with certified values for 25(OH)D₂, 25(OH)D₃ and C3-epimer of 25(OH)D₃ are available from the U.S. National Institute of Standards and Technology (NIST). An additional solvent-based reference material set (SRM 2972) with certified values for 25(OH)D₂ and 25(OH)D₃ is also available (https://www-s.nist.gov/srmors/view_detail.cfm?srm=972). Further improvement in the agreement between laboratories and methods is expected as more laboratories use these SRMs.

Data in NHANES. The data in this report were obtained by use of an antibody-based method, specifically a radioimmunoassay (DiaSorin, Stillwater, MN). The manufacturer reformulated the kit in the late 1990s, resulting in data that were on average 12% lower than those generated with the original kit. To make NHANES III data (original kit) comparable to data from 2001–2006 (reformulated kit), we followed the recommendations of a panel of experts (Yetley 2010) to use a published adjustment equation for the NHANES III data (see Analytic Note at http://www.cdc.gov/nchs/nhanes/nhanes2005-2006/VID_D.htm). The Analytic Note also reported that the reformulated kit showed some assay drifts between 2001 and 2006. To generate 2003–2004 and 2005–2006 tables and figures, we used the public release data files from November 2010. Using data that were already adjusted for these assay drifts was the most appropriate way to make comparisons across survey cycles.

Since 1988, NHANES has monitored the vitamin D status of the U.S. population. By design, this survey collects information and biological samples in the summer from people living at higher latitudes and in the winter from people living at lower latitudes. Because the different racial and ethnic groups are not evenly distributed across all geographic regions in the United States, the season-latitude structure of the survey can affect comparisons by race or ethnicity. In two seasonal subpopulations from NHANES III (1988–1994), Looker *et al.* (2002) showed that in the winter and lower latitude subpopulation, 1–5% and 25–57% had 25(OH)D concentrations less than 25 nmol/L (10 ng/mL) and less than 62.5 nmol/L (25 ng/mL), respectively. In the summer and higher latitude subpopulation, 1–3% and 21–49% had 25(OH)D concentrations below these cutoffs. Mean 25(OH)D concentrations were highest in non-Hispanic whites, intermediate in Mexican Americans, and lowest in non-Hispanic blacks. A more recent analysis of NHANES III and NHANES 2000–2004 (Looker 2008) demonstrated that overall, mean serum 25(OH)D were 5–9 nmol/L lower in 2000–2004 than in 1988–1994 in most males, but not in most females. Factors related to changes in vitamin D status were increased body mass index, decreased milk intake, and increased usage of sun protection in the more recent surveys.

For more information about vitamin D, see the Institute of Medicine’s Dietary Reference Intake reports (Institute of Medicine 2011), fact sheets from the National Institutes of Health, Office of Dietary Supplements

(http://ods.od.nih.gov/Health_Information/Information_About_Individual_Dietary_Supplements.aspx).

Highlights

Serum 25-hydroxyvitamin D [25(OH)D] concentrations in the U.S. population showed the following demographic patterns and characteristics:

- Concentrations generally decreased with increasing age.
- No consistent pattern was observed with regard to gender.
- Among the three race/ethnic groups, non-Hispanic blacks had the lowest 25(OH)D concentrations and non-Hispanic whites had the highest concentrations.
- The likelihood of being vitamin D deficient was significantly influenced by race/ethnicity.

During the past several years, the vitamin D status of the U.S. population was under intensive investigation to determine whether a downward trend was apparent. In the analysis below, we used data that were adjusted for radioimmunoassay reformulation and assay drifts according to recommendations made by a panel of experts (Yetley 2010). The age-adjusted mean 25(OH)D concentrations in the U.S. population decreased by approximately 10% between NHANES III and the periods 2001–2002 and 2003–2006 (Figure H.2.b). Decreases were seen in all groups shown (total or stratified by gender or race/ethnicity). Similarly, a recent report found that the age- and season-adjusted prevalence at risk of deficiency (serum 25(OH)D concentrations less than 30 nmol/L) increased between 1988–1994 and 2001–2002 from 4% to 7% for males aged 12 years and older and from 7% to 11% for females aged 12 years and older (Looker 2011).

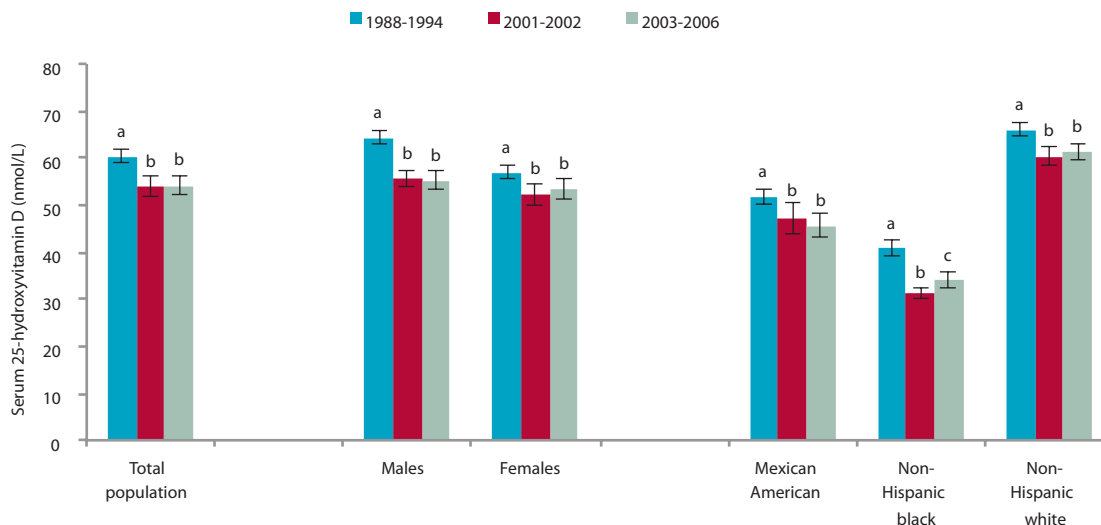


Figure H.2.b. Age-adjusted geometric mean concentrations of serum 25-hydroxyvitamin D in the U.S. population aged 12 years and older by gender or race/ethnicity, National Health and Nutrition Examination Survey, 1988–2006.

Error bars represent 95% confidence intervals. Within a demographic group, bars not sharing a common letter differ ($p < 0.05$). Age adjustment was done using direct standardization.

It is interesting to note that non-Hispanic blacks one year and older had the highest prevalence of vitamin D deficiency (serum 25(OH)D concentrations less than 30 nmol/L) (Figure H.2.c), despite clinical data showing superior bone health with greater density and fewer fractures than other race/ethnic groups; further research is needed to explain this unusual finding (Aloia 2008). Higher peak bone mass, higher obesity rates, greater muscle mass and lower bone turnover are some of the factors that have been suggested to protect African Americans against fracture

(Aloia 2008). Non-Hispanic blacks and Mexican Americans had the highest prevalence of low serum 25(OH)D concentrations categorized at risk for inadequacy (30 to less than 50 nmol/L) compared to non-Hispanic whites (Figure H.2.c).

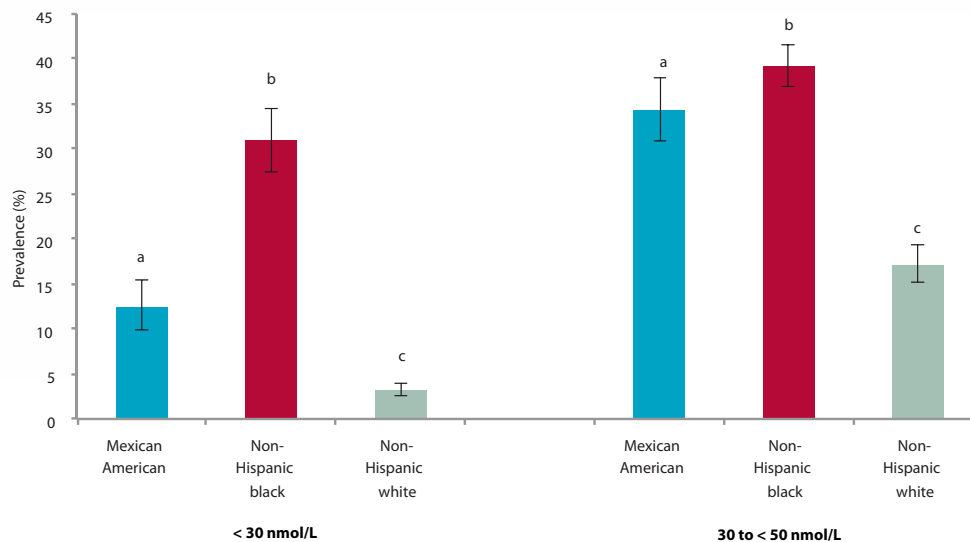


Figure H.2.c. Age-adjusted prevalence estimates of serum 25-hydroxyvitamin D concentrations less than 30 and 30 to less than 50 nmol/L in the U.S. population aged 1 year and older by race/ethnicity, National Health and Nutrition Examination Survey, 2003–2006.

Error bars represent 95% confidence intervals. Within each vitamin D status category, bars not sharing a common letter differ ($p < 0.05$). Age adjustment was done using direct standardization.

The Institute of Medicine (2011) report concluded that serum 25(OH)D levels of 40 nmol/L are at a level consistent with a desirable median intake of vitamin D. Non-Hispanic blacks had significantly higher prevalence of serum concentrations less than 40 nmol/L (Figure H.2.d) which corresponds to the targeted level for the median dietary requirement. The median meets the requirement of approximately half the population thus individuals with concentrations less than 40 nmol/L are at increased risk of adverse health outcomes.

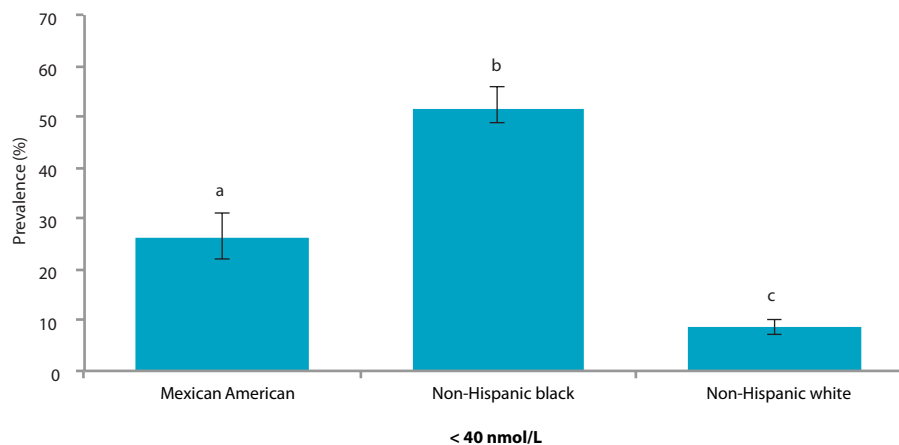


Figure H.2.d. Age-adjusted prevalence estimates of serum 25-hydroxyvitamin D concentrations less than 40 nmol/L in the U.S. population aged 1 years and older by race/ethnicity, National Health and Nutrition Examination Survey, 2003–2006.

Error bars represent 95% confidence intervals. Bars not sharing a common letter differ ($p < 0.05$). Age adjustment was done using direct standardization.

Detailed Observations

The selected observations mentioned below are derived from the tables and figures presented next. Statements about categorical differences between demographic groups noted below are based on non-overlapping confidence limits from univariate analysis without adjusting for demographic variables (e.g., age, gender, race/ethnicity) or other blood concentration determinants (e.g., dietary intake, supplement usage, smoking, BMI). A multivariate analysis may alter the size and statistical significance of these categorical differences. Furthermore, additional significant differences of smaller magnitude may be present despite their lack of mention here (e.g., if confidence limits slightly overlap or if differences are not statistically significant before covariate adjustment has occurred). For a selection of citations of descriptive NHANES papers related to these biochemical indicators of diet and nutrition, see [Appendix G](#).

Geometric mean concentrations (NHANES 2003–2006):

- Serum 25(OH)D concentrations decreased through adolescence and then stabilized (Table 2.13.a.1).
- Non-Hispanic blacks had the lowest concentrations of serum 25(OH)D (Table 2.13.a.1).

Changes in geometric mean concentrations across surveys:

- Geometric mean 25(OH)D concentrations remained steady across the survey cycles from 2001–2006 (Table 2.13.b).

Prevalence estimates of low or high biochemical indicator concentrations:

- Between 2003 and 2006, 8% of the population aged 1 year and older were at risk for vitamin D deficiency, as defined by a serum concentration < 30 nmol/L, whereas 24% had serum concentrations between 30 and less than 50 nmol/L, levels that placed them at risk for inadequacy (Tables 2.13.c.1 and 2.13.c.2). Approximately 17% of the population had concentrations < 40 nmol/L which is considered the level associated with desirable intake (Tables 2.13.c.3). Less than 1% had serum concentrations > 125 nmol/L, a level that may be reason for concern about excess (Tables 2.13.c.4).
- Less than 2% of children (1–11 years) were at risk for vitamin D deficiency (Table 2.13.c.1).
- More females (10%) than males (6%) were at risk for vitamin D deficiency (Table 2.13.c.1).
- More non-Hispanic blacks (31%) were at risk for vitamin D deficiency than non-Hispanic whites (4%) or Mexican Americans (11%) (Table 2.13.c.1).
- The prevalence of risk for vitamin D deficiency remained steady across the 2001–2006 survey cycles (Table 2.13.d.1).

Table 2.13.a.1. Serum 25-hydroxyvitamin D: Concentrations

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for the total U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th		
Total, 1 year and older	55.6 (53.6 – 57.6)	23.2 (21.4 – 25.0)	58.0 (56.3 – 59.9)	96.6 (93.9 – 101)	108 (105 – 112)	16,604	
Age group							
1–5 years	68.6 (66.7 – 70.5)	36.9 (32.9 – 38.8)	41.6 (39.5 – 43.4)	68.8 (66.9 – 70.6)	99.6 (95.7 – 107)	107 (102 – 121)	
6–11 years	63.8 (61.6 – 66.1)	30.5 (27.3 – 31.6)	35.3 (32.0 – 38.7)	64.5 (63.0 – 66.1)	97.2 (92.5 – 108)	105 (98.4 – 122)	
12–19 years	55.1 (52.4 – 58.0)	18.0 (15.6 – 20.1)	22.7 (19.8 – 25.1)	57.6 (55.3 – 60.1)	98.4 (94.3 – 108)	111 (106 – 123)	
20–39 years	54.5 (52.1 – 57.0)	17.6 (15.9 – 19.0)	21.8 (20.3 – 23.3)	56.6 (54.4 – 58.9)	102 (97.2 – 108)	115 (110 – 122)	
40–59 years	53.6 (51.3 – 56.0)	17.8 (16.3 – 18.9)	21.7 (19.8 – 23.6)	56.0 (54.1 – 58.1)	94.3 (90.5 – 98.3)	103 (98.0 – 110)	
60 years and older	54.1 (52.4 – 55.8)	19.1 (18.1 – 20.1)	23.1 (21.6 – 24.6)	56.9 (55.4 – 58.5)	91.9 (89.5 – 95.0)	100 (96.6 – 106)	
Gender							
Males	56.7 (54.7 – 58.7)	20.7 (18.6 – 22.3)	25.8 (23.8 – 27.3)	58.9 (57.1 – 60.7)	94.0 (90.7 – 97.7)	103 (98.6 – 109)	
Females	54.5 (52.5 – 56.6)	17.6 (16.2 – 18.5)	21.2 (19.8 – 22.5)	57.2 (55.2 – 59.2)	99.4 (96.1 – 106)	112 (108 – 117)	
Race/ethnicity							
Mexican Americans	48.7 (46.3 – 51.2)	18.2 (16.8 – 19.4)	21.5 (19.6 – 23.3)	49.9 (47.7 – 53.4)	81.8 (79.2 – 84.7)	88.2 (85.4 – 92.0)	
Non-Hispanic Blacks	36.1 (34.3 – 38.0)	12.0 (11.0 – 12.8)	14.3 (13.5 – 15.1)	36.6 (34.2 – 39.1)	70.9 (68.5 – 73.7)	79.0 (74.9 – 82.2)	
Non-Hispanic Whites	61.9 (60.3 – 63.4)	24.9 (23.3 – 25.9)	31.0 (29.1 – 32.6)	63.2 (61.8 – 64.6)	102 (97.8 – 106)	113 (110 – 117)	

Figure 2.13.a. Serum 25–hydroxyvitamin D: Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2006

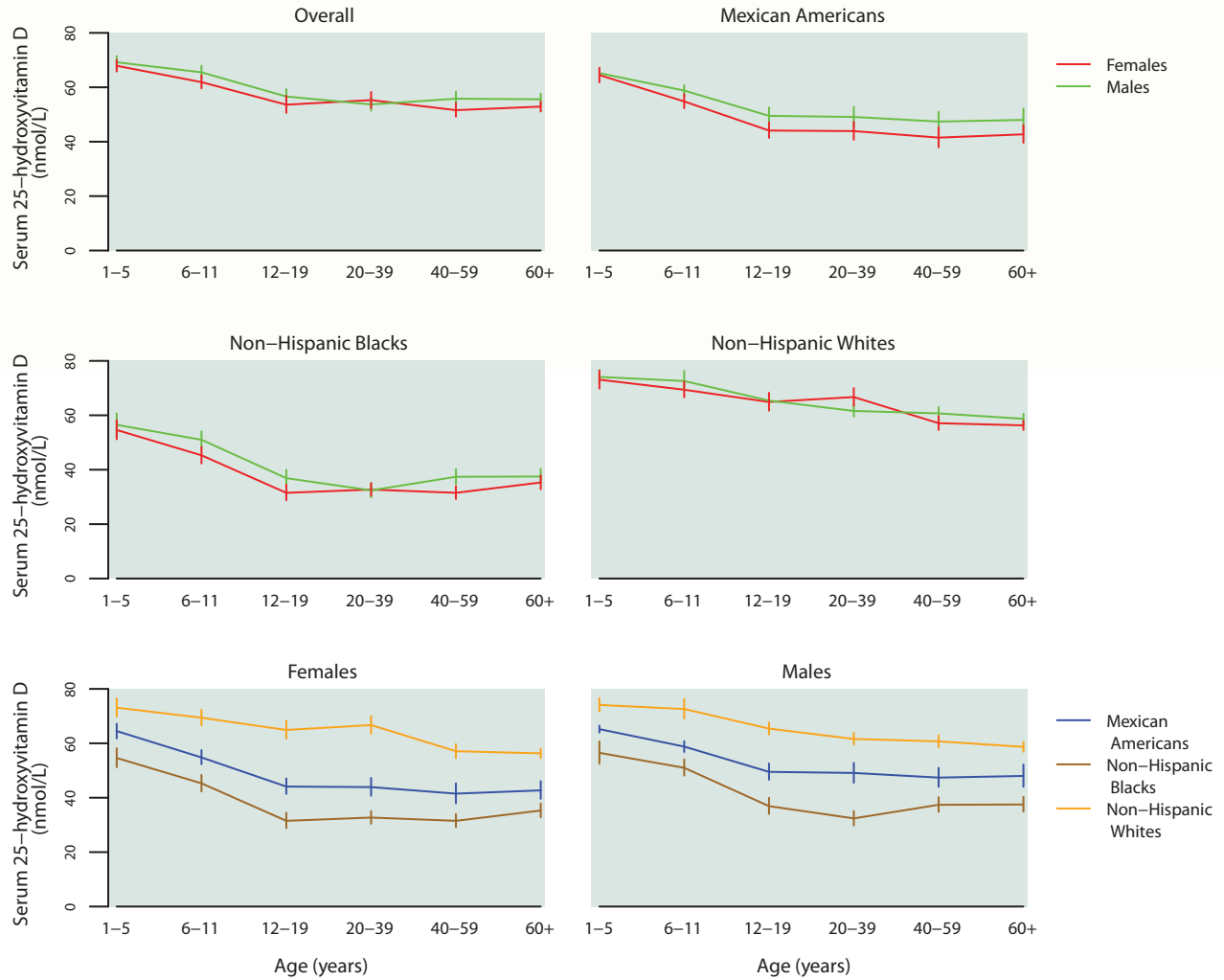


Table 2.13.a.2. Serum 25-hydroxyvitamin D: Total population

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for the total U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Males and Females					
Total, 1 year and older	55.6 (53.6 – 57.6)	23.2 (21.4 – 25.0)	58.0 (56.3 – 59.9)	96.6 (93.9 – 101)	16,604
1–5 years	68.6 (66.7 – 70.5)	41.6 (39.5 – 43.4)	68.8 (66.9 – 70.6)	99.6 (95.7 – 107)	1,799
6–11 years	63.8 (61.6 – 66.1)	35.3 (32.0 – 38.7)	64.5 (63.0 – 66.1)	97.2 (92.5 – 108)	1,768
12–19 years	55.1 (52.4 – 58.0)	22.7 (19.8 – 25.1)	57.6 (55.3 – 60.1)	98.4 (94.3 – 108)	4,044
20–39 years	54.5 (52.1 – 57.0)	21.8 (20.3 – 23.3)	56.6 (54.4 – 58.9)	102 (97.2 – 108)	3,262
40–59 years	53.6 (51.3 – 56.0)	21.7 (19.8 – 23.6)	56.0 (54.1 – 58.1)	94.3 (90.5 – 98.3)	2,660
60 years and older	54.1 (52.4 – 55.8)	23.1 (21.6 – 24.6)	56.9 (55.4 – 58.5)	91.9 (89.5 – 95.0)	3,071
Males					
Total, 1 year and older	56.7 (54.7 – 58.7)	25.8 (23.8 – 27.3)	58.9 (57.1 – 60.7)	94.0 (90.7 – 97.7)	8,145
1–5 years	69.2 (67.0 – 71.5)	41.7 (40.1 – 43.5)	69.3 (66.7 – 71.6)	101 (96.7 – 106)	904
6–11 years	65.5 (63.2 – 67.9)	36.9 (32.5 – 40.3)	65.8 (64.3 – 67.6)	98.0 (92.4 – 116)	862
12–19 years	56.6 (54.0 – 59.3)	25.3 (22.5 – 28.0)	58.7 (56.4 – 61.2)	95.2 (88.8 – 105)	2,049
20–39 years	53.7 (51.4 – 56.1)	23.6 (20.9 – 25.7)	55.9 (53.7 – 57.8)	90.6 (87.7 – 96.7)	1,472
40–59 years	55.8 (53.3 – 58.4)	25.3 (22.4 – 27.0)	58.0 (55.8 – 60.8)	92.4 (88.1 – 98.7)	1,311
60 years and older	55.6 (53.7 – 57.7)	26.0 (23.8 – 27.9)	57.5 (55.6 – 59.7)	91.9 (89.1 – 97.2)	1,547
Females					
Total, 1 year and older	54.5 (52.5 – 56.6)	21.2 (19.8 – 22.5)	57.2 (55.2 – 59.2)	99.4 (96.1 – 106)	8,459
1–5 years	67.9 (65.8 – 70.0)	41.3 (37.4 – 44.3)	68.4 (66.3 – 70.3)	98.1 (93.3 – 113)	895
6–11 years	61.9 (59.6 – 64.4)	34.0 (31.4 – 37.6)	62.8 (60.1 – 65.3)	96.4 (92.5 – 103)	906
12–19 years	53.6 (50.6 – 56.9)	20.6 (18.0 – 22.9)	56.4 (53.1 – 59.5)	106 (96.5 – 114)	1,995
20–39 years	55.3 (52.4 – 58.3)	20.5 (19.1 – 21.8)	57.6 (54.4 – 60.7)	110 (106 – 116)	1,790
40–59 years	51.6 (49.2 – 54.2)	19.4 (18.3 – 20.6)	54.1 (50.8 – 57.0)	95.1 (91.5 – 99.2)	1,349
60 years and older	52.9 (51.1 – 54.7)	21.7 (20.2 – 23.2)	56.4 (54.5 – 58.2)	92.0 (89.1 – 95.8)	1,524

Table 2.13.a.3. Serum 25-hydroxyvitamin D: Mexican Americans

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for Mexican Americans in the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Males and Females					
Total, 1 year and older	48.7 (46.3 – 51.2)	21.5 (19.6 – 23.3)	49.9 (47.7 – 53.4)	81.8 (79.2 – 84.7)	4,275
1–5 years	64.8 (63.1 – 66.6)	42.5 (39.4 – 44.7)	64.3 (62.3 – 66.1)	93.8 (89.5 – 99.7)	584
6–11 years	56.9 (55.0 – 58.8)	32.7 (30.9 – 34.9)	58.2 (56.3 – 59.8)	82.9 (80.7 – 86.9)	589
12–19 years	46.8 (44.2 – 49.6)	22.0 (20.2 – 23.4)	47.8 (45.6 – 50.7)	74.8 (71.2 – 83.6)	1,288
20–39 years	46.6 (43.6 – 49.7)	20.6 (17.6 – 23.5)	48.0 (45.4 – 51.5)	78.0 (75.6 – 83.1)	789
40–59 years	44.4 (41.4 – 47.7)	19.4 (17.4 – 21.2)	45.8 (41.9 – 49.0)	79.8 (72.4 – 87.7)	472
60 years and older	45.0 (42.4 – 47.8)	20.1 (17.6 – 21.4)	45.9 (43.6 – 48.1)	79.5 (73.4 – 89.5)	553
Males					
Total, 1 year and older	51.1 (48.7 – 53.7)	24.5 (21.7 – 26.6)	52.7 (49.4 – 55.5)	81.7 (79.0 – 85.2)	2,073
1–5 years	65.2 (63.9 – 66.5)	44.6 (40.5 – 45.8)	64.4 (63.1 – 65.6)	94.9 (88.6 – 109)	282
6–11 years	58.8 (56.8 – 60.8)	36.0 (32.3 – 38.8)	59.7 (57.8 – 62.3)	83.3 (80.5 – 92.2)	286
12–19 years	49.5 (46.6 – 52.6)	23.8 (21.5 – 26.2)	50.0 (47.4 – 54.0)	78.0 (72.7 – 85.8)	641
20–39 years	49.1 (45.5 – 52.8)	24.3 (19.7 – 26.2)	49.8 (47.1 – 54.1)	77.0 (73.1 – 86.5)	353
40–59 years	47.4 (44.0 – 51.0)	20.9 (15.3 – 25.9)	47.4 (44.6 – 54.3)	79.8 (72.2 – 92.8)	239
60 years and older	48.0 (44.0 – 52.2)	21.4 (18.3 – 25.0)	48.3 (43.6 – 54.3)	81.2 (74.4 – 96.7)	272
Females					
Total, 1 year and older	46.2 (43.7 – 48.8)	19.8 (18.9 – 20.6)	47.7 (45.4 – 50.3)	82.1 (78.6 – 85.4)	2,202
1–5 years	64.5 (61.8 – 67.2)	40.5 (36.0 – 44.3)	64.2 (59.9 – 67.5)	92.9 (89.1 – 98.6)	302
6–11 years	54.8 (52.3 – 57.5)	31.1 (25.0 – 33.7)	56.6 (54.0 – 58.8)	82.3 (74.5 – 93.8)	303
12–19 years	44.1 (41.4 – 47.1)	20.4 (17.3 – 22.5)	45.6 (42.4 – 48.0)	73.2 (67.7 – 80.3)	647
20–39 years	43.9 (40.7 – 47.3)	18.5 (16.4 – 20.4)	44.9 (41.6 – 48.2)	80.2 (74.8 – 87.1)	436
40–59 years	41.5 (37.9 – 45.3)	18.7 (17.5 – 20.0)	42.8 (37.3 – 46.8)	79.6 (70.9 – 85.0)	233
60 years and older	42.7 (39.6 – 46.1)	19.1 (15.4 – 21.1)	44.3 (40.5 – 47.0)	78.0 (71.5 – 88.9)	281

Table 2.13.a.4. Serum 25-hydroxyvitamin D: Non-Hispanic blacks

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for non-Hispanic blacks in the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Males and Females					
Total, 1 year and older	36.1 (34.3 – 38.0)	14.3 (13.5 – 15.1)	36.6 (34.2 – 39.1)	70.9 (68.5 – 73.7)	4,349
1–5 years	55.5 (52.7 – 58.5)	29.4 (21.0 – 33.4)	57.5 (54.5 – 59.6)	86.6 (82.1 – 91.3)	503
6–11 years	48.1 (45.7 – 50.6)	24.8 (23.4 – 25.7)	49.4 (47.3 – 52.2)	73.8 (71.5 – 80.2)	561
12–19 years	34.2 (31.4 – 37.2)	13.8 (13.0 – 14.6)	34.6 (31.3 – 38.2)	68.3 (64.2 – 72.2)	1,421
20–39 years	32.5 (30.4 – 34.8)	13.7 (12.7 – 14.8)	31.5 (29.2 – 34.2)	64.0 (61.1 – 70.4)	716
40–59 years	34.1 (32.0 – 36.3)	13.3 (11.6 – 14.8)	34.7 (32.4 – 37.7)	66.2 (62.0 – 71.6)	626
60 years and older	36.2 (34.1 – 38.3)	15.0 (13.2 – 15.9)	36.3 (33.8 – 39.7)	72.9 (67.6 – 80.3)	522
Males					
Total, 1 year and older	38.0 (35.9 – 40.3)	15.5 (14.0 – 16.6)	38.6 (35.9 – 41.4)	71.8 (69.0 – 78.6)	2,166
1–5 years	56.5 (52.5 – 60.7)	30.0 (21.7 – 34.0)	58.4 (54.3 – 61.6)	89.1 (81.9 – 98.4)	248
6–11 years	51.0 (48.1 – 54.1)	26.0 (23.0 – 28.4)	53.0 (49.3 – 56.5)	75.0 (70.5 – 88.7)	277
12–19 years	36.9 (34.0 – 40.0)	14.6 (13.2 – 15.9)	38.1 (34.9 – 41.0)	70.8 (66.6 – 75.9)	745
20–39 years	32.4 (29.8 – 35.1)	13.8 (11.6 – 15.2)	30.5 (28.4 – 33.3)	64.9 (59.0 – 82.3)	339
40–59 years	37.4 (34.8 – 40.2)	15.9 (14.0 – 17.1)	38.2 (34.2 – 42.2)	69.6 (62.4 – 77.2)	293
60 years and older	37.5 (34.9 – 40.3)	15.0 (12.8 – 16.6)	38.5 (34.7 – 42.7)	72.3 (66.1 – 79.2)	264
Females					
Total, 1 year and older	34.5 (32.7 – 36.3)	13.6 (12.9 – 14.3)	34.9 (32.4 – 37.7)	69.6 (65.9 – 73.0)	2,183
1–5 years	54.6 (51.2 – 58.2)	28.4 (13.2 – 35.2)	56.0 (53.3 – 58.8)	83.1 (79.7 – 94.4)	255
6–11 years	45.3 (42.3 – 48.4)	23.6 (19.4 – 25.3)	46.0 (42.4 – 49.7)	73.0 (71.0 – 76.9)	284
12–19 years	31.5 (28.8 – 34.5)	13.3 (12.5 – 14.2)	31.3 (27.7 – 34.3)	64.7 (59.3 – 71.5)	676
20–39 years	32.7 (30.4 – 35.1)	13.7 (11.8 – 15.1)	32.4 (29.3 – 36.2)	63.0 (60.6 – 70.6)	377
40–59 years	31.5 (29.2 – 34.0)	12.2 (10.5 – 13.2)	32.5 (28.6 – 35.2)	63.2 (58.7 – 75.3)	333
60 years and older	35.3 (32.8 – 37.9)	15.0 (13.0 – 15.8)	34.7 (31.6 – 39.3)	73.5 (64.4 – 96.3)	258

Table 2.13.a.5. Serum 25-hydroxyvitamin D: Non-Hispanic whites

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for non-Hispanic whites in the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Males and Females					
Total, 1 year and older	61.9 (60.3 – 63.4)	31.0 (29.1 – 32.6)	63.2 (61.8 – 64.6)	102 (97.8 – 106)	6,698
1–5 years	73.6 (71.3 – 76.0)	49.0 (44.1 – 51.7)	72.3 (70.7 – 74.2)	105 (97.8 – 118)	516
6–11 years	71.1 (68.2 – 74.1)	46.1 (43.5 – 48.1)	69.6 (67.5 – 71.8)	103 (96.1 – 119)	457
12–19 years	65.2 (63.0 – 67.4)	37.4 (35.6 – 40.1)	64.7 (62.9 – 66.6)	107 (100 – 113)	1,050
20–39 years	64.1 (61.8 – 66.5)	33.3 (29.8 – 36.3)	64.3 (61.8 – 66.6)	110 (107 – 115)	1,458
40–59 years	58.9 (56.8 – 61.0)	27.4 (25.9 – 30.2)	60.4 (58.0 – 63.2)	96.7 (92.5 – 103)	1,360
60 years and older	57.4 (55.9 – 58.9)	26.0 (24.2 – 27.7)	59.7 (58.3 – 61.1)	92.9 (90.8 – 97.2)	1,857
Males					
Total, 1 year and older	62.4 (60.8 – 64.1)	33.7 (31.8 – 35.4)	63.6 (62.1 – 65.0)	97.4 (93.9 – 103)	3,303
1–5 years	74.1 (71.7 – 76.6)	47.1 (41.5 – 52.3)	72.7 (70.4 – 74.8)	105 (99.2 – 116)	279
6–11 years	72.6 (69.1 – 76.3)	47.1† (41.6 – 52.5)	70.9 (68.0 – 74.8)	105† (96.4 – 136)	219
12–19 years	65.4 (63.2 – 67.7)	40.6 (37.3 – 42.7)	65.3 (63.5 – 67.1)	99.6 (93.5 – 112)	528
20–39 years	61.6 (59.5 – 63.8)	33.5 (30.7 – 36.5)	62.3 (59.6 – 64.7)	96.8 (90.9 – 104)	641
40–59 years	60.7 (58.5 – 63.0)	31.8 (28.4 – 34.0)	62.6 (59.9 – 64.8)	96.1 (90.0 – 104)	691
60 years and older	58.7 (56.9 – 60.5)	30.5 (26.7 – 33.3)	60.0 (58.1 – 61.5)	92.7 (90.1 – 98.7)	945
Females					
Total, 1 year and older	61.3 (59.6 – 63.1)	27.9 (25.6 – 30.3)	62.9 (61.0 – 64.5)	107 (102 – 111)	3,395
1–5 years	73.1 (69.8 – 76.5)	49.8 (45.5 – 52.8)	71.9 (69.3 – 75.8)	105 (94.9 – 122)	237
6–11 years	69.4 (66.6 – 72.4)	45.6 (42.7 – 47.6)	68.3 (65.6 – 70.8)	99.9 (94.8 – 109)	238
12–19 years	64.9 (61.7 – 68.3)	34.9 (31.1 – 37.5)	63.9 (61.4 – 67.0)	112 (106 – 127)	522
20–39 years	66.7 (63.5 – 70.0)	33.0 (26.4 – 37.1)	66.6 (63.5 – 69.6)	117 (112 – 128)	817
40–59 years	57.1 (54.6 – 59.7)	24.8 (19.9 – 27.0)	58.4 (55.6 – 61.9)	97.2 (93.4 – 105)	669
60 years and older	56.3 (54.6 – 58.0)	23.9 (22.0 – 25.7)	59.5 (57.8 – 61.2)	93.1 (90.0 – 99.8)	912

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.13.b. Serum 25-hydroxyvitamin D: Concentrations by survey cycle

Geometric mean and selected percentiles of serum concentrations (in nmol/L) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2006.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		5th	50th	95th	
Total, 6 years and older					
2001–2002	54.7 (52.6 – 56.8)	22.6 (20.4 – 24.9)	57.1 (55.1 – 59.3)	96.8 (92.4 – 105)	7,807
2003–2004	55.5 (52.5 – 58.7)	24.2 (20.9 – 26.3)	57.5 (54.7 – 60.6)	97.2 (92.8 – 104)	7,403
2005–2006	54.3 (51.5 – 57.3)	21.8 (20.1 – 23.5)	57.2 (54.8 – 59.7)	95.9 (91.9 – 103)	7,402
Age group					
1–5 years					
2003–2004	68.2 (65.9 – 70.5)	41.3 (37.6 – 44.4)	68.7 (66.8 – 70.6)	97.8 (96.3 – 101)	895
2005–2006	69.0 (65.7 – 72.5)	41.8 (39.3 – 44.0)	69.1 (64.7 – 72.1)	103 (94.2 – 121)	904
6–11 years					
2001–2002	63.8 (60.5 – 67.3)	36.9 (31.9 – 39.7)	63.7 (60.4 – 66.8)	101 (90.1 – 138)	991
2003–2004	63.4 (60.2 – 66.7)	34.8 (31.2 – 40.5)	64.5 (61.8 – 66.9)	94.3 (87.5 – 109)	846
2005–2006	64.2 (60.8 – 67.7)	35.8 (31.9 – 38.6)	64.4 (62.6 – 66.8)	98.8 (92.5 – 129)	922
12–19 years					
2001–2002	55.1 (52.5 – 57.8)	24.5 (20.8 – 27.2)	56.7 (54.2 – 59.1)	96.1 (91.8 – 102)	2,167
2003–2004	56.2 (52.2 – 60.6)	24.8 (21.0 – 27.3)	57.9 (53.9 – 61.8)	101 (94.1 – 112)	2,059
2005–2006	54.0 (50.1 – 58.3)	21.2 (17.6 – 23.9)	57.3 (54.0 – 60.7)	96.3 (88.6 – 111)	1,985
20–39 years					
2001–2002	54.1 (51.8 – 56.5)	21.2 (19.4 – 23.1)	56.4 (54.0 – 59.0)	102 (94.8 – 110)	1,691
2003–2004	54.4 (50.9 – 58.1)	22.5 (19.0 – 25.4)	56.1 (51.9 – 59.9)	104 (95.9 – 110)	1,559
2005–2006	54.6 (51.1 – 58.4)	21.1 (19.0 – 23.3)	57.0 (54.2 – 60.1)	99.2 (95.5 – 113)	1,703
40–59 years					
2001–2002	54.0 (51.4 – 56.6)	21.4 (18.7 – 24.4)	56.8 (54.6 – 59.8)	94.9 (90.5 – 104)	1,449
2003–2004	54.7 (51.1 – 58.5)	23.6 (18.7 – 26.9)	56.5 (53.6 – 60.2)	94.5 (89.0 – 102)	1,278
2005–2006	52.6 (49.6 – 55.9)	20.8 (18.8 – 22.8)	55.5 (52.9 – 58.4)	94.1 (88.9 – 100)	1,382
60 years and older					
2001–2002	52.5 (49.9 – 55.3)	23.1 (21.1 – 24.4)	55.1 (52.4 – 57.7)	91.8 (88.4 – 95.0)	1,509
2003–2004	55.2 (52.9 – 57.5)	24.2 (21.8 – 25.8)	57.6 (55.2 – 59.7)	94.1 (90.1 – 102)	1,661
2005–2006	53.1 (50.4 – 55.9)	22.3 (20.4 – 24.3)	56.4 (54.1 – 58.9)	90.4 (87.5 – 93.9)	1,410
Gender					
(6 years and older)					
Males					
2001–2002	56.5 (54.5 – 58.6)	25.8 (23.8 – 27.2)	58.3 (56.3 – 60.7)	96.0 (91.2 – 105)	3,782
2003–2004	56.8 (53.6 – 60.2)	27.0 (23.7 – 29.4)	58.6 (55.8 – 61.7)	92.1 (88.8 – 98.2)	3,638
2005–2006	55.1 (52.4 – 58.0)	23.8 (21.5 – 25.6)	57.7 (55.7 – 60.1)	94.1 (88.1 – 102)	3,603
Females					
2001–2002	53.0 (50.6 – 55.5)	20.5 (18.0 – 22.7)	55.8 (53.5 – 58.1)	98.4 (92.6 – 108)	4,025
2003–2004	54.3 (51.4 – 57.3)	21.3 (19.2 – 23.5)	56.3 (53.3 – 59.5)	103 (97.3 – 109)	3,765
2005–2006	53.6 (50.5 – 56.9)	20.5 (18.6 – 22.3)	56.6 (53.8 – 59.5)	97.1 (93.1 – 107)	3,799
Race/ethnicity					
(6 years and older)					
Mexican Americans					
2001–2002	48.9 (46.2 – 51.8)	23.0 (21.3 – 24.5)	50.1 (47.1 – 52.7)	81.6 (77.3 – 91.2)	1,961
2003–2004	48.7 (46.0 – 51.6)	22.8 (19.4 – 25.5)	50.2 (47.1 – 53.4)	80.5 (77.2 – 84.1)	1,802
2005–2006	45.9 (41.9 – 50.2)	20.0 (16.3 – 22.6)	47.3 (43.3 – 52.8)	78.5 (73.0 – 84.5)	1,889
Non-Hispanic Blacks					
2001–2002	32.6 (31.3 – 34.0)	13.3 (10.9 – 14.4)	32.5 (31.1 – 34.2)	66.2 (63.9 – 68.5)	1,821
2003–2004	36.3 (33.5 – 39.4)	14.3 (12.8 – 15.6)	37.0 (34.0 – 40.7)	69.1 (65.8 – 73.9)	1,914
2005–2006	33.8 (31.6 – 36.2)	13.9 (13.0 – 14.8)	33.4 (30.7 – 37.1)	68.4 (64.5 – 71.1)	1,932
Non-Hispanic Whites					
2001–2002	60.9 (58.7 – 63.1)	29.9 (28.2 – 31.2)	62.2 (60.2 – 64.2)	102 (95.9 – 110)	3,416
2003–2004	61.7 (59.3 – 64.2)	30.2 (27.0 – 33.6)	63.2 (60.8 – 65.2)	103 (97.3 – 109)	3,155
2005–2006	61.0 (59.0 – 63.1)	31.0 (27.5 – 32.4)	62.3 (60.3 – 64.1)	99.0 (95.9 – 108)	3,027

Figure 2.13.b. Serum 25–hydroxyvitamin D: Concentrations by survey cycle

Selected percentiles in nmol/L (95% confidence intervals), National Health and Nutrition Examination Survey, 2001–2006

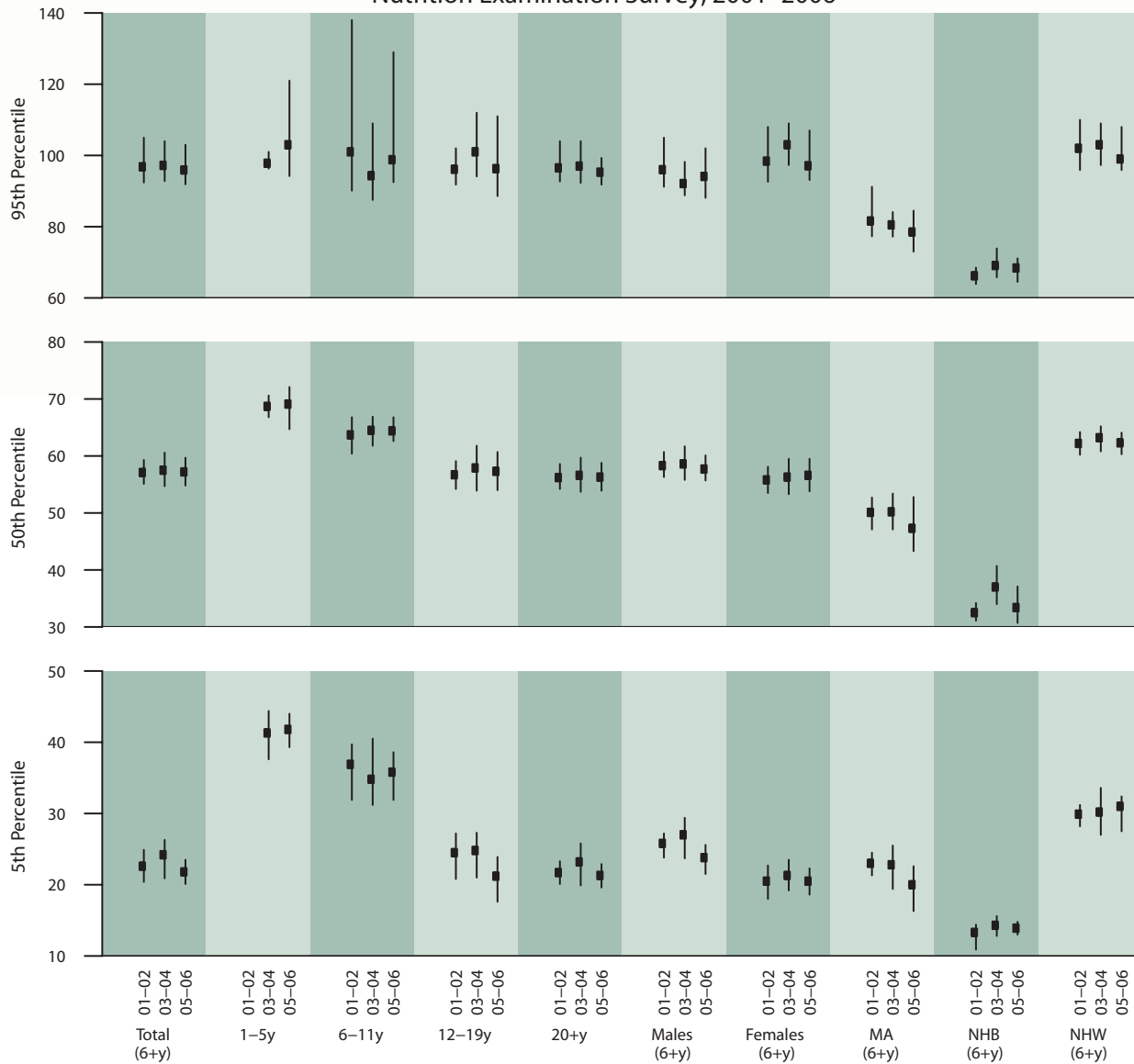


Table 2.13.c.1. Serum 25-hydroxyvitamin D: Prevalence

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (< 30 nmol/L) for the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 1 year and older	16,604	8.1 (6.7 – 9.8)	23,004,000
Age group			
1–5 years	1,799	0.7 (0.4 – 1.3)	146,000
6–11 years	1,768	1.8 (1.3 – 2.6)	442,000
12–19 years	4,044	8.5 (6.5 – 11.2)	2,823,000
20–39 years	3,262	9.5 (7.6 – 11.8)	7,538,000
40–59 years	2,660	9.3 (7.4 – 11.7)	7,343,000
60 years and older	3,071	8.8 (7.3 – 10.5)	4,084,000
Gender			
Males	8,145	6.3 (5.0 – 7.9)	8,735,000
Females	8,459	9.9 (8.1 – 11.9)	14,288,000
Race/ethnicity			
Mexican Americans	4,275	11.3 (8.7 – 14.6)	2,919,000
Non-Hispanic Blacks	4,349	31.1 (27.4 – 35.1)	10,623,000
Non-Hispanic Whites	6,698	3.6 (3.0 – 4.4)	6,929,000

Table 2.13.c.2. Serum 25-hydroxyvitamin D: Prevalence

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (between 30–50 nmol/L) for the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 1 year and older	16,604	23.6 (21.6 – 25.8)	66,859,000
Age group			
1–5 years	1,799	8.9 (7.1 – 11.0)	1,799,000
6–11 years	1,768	14.1 (11.5 – 17.2)	3,407,000
12–19 years	4,044	24.2 (21.3 – 27.3)	8,005,000
20–39 years	3,262	26.2 (23.6 – 29.0)	20,908,000
40–59 years	2,660	25.0 (22.2 – 28.0)	19,729,000
60 years and older	3,071	25.5 (23.7 – 27.4)	11,879,000
Gender			
Males	8,145	23.1 (20.8 – 25.6)	31,909,000
Females	8,459	24.1 (22.1 – 26.3)	34,955,000
Race/ethnicity			
Mexican Americans	4,275	32.9 (29.6 – 36.4)	8,514,000
Non-Hispanic Blacks	4,349	39.5 (37.3 – 41.7)	13,483,000
Non-Hispanic Whites	6,698	18.1 (16.2 – 20.2)	34,769,000

Table 2.13.c.3. Serum 25-hydroxyvitamin D: Prevalence

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (< 40 nmol/L) for the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 1 year and older	16,604	17.2 (14.7 – 20.0)	49,431,000
Age group			
1–5 years	1,799	2.7 (1.8 – 4.0)	541,000
6–11 years	1,768	5.7 (4.2 – 7.7)	1,358,000
12–19 years	4,044	17.1 (13.8 – 21.0)	5,729,000
20–39 years	3,262	19.7 (16.4 – 23.4)	15,722,000
40–59 years	2,660	20.0 (16.6 – 23.9)	16,400,000
60 years and older	3,071	17.8 (15.5 – 20.4)	8,602,000
Gender			
Males	8,145	14.6 (12.3 – 17.4)	20,576,000
Females	8,459	19.6 (16.9 – 22.7)	28,869,000
Race/ethnicity			
Mexican Americans	4,275	24.4 (20.1 – 29.3)	6,635,000
Non-Hispanic Blacks	4,349	51.6 (46.7 – 56.5)	17,968,000
Non-Hispanic Whites	6,698	9.4 (7.9 – 11.2)	18,114,000

Table 2.13.c.4. Serum 25-hydroxyvitamin D: Prevalence

Prevalence (in percent) of high serum 25-hydroxyvitamin D concentration (> 125 nmol/L) for the U.S. population aged 1 year and older, National Health and Nutrition Examination Survey, 2003–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 1 year and older	16,604	0.9 (0.6 – 1.2)	2,449,000
Age group			
1–5 years	1,799	§	§
6–11 years	1,768	§	§
12–19 years	4,044	1.4 (0.9 – 2.1)	450,000
20–39 years	3,262	1.5 (0.9 – 2.4)	1,193,000
40–59 years	2,660	0.6‡ (0.3 – 1.2)	498,000‡
60 years and older	3,071	0.3‡ (0.1 – 0.6)	134,000‡
Gender			
Males	8,145	0.4 (0.3 – 0.7)	587,000
Females	8,459	1.3 (0.9 – 1.9)	1,867,000
Race/ethnicity			
Mexican Americans	4,275	§	§
Non-Hispanic Blacks	4,349	§	§
Non-Hispanic Whites	6,698	1.2 (0.8 – 1.7)	2,283,000

‡ Estimate flagged: $30\% \leq \text{RSE} < 40\%$ for the prevalence estimate.

§ Estimate suppressed: $\text{RSE} \geq 40\%$ for the prevalence estimate.

Table 2.13.d.1. Serum 25-hydroxyvitamin D: Prevalence by survey cycle

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (< 30 nmol/L) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
2001–2002	7,807	8.4 (6.8 – 10.3)	21,467,000
2003–2004	7,403	7.6 (5.5 – 10.5)	20,049,000
2005–2006	7,402	9.5 (7.3 – 12.2)	25,318,000
Age group			
1–5 years			
2003–2004	895	§	§
2005–2006	904	0.7‡ (0.3 – 1.5)	137,000‡
6–11 years			
2001–2002	991	§	§
2003–2004	846	1.5 (0.8 – 2.6)	350,000
2005–2006	922	2.2 (1.4 – 3.5)	524,000
12–19 years			
2001–2002	2,167	7.0 (4.4 – 11.1)	2,266,000
2003–2004	2,059	7.0 (4.6 – 10.7)	2,327,000
2005–2006	1,985	10.0 (6.8 – 14.5)	3,353,000
20–39 years			
2001–2002	1,691	9.5 (7.7 – 11.5)	7,498,000
2003–2004	1,559	9.3 (6.6 – 12.8)	7,391,000
2005–2006	1,703	9.6 (6.9 – 13.3)	7,700,000
40–59 years			
2001–2002	1,449	9.4 (7.2 – 12.2)	7,125,000
2003–2004	1,278	7.5 (4.8 – 11.4)	5,910,000
2005–2006	1,382	11.0 (8.3 – 14.5)	9,054,000
60 years and older			
2001–2002	1,509	8.8 (6.7 – 11.3)	3,921,000
2003–2004	1,661	8.3 (6.1 – 11.1)	3,841,000
2005–2006	1,410	9.3 (7.2 – 11.8)	4,488,000
Gender			
(6 years and older)			
Males			
2001–2002	3,782	6.2 (4.9 – 7.9)	7,774,000
2003–2004	3,638	5.3 (3.5 – 8.1)	6,830,000
2005–2006	3,603	8.0 (6.0 – 10.6)	10,419,000
Females			
2001–2002	4,025	10.4 (8.2 – 13.0)	13,726,000
2003–2004	3,765	9.8 (7.3 – 13.1)	13,254,000
2005–2006	3,799	10.9 (8.2 – 14.2)	14,894,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
2001–2002	1,961	8.9 (6.7 – 11.6)	1,863,000
2003–2004	1,802	9.7 (7.1 – 13.3)	2,218,000
2005–2006	1,889	15.0 (10.2 – 21.5)	3,604,000
Non-Hispanic Blacks			
2001–2002	1,821	37.8 (34.5 – 41.2)	11,654,000
2003–2004	1,914	28.5 (22.6 – 35.2)	8,872,000
2005–2006	1,932	37.4 (32.2 – 42.9)	11,915,000
Non-Hispanic Whites			
2001–2002	3,416	3.7 (2.9 – 4.7)	6,654,000
2003–2004	3,155	3.6 (2.6 – 4.9)	6,423,000
2005–2006	3,027	4.0 (3.1 – 5.1)	7,240,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

Table 2.13.d.2. Serum 25-hydroxyvitamin D: Prevalence by survey cycle

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (between 30–50 nmol/L) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
2001–2002	7,807	24.0 (21.7 – 26.4)	61,533,000
2003–2004	7,403	24.5 (21.2 – 28.1)	64,338,000
2005–2006	7,402	24.5 (21.7 – 27.5)	65,423,000
Age group			
1–5 years			
2003–2004	895	8.6 (6.4 – 11.5)	1,741,000
2005–2006	904	9.2 (6.5 – 12.8)	1,857,000
6–11 years			
2001–2002	991	14.7 (10.9 – 19.6)	3,639,000
2003–2004	846	13.3 (9.4 – 18.4)	3,199,000
2005–2006	922	15.0 (11.5 – 19.3)	3,558,000
12–19 years			
2001–2002	2,167	23.6 (20.4 – 27.1)	7,638,000
2003–2004	2,059	23.8 (19.4 – 28.9)	7,881,000
2005–2006	1,985	24.6 (20.8 – 28.8)	8,214,000
20–39 years			
2001–2002	1,691	24.8 (21.8 – 28.1)	19,655,000
2003–2004	1,559	27.5 (23.1 – 32.4)	21,959,000
2005–2006	1,703	24.9 (21.9 – 28.1)	19,866,000
40–59 years			
2001–2002	1,449	24.3 (21.3 – 27.5)	18,368,000
2003–2004	1,278	25.1 (21.0 – 29.6)	19,828,000
2005–2006	1,382	24.8 (20.8 – 29.4)	20,365,000
60 years and older			
2001–2002	1,509	26.9 (23.0 – 31.2)	12,040,000
2003–2004	1,661	23.8 (21.6 – 26.0)	11,054,000
2005–2006	1,410	27.3 (24.1 – 30.6)	13,167,000
Gender			
(6 years and older)			
Males			
2001–2002	3,782	22.8 (20.4 – 25.4)	28,420,000
2003–2004	3,638	23.6 (19.8 – 27.9)	30,162,000
2005–2006	3,603	24.3 (21.2 – 27.8)	31,683,000
Females			
2001–2002	4,025	25.1 (22.5 – 27.9)	33,130,000
2003–2004	3,765	25.4 (22.1 – 28.9)	34,190,000
2005–2006	3,799	24.6 (21.6 – 27.8)	33,739,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
2001–2002	1,961	35.6 (31.0 – 40.5)	7,496,000
2003–2004	1,802	34.9 (30.6 – 39.5)	7,963,000
2005–2006	1,889	35.5 (30.0 – 41.3)	8,515,000
Non-Hispanic Blacks			
2001–2002	1,821	40.0 (37.5 – 42.6)	12,350,000
2003–2004	1,914	42.2 (38.1 – 46.3)	13,140,000
2005–2006	1,932	39.0 (36.1 – 42.0)	12,422,000
Non-Hispanic Whites			
2001–2002	3,416	18.7 (16.6 – 21.0)	33,627,000
2003–2004	3,155	18.6 (15.6 – 22.1)	33,594,000
2005–2006	3,027	18.9 (16.0 – 22.2)	34,271,000

Table 2.13.d.3. Serum 25-hydroxyvitamin D: Prevalence by survey cycle

Prevalence (in percent) of low serum 25-hydroxyvitamin D concentration (< 40 nmol/L) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
2001–2002	7,807	18.2 (15.5 – 21.3)	46,723,000
2003–2004	7,403	17.2 (13.3 – 21.9)	45,025,000
2005–2006	7,402	18.9 (15.3 – 23.1)	50,461,000
Age group			
1–5 years			
2003–2004	895	3.0 (1.6 – 5.5)	612,000
2005–2006	904	2.3 (1.4 – 3.7)	467,000
6–11 years			
2001–2002	991	5.3 (3.2 – 8.7)	1,313,000
2003–2004	846	5.8 (3.4 – 9.7)	1,399,000
2005–2006	922	5.6 (4.0 – 7.9)	1,338,000
12–19 years			
2001–2002	2,167	17.5 (13.2 – 22.8)	5,660,000
2003–2004	2,059	15.3 (11.2 – 20.6)	5,078,000
2005–2006	1,985	18.9 (13.8 – 25.4)	6,325,000
20–39 years			
2001–2002	1,691	19.7 (16.2 – 23.6)	15,557,000
2003–2004	1,559	19.9 (15.1 – 25.6)	15,829,000
2005–2006	1,703	19.5 (14.9 – 25.2)	15,587,000
40–59 years			
2001–2002	1,449	19.1 (16.0 – 22.7)	14,488,000
2003–2004	1,278	18.5 (13.6 – 24.6)	14,620,000
2005–2006	1,382	21.5 (16.8 – 27.0)	17,595,000
60 years and older			
2001–2002	1,509	20.9 (16.9 – 25.7)	9,371,000
2003–2004	1,661	16.4 (13.4 – 20.0)	7,646,000
2005–2006	1,410	19.1 (15.5 – 23.4)	9,241,000
Gender			
(6 years and older)			
Males			
2001–2002	3,782	14.8 (12.6 – 17.3)	18,450,000
2003–2004	3,638	14.2 (10.4 – 19.1)	18,138,000
2005–2006	3,603	16.6 (13.4 – 20.4)	21,606,000
Females			
2001–2002	4,025	21.4 (18.1 – 25.3)	28,325,000
2003–2004	3,765	20.0 (15.9 – 24.8)	26,932,000
2005–2006	3,799	21.0 (16.8 – 26.0)	28,849,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
2001–2002	1,961	23.3 (19.0 – 28.2)	4,904,000
2003–2004	1,802	24.5 (19.1 – 30.8)	5,582,000
2005–2006	1,889	28.9 (21.3 – 37.9)	6,943,000
Non-Hispanic Blacks			
2001–2002	1,821	60.6 (57.1 – 64.1)	18,708,000
2003–2004	1,914	51.0 (43.9 – 58.1)	15,900,000
2005–2006	1,932	57.7 (50.3 – 64.7)	18,374,000
Non-Hispanic Whites			
2001–2002	3,416	10.4 (8.6 – 12.4)	18,638,000
2003–2004	3,155	9.5 (7.0 – 12.8)	17,121,000
2005–2006	3,027	10.1 (8.1 – 12.6)	18,342,000

Table 2.13.d.4. Serum 25-hydroxyvitamin D: Prevalence by survey cycle

Prevalence (in percent) of high serum 25-hydroxyvitamin D concentration (> 125 nmol/L) for the U.S. population, National Health and Nutrition Examination Survey, 2001–2006.

	Sample size	Prevalence (95% conf. interval)	Estimated total number of persons
Total, 6 years and older			
2001–2002	7,807	0.8 (0.5 – 1.2)	1,998,000
2003–2004	7,403	1.0 (0.5 – 1.7)	2,547,000
2005–2006	7,402	0.8 (0.6 – 1.2)	2,224,000
Age group			
1–5 years			
2003–2004	895	§	§
2005–2006	904	§	§
6–11 years			
2001–2002	991	§	§
2003–2004	846	§	§
2005–2006	922	§	§
12–19 years			
2001–2002	2,167	§	§
2003–2004	2,059	1.3 (0.7 – 2.3)	427,000
2005–2006	1,985	1.4‡ (0.7 – 2.9)	478,000‡
20–39 years			
2001–2002	1,691	1.0 (0.6 – 1.8)	821,000
2003–2004	1,559	1.7‡ (0.8 – 3.4)	1,334,000‡
2005–2006	1,703	1.3 (0.7 – 2.4)	1,050,000
40–59 years			
2001–2002	1,449	0.8‡ (0.4 – 1.6)	616,000‡
2003–2004	1,278	§	§
2005–2006	1,382	§	§
60 years and older			
2001–2002	1,509	§	§
2003–2004	1,661	§	§
2005–2006	1,410	§	§
Gender			
(6 years and older)			
Males			
2001–2002	3,782	§	§
2003–2004	3,638	§	§
2005–2006	3,603	0.5‡ (0.2 – 1.0)	649,000‡
Females			
2001–2002	4,025	1.1 (0.7 – 1.7)	1,395,000
2003–2004	3,765	1.5 (0.8 – 2.9)	2,071,000
2005–2006	3,799	1.1 (0.7 – 1.9)	1,574,000
Race/ethnicity			
(6 years and older)			
Mexican Americans			
2001–2002	1,961	§	§
2003–2004	1,802	§	§
2005–2006	1,889	§	§
Non-Hispanic Blacks			
2001–2002	1,821	§	§
2003–2004	1,914	§	§
2005–2006	1,932	§	§
Non-Hispanic Whites			
2001–2002	3,416	1.0 (0.7 – 1.5)	1,859,000
2003–2004	3,155	1.3 (0.7 – 2.5)	2,391,000
2005–2006	3,027	1.1 (0.7 – 1.7)	2,047,000

‡ Estimate flagged: 30% ≤ RSE < 40% for the prevalence estimate.

§ Estimate suppressed: RSE ≥ 40% for the prevalence estimate.

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Fatty Acids

Background Information

Nomenclature. Fatty acids are organic acids characterized by long unbranched aliphatic tails (4–28 carbons) attached to a carboxyl group. Fatty acids usually possess an even number of carbon atoms; and the carbon chain may contain several unsaturated or exclusively saturated bonds. Thus, fatty acids differ in chain length, degree of saturation, location of the double bond(s) along the chain, and whether the orientation of hydrogen atoms adjacent to the double bond is *cis* or *trans*. Fatty acids with no double bonds are referred to as saturated fatty acids (SFA) while those with one double bond are monounsaturated fatty acids (MUFA). Fatty acids with two or more double bonds are termed polyunsaturated fatty acids (PUFA). PUFA are most often categorized into two groups distinguished by a difference in location of the first double bond from the methyl end of the acyl chain, namely, n-6 and n-3. Linoleic acid (18:2n-6) and alpha-linolenic acid (18:3n-3) are representatives of these two groups. Each contains 18 carbon atoms but differs in the number of double bonds (18:2n-6 vs 18:3n-3) and the location of the first double bond (18:2n-6 vs 18:3n-3). In this report, unless marked, all unsaturated fatty acids are assumed to be in the *cis* configuration.

Sources and Physiological Functions. Good sources of PUFA include soybean, corn and cottonseed oils (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010). Oils that are rich in MUFA include olive, canola and safflower oils (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010). Recent NHANES data provide information on the major food sources of various fatty acids consumed in the United States (U.S. National Institutes of Health 2010a and 2010b). Chicken dishes, desserts, salad dressings, chips, nuts, seeds and pizza are the main sources of n-6 PUFA. The main sources of n-3 PUFA (C18:3n-3) in the American diet are salad dressings, chicken dishes, desserts, pizza, bread, mayonnaise and pasta dishes; whereas, the main sources of long-chain n-3 PUFA (C20:5n-3 and C22:6n-3) are fish and fish mixed dishes. The chief dietary sources of MUFA (C18:1) are desserts, meats, nuts, seeds, pizza, French fries and Mexican foods. The main sources of SFA in the American diet are full-fat cheese, pizza and desserts; other sources include chicken dishes, cured meats, ribs and burgers.

Triacylglycerols (triglycerides), the basic building blocks of fats and oils, are made up of three fatty acids esterified to a glycerol molecule (Lichtenstein 2005). They are usually composed of 2–3 different kinds of fatty acids per molecule. During digestion, dietary triglycerides from animal and vegetable fats are hydrolyzed in the small intestine to release free fatty acids. These acids enter the intestinal cells and are used to resynthesize triglycerides, which become incorporated into large lipoprotein particles called chylomicrons; these in turn are released into the lymph prior to entering the plasma. Fatty acids with 10 or fewer carbon atoms can be absorbed from the gut directly into the bloodstream where they are bound to albumin in the plasma. At distal sites, triglycerides are again hydrolyzed by lipases before fatty acids can enter cells for further metabolism. Once inside peripheral cells, free fatty acids provide an immediate source of energy (fatty acids are the body's major fuel source) or act as substrate for the biosynthesis of signaling molecules such as eicosanoids. Free fatty acids are also incorporated into other lipid classes, such as phospholipids, sphingolipids, and cholesteryl esters, or they may be resynthesized into triglycerides and stored for later use. Phospholipids, which are critical structural components of cellular membranes, tend to incorporate unsaturated fatty acids and so serve as a reservoir for MUFA and PUFA.

Humans are incapable of *de novo* synthesis of n-6 and n-3 PUFA because they lack the ability to insert a double bond any closer than 9 carbons from the methyl end. Thus, linoleic (18:2n-6) and alpha-linolenic (18:3n-3) acid are called “essential” PUFA in that they are required for good health but must be derived from food sources rather than through endogenous biosynthesis or metabolism. Both of these fatty acids are metabolized to longer-chain, more highly unsaturated forms. Note that SFA and MUFA in plasma are not expected to closely reflect dietary intake because these two classes of fatty acids can be endogenously synthesized from carbohydrates. The strongest correlations with dietary intake are provided by plasma concentrations of n-3 PUFA and *trans*-fatty acids (Sun 2007).

Health Effects. The most common MUFA is oleic acid (C18:1n-9); although humans can synthesize this fatty acid, it is obtained largely through the diet. Evidence suggests that replacing dietary carbohydrates with MUFA decreases LDL-cholesterol concentration, but there is little evidence that MUFA are associated with coronary heart disease (Astrup 2011). Currently, intense debate surrounds the question whether reduction in dietary SFA reduces risk of cardiovascular disease (Zelman 2011). At present, the Dietary Guidelines for Americans recommend reduced intake of SFA (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010). Restricting fat intake and replacing SFA with other nutrients has revealed added complexity in the diet-heart issue. According to evidence from human studies, replacing SFA with PUFA lowers coronary heart disease risk, whereas replacing SFA with carbohydrate either has no benefit (Micha 2010) or may be harmful or beneficial depending upon the quality of the carbohydrate (Jakobsen 2009; Jakobsen 2010). Carbohydrates either rapidly or slowly increase blood glucose; highly refined carbohydrates are amongst the former, and higher intake of these is associated with greater risk for development of diabetes. Replacing SFA with highly refined carbohydrates and added sugars may be increasing heart disease risk through promotion of obesity and diabetes (Hu 2010).

The heart healthy effects of PUFA are most often assessed based on their effects on the concentrations of total cholesterol, HDL- and LDL-cholesterol, cholesterol ratios and/or triglycerides. Intake of n-6 PUFA helps to lower total cholesterol and LDL-cholesterol, however, high intake of n-6 fatty acids may suppress HDL-cholesterol levels. In contrast, n-3 fatty acid consumption has been shown to maintain and even increase HDL status (International Life Sciences Institute 2001). In the United States, the FDA permits qualified health claims to be made about a diet-disease relationship for cardiovascular disease; currently, 6 of the 7 permitted claims for cardiovascular disease are related to the MUFA or PUFA content of nuts, oils and spreads, or fish oil supplements.

Deficiency in the essential fatty acids is determined by use of a plasma triene-to-tetraene ratio (eicosatrienoic [C20:3n-9]:arachidonic [C20:4n-6] acid); a ratio greater than 0.2 indicates deficiency (Institute of Medicine 2005). (Note: eicosatrienoic was not part of the plasma fatty acid profile measured for NHANES 2003-2004.) PUFA deficiency may manifest with neuropathy and skin problems, such as rough or scaly skin and dermatitis (International Life Sciences Institute 2001).

Intake Recommendations. Because the body makes more than enough SFA to meet metabolic needs, people have no requirement for these fatty acids. Evidence suggests that SFA are positively associated with total cholesterol and LDL-cholesterol concentrations and thus with cardiovascular disease risk. Lowering dietary intake of SFA to no more than 10% of caloric intake and replacing them with MUFA and PUFA is recommended to reduce the risk of cardiovascular disease; moreover, lowering the percentage of calories derived from SFA to 7% of calories, can further reduce risk of cardiovascular disease (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010; Cleman 2001). The National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (ATP III) recommends

that MUFA not exceed 20% of calories (Cleeman 2001). Guidance about adequate intake (AI) is available for the essential fatty acids. The AI of linoleic acid is 17 g/d for men and 12 g/d for women. For alpha-linolenic acid, the AI is 1.6 g/d for men and 1.1 g/d for women. Moderate evidence shows that consumption of about 8 oz of seafood per week, which provides an average of 250 mg per day of eicosapentaenoic acid (C20:5n-3) and docosahexaenoic acid (C22:6n-3), reduces cardiac deaths among persons with and without cardiovascular disease (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010). This amount of seafood is also associated with improved infant health outcomes such as visual and cognitive development, when consumed by pregnant or lactating women (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010). Currently, there is not enough evidence to establish upper tolerable limits for n-3 or n-6 PUFA (Institute of Medicine 2005).

According to the American Heart Association, patients with coronary heart disease should be encouraged to increase their consumption of eicosapentaenoic acid (C20:5n-3) and docosahexaenoic acid (C22:6n-3) to about 1 gram per day preferably from oily fish. The American Heart Association Dietary Guidelines recommend at least two servings of fish per week (particularly fatty fish) for patients without documented coronary heart disease. In addition, inclusion of vegetable oils (e.g., soybean, canola, walnut, flaxseed) and food sources (e.g., walnuts, flaxseeds) high in alpha-linolenic acid (C18:3n-3) is recommended in a healthy diet for the general population (Kris-Etherton 2002). The American Heart Association recommends 5-10% of energy from n-6 fatty acids (Harris 2009) while Adult Treatment Panel III recommends up to 10% of total calories may be consumed from polyunsaturated fats (Cleeman 2001).

Biochemical Indicators and Methods. The long term fatty acid content of the diet is best represented by the adipose tissue triglyceride content owing to the two-year half-life of adipose tissue fatty acids. Erythrocytes, due to their 120 day half-life, reflect intermediate term (weeks-to-months) dietary intake, although this idea has been challenged by data demonstrating large changes in the fatty acid composition of erythrocytes within days of altering dietary fat intake (Hodson 2008). Serum or plasma concentrations represent more recent intake (days-to-weeks). Few studies have compared the fatty acid composition of plasma with red blood cells to assess which substrate best reflects dietary intake. In one study, fatty acid correlations with food frequency questionnaire data were only slightly stronger for erythrocytes than for plasma (Sun 2007). The triglyceride fraction of plasma appears to demonstrate the greatest day-to-day variation of any circulating lipid fraction. Thus, whenever serum or plasma is collected for fatty acid analysis, fasting is preferred to minimize the within- and between-person variability at the time of specimen collection.



Capillary gas chromatography (GC) is the technique most frequently used to separate fatty acids for quantitative analysis. Detection methods include flame ionization or electron capture negative chemical ionization mass spectrometry. Internal standards are used to correct for losses during sample preparation and improve the accuracy and precision of measurements.

Data in NHANES. The data in this report were generated for fasted (≥ 8 hours) adults (≥ 20 years) by use of gas chromatography-mass spectrometry (GC-MS) based on a modification of the method of Lagerstedt *et al.* (2001). Plasma fatty acid concentrations are reported in $\mu\text{mol/L}$ units.

Generally, fatty acid data are expressed as percentage by weight of total fatty acids (wt%) although percentage by mole (mol%) would be more meaningful. The possible advantages of using absolute concentrations of individual fatty acids have not been well investigated (Hodson 2008). No data exist on plasma concentrations of fatty acids in NHANES prior to 2003. This report shows first-time NHANES data for 24 plasma fatty acids including 6 SFA, 7 MUFA, and 11 PUFA; these data were acquired using surplus plasma from NHANES 2003-2004. The serum specimens were stored at -70°C until fatty acids were measured during the period 2010–2011. Based on limited information in the literature about absolute concentrations, these 24 fatty acids are estimated to comprise at least 90% of the total fatty acids circulating in the plasma in all lipid classes (fatty acyls, glycerolipids, glycerophospholipids, sphingolipids and sterols). All unsaturated fatty acids are assumed to be in the *cis* configuration; *trans*-fatty acids were not measured.

For more information about polyunsaturated fatty acids, see the Institute of Medicine's Dietary Reference Intake reports (Institute of Medicine 2005) and fact sheets from the National Institutes of Health, Office of Dietary Supplements (<http://ods.od.nih.gov/FactSheets/Omega3FattyAcidsandHealth.asp>).

Highlights

These first-time plasma concentrations of saturated (SFA), monounsaturated (MUFA), and polyunsaturated (PUFA) fatty acids in the U.S. population showed the following demographic patterns and characteristics:

- In general, fatty acids circulated at lower concentrations in younger adults.
- Plasma concentrations of individual fatty acids were generally similar in men and women.
- No consistent race/ethnic pattern was observed for plasma fatty acid concentrations, however heart-healthy polyunsaturated fatty acids showed race/ethnic differences.

All three classes of fatty acids contained representatives at low ($< 100 \mu\text{mol/L}$) and high concentrations ($> 1,000 \mu\text{mol/L}$) (Figure H.2.e).

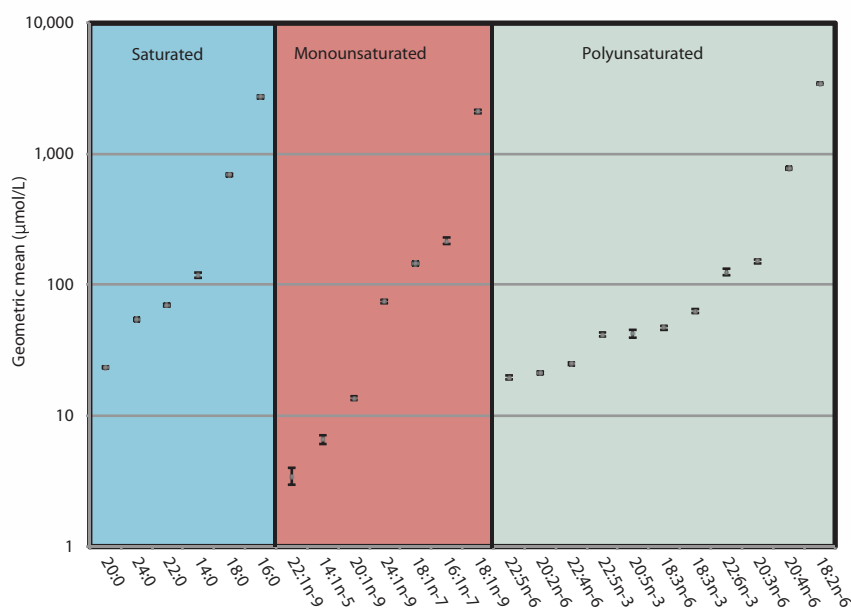


Figure H.2.e. Geometric mean plasma concentrations of individual fatty acids in the U.S. population from fasted adults aged 20 years and older by race/ethnicity, National Health and Nutrition Examination Survey, 2003-2004.

Error bars represent 95% confidence intervals. The y-axis is displayed on the logarithmic scale.

Saturated (SFA)

- 20:0 Arachidic acid
- 24:0 Lignoceric acid
- 22:0 Doconsanoic acid
- 14:0 Myristic acid
- 18:0 Stearic acid
- 16:0 Palmitic acid

Monounsaturated (MUFA)

- 22:1n-9 Docosenoic acid
- 14:1n-5 Myristoleic acid
- 20:1n-9 Eicosenoic acid
- 24:1n-9 Nervonic acid
- 18:1n-9 *cis*-Vaccenic acid
- 16:1n-9 Palmitoleic acid
- 18:1n-9 Oleic acid

Polyunsaturated (PUFA)

- 22:5n-6 Docosapentaenoic acid
- 20:2n-6 Eicosadienoic acid
- 22:4n-6 Docosatetraenoic acid
- 22:5n-3 Docosapentaenoic acid
- 20:5n-3 Eicosapentaenoic acid
- 18:3n-6 *gamma*-Linolenic acid
- 18:3n-3 *alpha*-Linolenic acid
- 22:6n-3 Docosahexaenoic acid
- 20:3n-6 *homo-gamma*-Linolenic acid
- 20:4n-6 Arachidonic acid
- 18:2n-6 Linoleic acid

Plasma concentrations of heart-healthy PUFA showed race/ethnic differences. Geometric mean concentrations of eicosapentaenoic acid (EPA), which is typically derived from seafood and supplements, were higher in fasted non-Hispanic blacks and whites compared with Mexican-American adults (Figure H.2.f).

In addition, plasma concentrations of the related long-chain polyunsaturated docosahexaenoic acid (DHA) were higher in non-Hispanic black compared with Mexican-American and non-Hispanic white adults (Figure H.2.g).

Tracking plasma fatty acid concentrations over time will show progress toward more heart-healthy diets.

A.

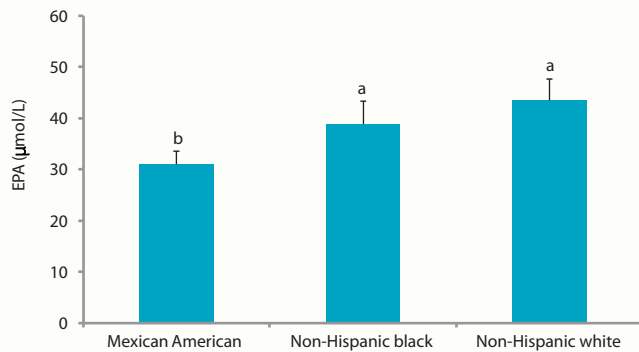


Figure H.2.f. Geometric mean plasma concentrations of eicosapentaenoic acid (EPA) in the U.S. population from fasted adults aged 20 years and older by race/ethnicity, National Health and Nutrition Examination Survey, 2003-2004.

Error bars represent 95% confidence intervals. Bars not sharing a common letter differ ($p < 0.05$).

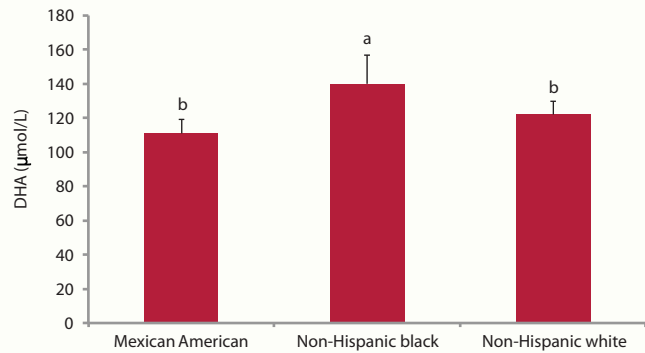


Figure H.2.g. Geometric mean plasma concentrations of docosahexaenoic acid (DHA) in the U.S. population from fasted adults aged 20 years and older by race/ethnicity, National Health and Nutrition Examination Survey, 2003-2004.

Error bars represent 95% confidence intervals. Bars not sharing a common letter differ ($p < 0.05$).

Detailed Observations

The selected observations mentioned below are taken from the tables and figures presented next. Statements about categorical differences between demographic groups noted below are based on non-overlapping confidence limits from univariate analysis without adjusting for demographic variables (e.g., age, gender, race/ethnicity) or other blood concentration determinants (e.g., dietary intake, supplement usage, smoking, BMI). A multivariate analysis may alter the size and statistical significance of these categorical differences. Furthermore, additional significant differences of smaller magnitude may be present despite their lack of mention here (e.g., if confidence limits slightly overlap or if differences are not statistically significant before covariate adjustment has occurred). For a selection of citations of descriptive NHANES papers related to these biochemical indicators of diet and nutrition, see [Appendix G](#).

Geometric mean concentrations (NHANES 2003–2004):

- The majority of fatty acids circulated in plasma at lower concentrations in younger adults (20-29 y) compared with those in the older age groups (40-59 and/or 60+ y) (Tables 2.14.a.1-2.37.a.1).
- (While in general, plasma concentrations of fatty acids were similar in men and women, there were a few long chain (C20-C24) exceptions in which concentrations were higher in women than in men (Tables 2.14.a.1-2.37.a.1).
- (Plasma concentrations of approximately one-third of SFA and three-quarters of MUFA were found at lower concentrations in non-Hispanic blacks compared with non-Hispanic whites and/or Mexican Americans. Notably, non-Hispanic blacks had substantially lower plasma concentrations of myristic (SFA) and myristoleic (MUFA) acid than non-Hispanic whites or Mexican Americans (Tables 2.14.a.1 and 2.20.a.1). For PUFA, the picture was mixed with each race/ethnic group having higher or lower concentrations of at least one PUFA compared with one or both race/ethnic groups.



Table 2.14.a.1. Plasma myristic acid (14:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	119 (113 – 125)	42.5 (39.9 – 45.1)	48.1 (46.2 – 50.5)	116 (108 – 123)	308 (282 – 353)	392 (360 – 438)	1,796	
Age group								
20–39 years	110 (104 – 117)	39.0 (31.1 – 42.5)	45.0 (42.5 – 46.8)	106 (99.0 – 118)	301 (252 – 370)	370 (330 – 533)	603	
40–59 years	126 (117 – 136)	46.2 (41.4 – 47.9)	51.8 (47.2 – 56.4)	120 (109 – 132)	329 (287 – 401)	410 (383 – 481)	514	
60 years and older	121 (112 – 131)	44.5 (37.9 – 47.5)	50.2 (46.3 – 54.5)	120 (112 – 127)	300 (243 – 366)	329 (307 – 426)	679	
Gender								
Males	120 (112 – 129)	40.6 (34.0 – 45.1)	47.6 (44.8 – 52.6)	118 (105 – 129)	320 (285 – 384)	414 (366 – 508)	856	
Females	117 (111 – 124)	44.6 (39.5 – 45.9)	48.3 (45.9 – 50.8)	115 (107 – 121)	303 (258 – 359)	365 (325 – 434)	940	
Race/ethnicity								
Mexican Americans	126 (110 – 144)	41.6† (39.1 – 47.5)	48.5 (40.6 – 52.3)	124 (108 – 144)	342 (304 – 470)	408† (349 – 1,810)	375	
Non-Hispanic Blacks	85.8 (78.9 – 93.3)	32.8† (27.9 – 38.3)	39.8 (30.2 – 43.5)	84.3 (72.0 – 95.0)	223 (178 – 283)	261† (229 – 410)	309	
Non-Hispanic Whites	123 (116 – 131)	45.6 (38.4 – 47.8)	50.9 (46.5 – 55.8)	119 (110 – 127)	310 (286 – 364)	396 (358 – 464)	982	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.14.a. Plasma myristic acid (14:0): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

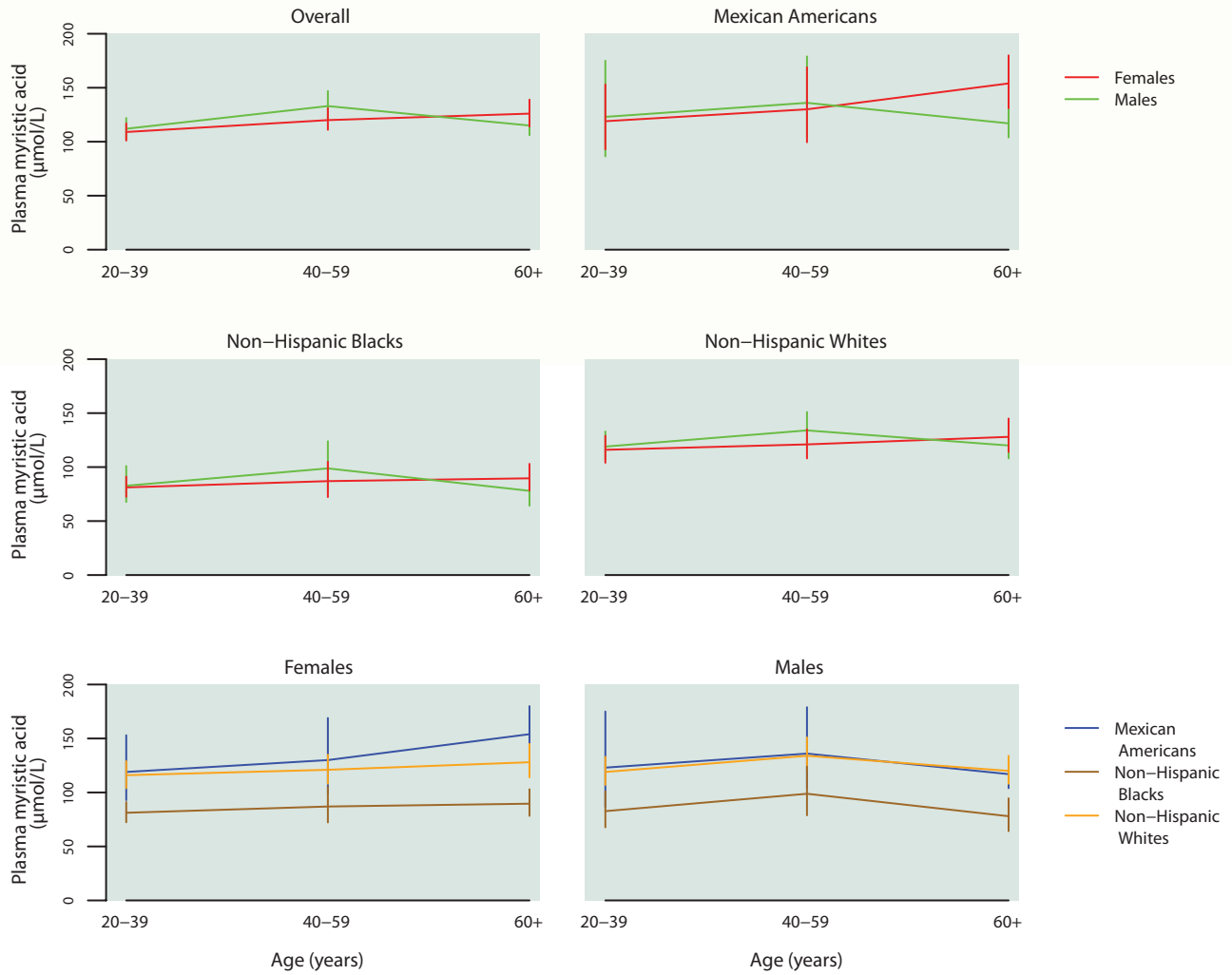


Table 2.14.a.2. Plasma myristic acid (14:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	119 (113 – 125)	57.9 (55.2 – 61.1)	116 (108 – 123)	248 (237 – 266)	1,796
20–39 years	110 (104 – 117)	52.8 (49.4 – 55.9)	106 (99.0 – 118)	240 (209 – 260)	603
40–59 years	126 (117 – 136)	61.8 (56.1 – 66.0)	120 (109 – 132)	266 (248 – 294)	514
60 years and older	121 (112 – 131)	61.4 (54.6 – 67.0)	120 (112 – 127)	238 (224 – 256)	679
Males					
Total, 20 years and older	120 (112 – 129)	58.8 (54.7 – 61.5)	118 (105 – 129)	260 (243 – 272)	856
20–39 years	112 (102 – 122)	53.4 (47.6 – 57.8)	106 (93.5 – 122)	245 (209 – 284)	277
40–59 years	133 (120 – 147)	61.8 (57.5 – 70.6)	124 (109 – 154)	279 (265 – 336)	247
60 years and older	115 (106 – 126)	58.2 (47.3 – 67.9)	119 (112 – 123)	226 (201 – 244)	332
Females					
Total, 20 years and older	117 (111 – 124)	56.6 (53.6 – 61.5)	115 (107 – 121)	242 (225 – 270)	940
20–39 years	109 (101 – 117)	51.3 (49.2 – 55.4)	106 (95.9 – 119)	226 (193 – 308)	326
40–59 years	120 (111 – 131)	61.5 (51.6 – 64.9)	115 (107 – 123)	249 (226 – 301)	267
60 years and older	126 (114 – 139)	64.1 (51.0 – 73.7)	121 (109 – 143)	244 (227 – 302)	347

Table 2.14.a.3. Plasma myristic acid (14:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	126 (110 – 144)	54.6 (49.2 – 62.0)	124 (108 – 144)	277 (244 – 352)	375
20–39 years	122 (95.1 – 155)	51.0 (45.4 – 56.1)	123 (83.9 – 158)	259 (212 – 1,990)	132
40–59 years	133 (112 – 159)	61.2† (46.5 – 76.0)	130 (95.3 – 155)	313† (248 – 387)	93
60 years and older	135 (124 – 146)	68.0 (64.2 – 75.1)	133 (112 – 160)	252 (224 – 315)	150
Males					
Total, 20 years and older	126 (102 – 156)	56.3 (49.6 – 62.4)	123 (95.9 – 153)	282 (228 – 410)	188
20–39 years	123 (86.4 – 175)	51.8† (46.6 – 57.2)	123 (67.8 – 214)	274† (202 – 556)	67
40–59 years	136 (104 – 179)	68.5† (54.1 – 82.7)	125 (90.5 – 177)	305† (201 – 721)	48
60 years and older	117 (104 – 131)	65.6† (48.2 – 71.4)	117 (104 – 135)	199† (164 – 390)	73
Females					
Total, 20 years and older	126 (110 – 145)	51.4 (40.7 – 65.3)	127 (108 – 152)	268 (240 – 339)	187
20–39 years	119 (92.9 – 153)	50.5† (39.7 – 66.1)	121 (93.6 – 150)	245† (173 – 2,410)	65
40–59 years	130 (99.5 – 169)	50.0† (36.9 – 74.6)	134 (83.1 – 193)	313† (248 – 460)	45
60 years and older	154 (131 – 180)	81.6† (54.5 – 95.1)	153 (120 – 195)	274† (228 – 391)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.14.a.4. Plasma myristic acid (14:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	85.8 (78.9 – 93.3)	44.8 (38.0 – 50.1)	84.3 (72.0 – 95.0)	161 (146 – 201)	309
20–39 years	81.9 (72.7 – 92.2)	43.6 (33.7 – 48.1)	76.7 (66.9 – 92.1)	149 (128 – 249)	125
40–59 years	91.9 (82.8 – 102)	44.5† (28.4 – 51.6)	93.4 (82.5 – 106)	184† (150 – 249)	98
60 years and older	84.9 (76.3 – 94.5)	46.9† (36.2 – 58.7)	79.7 (71.8 – 95.2)	154† (129 – 188)	86
Males					
Total, 20 years and older	87.3 (76.6 – 99.4)	40.9 (31.8 – 46.6)	85.3 (67.2 – 98.7)	170 (148 – 270)	142
20–39 years	82.7 (67.7 – 101)	39.7† (28.5 – 47.0)	71.6 (61.5 – 101)	167† (128 – 466)	57
40–59 years	98.8 (78.8 – 124)	41.2† (29.2 – 55.7)	97.8 (84.0 – 115)	229† (148 – 479)	42
60 years and older	78.0 (64.2 – 94.6)	43.7† (36.0 – 52.8)	67.4 (58.9 – 104)	143† (121 – 187)	43
Females					
Total, 20 years and older	84.7 (76.2 – 94.2)	46.5 (39.2 – 51.8)	83.0 (69.2 – 99.1)	153 (135 – 189)	167
20–39 years	81.2 (72.4 – 91.2)	44.2† (33.9 – 51.5)	78.8 (64.6 – 98.7)	144† (110 – 259)	68
40–59 years	87.0 (72.2 – 105)	46.6† (27.8 – 51.5)	86.5 (64.8 – 106)	160† (123 – 690)	56
60 years and older	89.6 (78.3 – 103)	53.5† (39.8 – 63.8)	82.6 (73.5 – 103)	158† (120 – 194)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.14.a.5. Plasma myristic acid (14:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	123 (116 – 131)	61.6 (56.2 – 65.5)	119 (110 – 127)	250 (236 – 280)	982
20–39 years	118 (110 – 126)	56.9 (50.1 – 64.0)	115 (103 – 123)	244 (216 – 303)	294
40–59 years	127 (115 – 140)	63.8 (56.4 – 69.1)	120 (108 – 136)	266 (238 – 299)	279
60 years and older	124 (114 – 136)	61.8 (53.5 – 70.8)	121 (116 – 134)	241 (225 – 301)	409
Males					
Total, 20 years and older	126 (115 – 137)	61.5 (56.0 – 67.2)	121 (107 – 141)	263 (243 – 273)	465
20–39 years	119 (107 – 133)	58.3 (35.4 – 67.0)	115 (98.2 – 140)	245 (206 – 337)	124
40–59 years	134 (120 – 151)	65.6 (57.8 – 72.3)	124 (108 – 163)	272 (264 – 317)	139
60 years and older	120 (108 – 134)	58.8 (46.7 – 72.3)	121 (115 – 127)	229 (203 – 262)	202
Females					
Total, 20 years and older	121 (114 – 128)	61.5 (55.6 – 64.2)	118 (110 – 123)	247 (223 – 303)	517
20–39 years	116 (104 – 129)	55.5 (48.9 – 63.3)	114 (97.3 – 128)	240 (197 – 361)	170
40–59 years	121 (108 – 135)	62.2 (48.3 – 69.0)	115 (104 – 123)	237 (195 – 399)	140
60 years and older	128 (114 – 145)	64.1 (47.6 – 74.7)	124 (110 – 146)	248 (229 – 314)	207

Table 2.15.a.1. Plasma palmitic acid (16:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	2,710 (2,640 – 2,780)		1,570 (1,420 – 1,610)	1,690 (1,610 – 1,770)	2,630 (2,540 – 2,730)	4,710 (4,500 – 5,030)	5,370 (5,180 – 5,630)	1,805
Age group								
20–39 years	2,540 (2,470 – 2,610)		1,440 (1,330 – 1,550)	1,590 (1,480 – 1,670)	2,450 (2,380 – 2,540)	4,550 (4,000 – 5,330)	5,340 (4,740 – 6,860)	609
40–59 years	2,780 (2,680 – 2,880)		1,600 (1,330 – 1,750)	1,830 (1,650 – 1,910)	2,650 (2,530 – 2,800)	4,750 (4,560 – 5,320)	5,410 (5,260 – 5,760)	514
60 years and older	2,890 (2,790 – 2,990)		1,750 (1,610 – 1,860)	1,910 (1,760 – 1,970)	2,820 (2,740 – 2,940)	4,630 (4,390 – 5,160)	5,220 (4,830 – 5,790)	682
Gender								
Males	2,700 (2,590 – 2,810)		1,560 (1,380 – 1,650)	1,670 (1,570 – 1,790)	2,610 (2,500 – 2,710)	4,730 (4,400 – 5,320)	5,630 (5,090 – 6,090)	863
Females	2,720 (2,640 – 2,800)		1,570 (1,400 – 1,610)	1,710 (1,660 – 1,780)	2,640 (2,540 – 2,760)	4,660 (4,450 – 5,270)	5,350 (4,970 – 5,500)	942
Race/ethnicity								
Mexican Americans	2,880 (2,710 – 3,050)		1,500† (1,310 – 1,710)	1,750 (1,500 – 1,830)	2,750 (2,620 – 2,970)	5,430 (4,580 – 6,310)	5,980† (5,640 – 6,380)	374
Non-Hispanic Blacks	2,450 (2,340 – 2,570)		1,540† (1,250 – 1,580)	1,590 (1,320 – 1,730)	2,330 (2,240 – 2,480)	4,020 (3,610 – 4,510)	4,570† (4,050 – 8,480)	310
Non-Hispanic Whites	2,720 (2,630 – 2,810)		1,570 (1,380 – 1,610)	1,690 (1,600 – 1,780)	2,650 (2,550 – 2,730)	4,720 (4,430 – 5,270)	5,350 (4,930 – 5,640)	991

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.15.a. Plasma palmitic acid (16:0): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

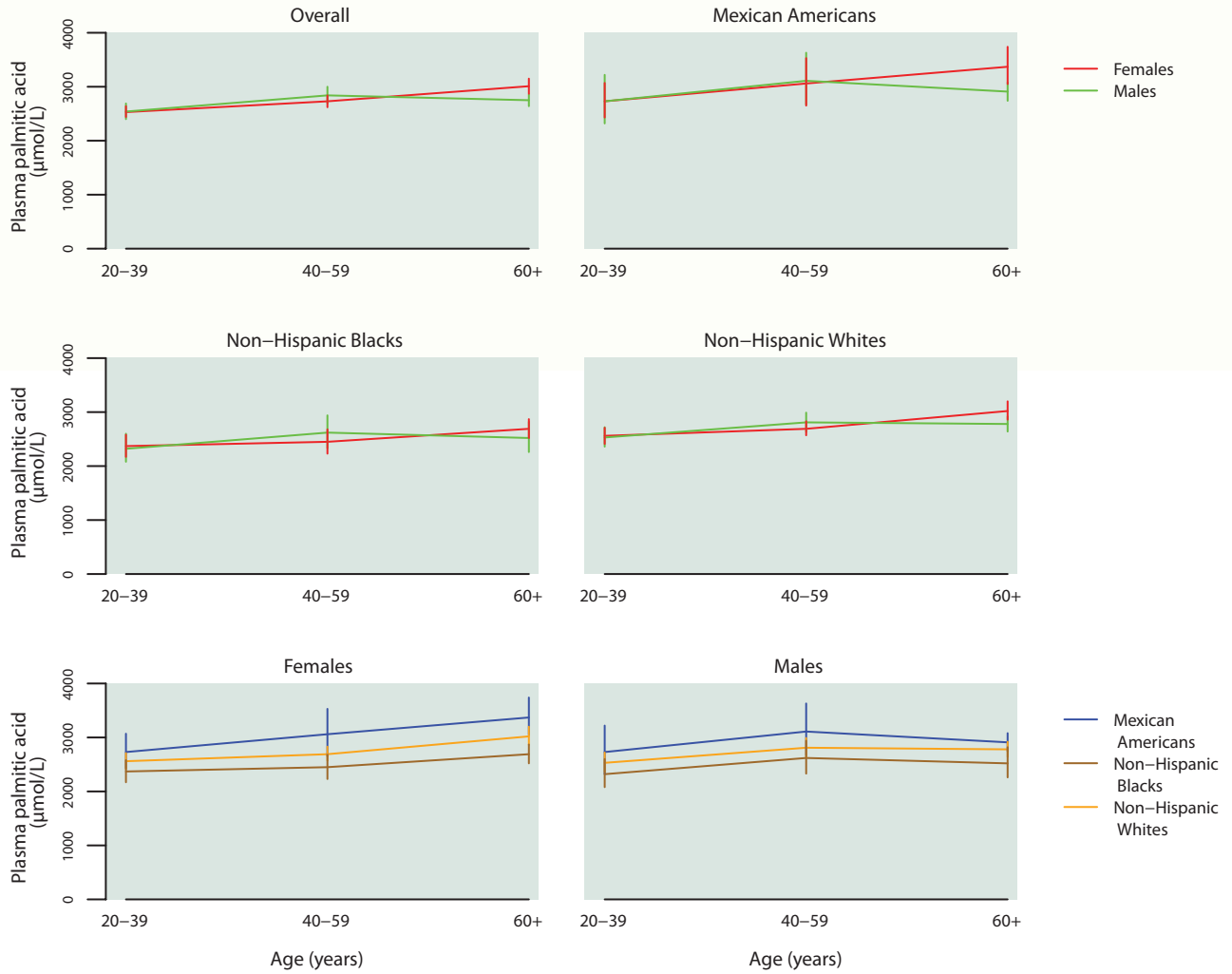


Table 2.15.a.2. Plasma palmitic acid (16:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,710 (2,640 – 2,780)	1,890 (1,820 – 1,930)	2,630 (2,540 – 2,730)	3,990 (3,820 – 4,360)	1,805
20–39 years	2,540 (2,470 – 2,610)	1,750 (1,660 – 1,810)	2,450 (2,380 – 2,540)	3,790 (3,540 – 4,260)	609
40–59 years	2,780 (2,680 – 2,880)	1,950 (1,910 – 1,990)	2,650 (2,530 – 2,800)	4,160 (3,840 – 4,570)	514
60 years and older	2,890 (2,790 – 2,990)	2,050 (1,960 – 2,140)	2,820 (2,740 – 2,940)	4,050 (3,840 – 4,430)	682
Males					
Total, 20 years and older	2,700 (2,590 – 2,810)	1,880 (1,760 – 1,920)	2,610 (2,500 – 2,710)	4,010 (3,790 – 4,430)	863
20–39 years	2,540 (2,400 – 2,690)	1,740 (1,580 – 1,820)	2,470 (2,340 – 2,600)	3,690 (3,420 – 4,540)	282
40–59 years	2,840 (2,690 – 3,000)	1,950 (1,890 – 2,010)	2,700 (2,480 – 2,870)	4,420 (4,030 – 4,760)	247
60 years and older	2,750 (2,640 – 2,860)	1,960 (1,820 – 2,070)	2,730 (2,620 – 2,830)	3,790 (3,530 – 4,380)	334
Females					
Total, 20 years and older	2,720 (2,640 – 2,800)	1,920 (1,820 – 1,970)	2,640 (2,540 – 2,760)	3,960 (3,810 – 4,370)	942
20–39 years	2,530 (2,440 – 2,640)	1,760 (1,670 – 1,840)	2,440 (2,350 – 2,580)	3,870 (3,510 – 4,530)	327
40–59 years	2,730 (2,620 – 2,840)	1,960 (1,820 – 2,090)	2,590 (2,530 – 2,760)	3,850 (3,620 – 4,630)	267
60 years and older	3,010 (2,870 – 3,150)	2,180 (2,050 – 2,230)	2,950 (2,760 – 3,150)	4,340 (4,000 – 4,570)	348

Table 2.15.a.3. Plasma palmitic acid (16:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,880 (2,710 – 3,050)	1,900 (1,720 – 2,050)	2,750 (2,620 – 2,970)	4,540 (4,130 – 5,550)	374
20–39 years	2,730 (2,510 – 2,970)	1,820 (1,390 – 1,970)	2,700 (2,350 – 2,890)	4,410 (3,700 – 5,680)	131
40–59 years	3,090 (2,820 – 3,380)	2,000† (1,480 – 2,330)	2,840 (2,610 – 3,290)	4,940† (4,130 – 6,470)	93
60 years and older	3,140 (3,010 – 3,280)	2,250 (1,970 – 2,420)	3,150 (3,010 – 3,300)	4,530 (3,910 – 5,350)	150
Males					
Total, 20 years and older	2,850 (2,580 – 3,160)	1,890 (1,570 – 2,010)	2,690 (2,510 – 3,180)	4,500 (4,020 – 5,950)	188
20–39 years	2,730 (2,320 – 3,220)	1,770† (1,460 – 1,940)	2,540 (2,090 – 3,270)	4,400† (3,600 – 6,350)	67
40–59 years	3,110 (2,670 – 3,630)	1,950† (1,790 – 2,530)	2,830 (2,580 – 3,400)	4,580† (3,880 – 7,970)	48
60 years and older	2,910 (2,740 – 3,080)	2,090† (1,500 – 2,420)	2,900 (2,580 – 3,230)	3,810† (3,500 – 5,010)	73
Females					
Total, 20 years and older	2,900 (2,660 – 3,170)	1,930 (1,330 – 2,180)	2,790 (2,450 – 3,280)	4,570 (4,060 – 5,360)	186
20–39 years	2,730 (2,430 – 3,070)	1,840† (1,300 – 2,150)	2,740 (2,230 – 3,080)	4,330† (3,560 – 6,760)	64
40–59 years	3,060 (2,650 – 3,530)	2,050† (1,480 – 2,330)	2,890 (2,460 – 3,500)	4,950† (3,540 – 6,010)	45
60 years and older	3,370 (3,050 – 3,740)	2,370† (2,060 – 2,540)	3,370 (2,780 – 3,790)	5,020† (4,210 – 6,170)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.15.a.4. Plasma palmitic acid (16:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,450 (2,340 – 2,570)	1,750 (1,600 – 1,830)	2,330 (2,240 – 2,480)	3,430 (3,330 – 3,630)	310
20–39 years	2,350 (2,170 – 2,530)	1,680 (1,410 – 1,810)	2,190 (2,070 – 2,480)	3,390 (3,140 – 3,730)	126
40–59 years	2,520 (2,370 – 2,680)	1,790† (1,620 – 1,890)	2,350 (2,270 – 2,590)	3,430† (3,370 – 4,090)	98
60 years and older	2,620 (2,490 – 2,760)	2,030† (1,870 – 2,180)	2,510 (2,430 – 2,760)	3,450† (3,280 – 3,770)	86
Males					
Total, 20 years and older	2,450 (2,280 – 2,640)	1,690 (1,550 – 1,810)	2,340 (2,180 – 2,500)	3,550 (3,170 – 4,270)	143
20–39 years	2,320 (2,080 – 2,600)	1,570† (1,310 – 1,770)	2,140 (1,930 – 2,710)	3,410† (2,940 – 9,940)	58
40–59 years	2,620 (2,330 – 2,940)	1,770† (1,380 – 1,950)	2,370 (2,290 – 2,620)	4,060† (2,900 – 8,390)	42
60 years and older	2,520 (2,260 – 2,820)	1,740† (1,640 – 1,910)	2,440 (2,150 – 2,980)	3,290† (3,000 – 4,330)	43
Females					
Total, 20 years and older	2,450 (2,300 – 2,620)	1,800 (1,690 – 1,870)	2,330 (2,230 – 2,570)	3,380 (3,210 – 3,680)	167
20–39 years	2,370 (2,170 – 2,580)	1,700† (1,390 – 1,850)	2,230 (2,030 – 2,590)	3,350† (3,110 – 4,210)	68
40–59 years	2,450 (2,230 – 2,680)	1,780† (1,260 – 1,940)	2,330 (2,140 – 2,650)	3,370† (2,930 – 6,230)	56
60 years and older	2,690 (2,520 – 2,870)	2,180† (1,950 – 2,240)	2,530 (2,400 – 2,790)	3,510† (3,260 – 4,220)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.15.a.5. Plasma palmitic acid (16:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,720 (2,630 – 2,810)	1,900 (1,800 – 1,950)	2,650 (2,550 – 2,730)	3,960 (3,810 – 4,420)	991
20–39 years	2,550 (2,450 – 2,640)	1,720 (1,600 – 1,810)	2,450 (2,370 – 2,590)	3,790 (3,510 – 4,490)	300
40–59 years	2,750 (2,630 – 2,870)	1,950 (1,900 – 1,990)	2,640 (2,500 – 2,800)	4,040 (3,790 – 4,700)	279
60 years and older	2,910 (2,790 – 3,030)	2,040 (1,950 – 2,140)	2,840 (2,730 – 2,990)	4,150 (3,840 – 4,520)	412
Males					
Total, 20 years and older	2,700 (2,580 – 2,840)	1,890 (1,750 – 1,940)	2,630 (2,500 – 2,740)	3,960 (3,770 – 4,500)	471
20–39 years	2,530 (2,360 – 2,720)	1,680 (1,540 – 1,800)	2,460 (2,350 – 2,620)	3,630 (3,260 – 5,810)	128
40–59 years	2,810 (2,630 – 2,990)	1,950 (1,890 – 2,010)	2,700 (2,460 – 2,930)	4,280 (3,850 – 4,740)	139
60 years and older	2,780 (2,640 – 2,920)	1,950 (1,760 – 2,070)	2,750 (2,600 – 2,930)	3,830 (3,530 – 4,690)	204
Females					
Total, 20 years and older	2,730 (2,640 – 2,820)	1,920 (1,810 – 1,970)	2,650 (2,550 – 2,770)	3,970 (3,810 – 4,500)	520
20–39 years	2,560 (2,410 – 2,710)	1,740 (1,600 – 1,870)	2,440 (2,280 – 2,690)	3,890 (3,490 – 4,960)	172
40–59 years	2,690 (2,570 – 2,830)	1,940 (1,720 – 2,110)	2,580 (2,530 – 2,710)	3,780 (3,510 – 4,690)	140
60 years and older	3,020 (2,860 – 3,200)	2,140 (2,010 – 2,250)	2,960 (2,750 – 3,210)	4,440 (4,030 – 4,660)	208

Table 2.16.a.1. Plasma stearic acid (18:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	692 (678 – 706)		432 (411 – 444)	471 (440 – 484)	684 (663 – 705)	1,040 (1,020 – 1,100)	1,180 (1,130 – 1,270)	1,806
Age group								
20–39 years	649 (635 – 664)		420 (362 – 437)	444 (422 – 468)	638 (624 – 659)	998 (922 – 1,120)	1,150 (1,030 – 1,470)	609
40–59 years	718 (698 – 738)		430 (383 – 473)	481 (426 – 524)	711 (682 – 733)	1,100 (1,040 – 1,160)	1,210 (1,130 – 1,350)	515
60 years and older	724 (703 – 746)		471 (430 – 489)	511 (473 – 534)	731 (697 – 763)	1,030 (976 – 1,120)	1,130 (1,040 – 1,310)	682
Gender								
Males	690 (671 – 710)		433 (408 – 469)	472 (440 – 483)	673 (644 – 711)	1,090 (1,030 – 1,200)	1,280 (1,170 – 1,360)	864
Females	694 (677 – 712)		421 (399 – 441)	462 (433 – 489)	689 (667 – 712)	1,030 (975 – 1,080)	1,140 (1,080 – 1,190)	942
Race/ethnicity								
Mexican Americans	710 (677 – 745)		440† (411 – 467)	475 (434 – 492)	710 (666 – 748)	1,150 (1,030 – 1,320)	1,210† (1,170 – 1,330)	374
Non-Hispanic Blacks	676 (655 – 697)		440† (356 – 471)	473 (435 – 495)	669 (645 – 693)	961 (901 – 1,130)	1,130† (998 – 2,010)	310
Non-Hispanic Whites	692 (676 – 709)		421 (408 – 441)	465 (430 – 485)	686 (663 – 709)	1,040 (1,020 – 1,090)	1,170 (1,090 – 1,270)	992

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.16.a. Plasma stearic acid (18:0): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

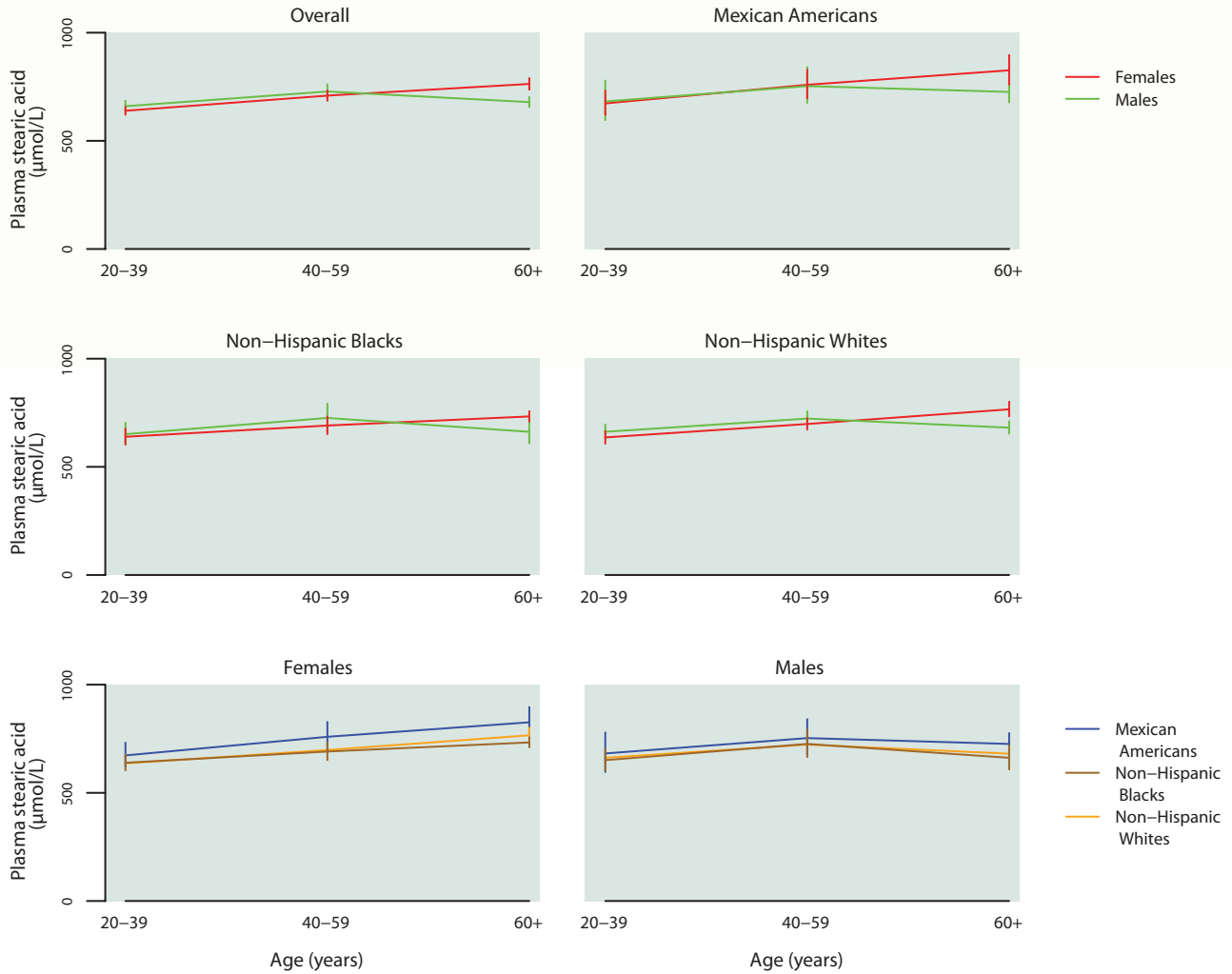


Table 2.16.a.2. Plasma stearic acid (18:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	692 (678 – 706)	515 (489 – 531)	684 (663 – 705)	939 (914 – 963)	1,806
20–39 years	649 (635 – 664)	484 (468 – 498)	638 (624 – 659)	870 (831 – 932)	609
40–59 years	718 (698 – 738)	545 (520 – 557)	711 (682 – 733)	989 (955 – 1,030)	515
60 years and older	724 (703 – 746)	552 (538 – 567)	731 (697 – 763)	930 (893 – 976)	682
Males					
Total, 20 years and older	690 (671 – 710)	509 (483 – 527)	673 (644 – 711)	967 (930 – 1,010)	864
20–39 years	660 (636 – 686)	484 (469 – 504)	643 (615 – 672)	888 (831 – 1,010)	282
40–59 years	728 (697 – 761)	548 (520 – 571)	711 (646 – 752)	1,020 (997 – 1,040)	248
60 years and older	679 (656 – 703)	514 (472 – 546)	679 (659 – 718)	874 (825 – 960)	334
Females					
Total, 20 years and older	694 (677 – 712)	522 (484 – 543)	689 (667 – 712)	916 (892 – 951)	942
20–39 years	639 (620 – 658)	483 (454 – 504)	635 (622 – 658)	849 (817 – 919)	327
40–59 years	709 (685 – 733)	532 (478 – 566)	710 (687 – 733)	934 (900 – 990)	267
60 years and older	763 (736 – 790)	617 (573 – 628)	763 (735 – 786)	971 (914 – 1,020)	348

Table 2.16.a.3. Plasma stearic acid (18:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	710 (677 – 745)	503 (485 – 528)	710 (666 – 748)	997 (921 – 1,160)	374
20–39 years	678 (632 – 727)	492 (464 – 510)	664 (594 – 755)	971 (801 – 1,330)	131
40–59 years	756 (710 – 806)	534† (457 – 587)	746 (714 – 770)	1,060† (915 – 1,470)	93
60 years and older	776 (735 – 820)	602 (491 – 646)	767 (720 – 815)	1,060 (961 – 1,180)	150
Males					
Total, 20 years and older	705 (651 – 764)	501 (480 – 522)	690 (611 – 766)	1,030 (919 – 1,210)	188
20–39 years	682 (596 – 779)	492† (456 – 508)	647 (540 – 805)	1,040† (830 – 1,330)	67
40–59 years	753 (675 – 841)	529† (469 – 595)	725 (656 – 815)	1,010† (911 – 1,490)	48
60 years and older	726 (678 – 776)	593† (457 – 610)	720 (658 – 783)	896† (832 – 1,300)	73
Females					
Total, 20 years and older	716 (677 – 758)	514 (443 – 559)	730 (669 – 777)	996 (885 – 1,140)	186
20–39 years	673 (620 – 732)	481† (340 – 555)	678 (629 – 751)	835† (791 – 1,140)	64
40–59 years	759 (696 – 828)	519† (439 – 624)	756 (700 – 819)	1,070† (859 – 1,410)	45
60 years and older	826 (760 – 897)	624† (541 – 652)	810 (736 – 903)	1,100† (1,050 – 1,250)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.16.a.4. Plasma stearic acid (18:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	676 (655 – 697)	509 (458 – 540)	669 (645 – 693)	886 (835 – 941)	310
20–39 years	645 (610 – 682)	483 (435 – 514)	641 (587 – 672)	887 (808 – 945)	126
40–59 years	706 (675 – 738)	542† (477 – 567)	693 (664 – 710)	908† (833 – 1,120)	98
60 years and older	705 (681 – 729)	561† (511 – 615)	711 (692 – 753)	834† (806 – 886)	86
Males					
Total, 20 years and older	678 (645 – 713)	483 (455 – 524)	663 (618 – 696)	925 (854 – 1,110)	143
20–39 years	651 (602 – 704)	461† (422 – 517)	619 (569 – 687)	897† (803 – 2,540)	58
40–59 years	726 (665 – 792)	544† (475 – 557)	676 (621 – 738)	1,010† (877 – 1,670)	42
60 years and older	662 (608 – 720)	503† (334 – 555)	673 (615 – 738)	830† (782 – 974)	43
Females					
Total, 20 years and older	674 (649 – 699)	514 (354 – 567)	674 (644 – 702)	834 (789 – 1,030)	167
20–39 years	639 (604 – 677)	496† (446 – 515)	645 (594 – 667)	833† (715 – 1,090)	68
40–59 years	691 (651 – 733)	526† (353 – 589)	693 (643 – 710)	826† (774 – 2,490)	56
60 years and older	733 (710 – 757)	638† (558 – 668)	718 (696 – 779)	842† (800 – 885)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.16.a.5. Plasma stearic acid (18:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	692 (676 – 709)	515 (484 – 533)	686 (663 – 709)	940 (913 – 973)	992
20–39 years	648 (627 – 669)	481 (441 – 507)	635 (614 – 661)	853 (823 – 953)	300
40–59 years	710 (689 – 733)	540 (494 – 565)	705 (675 – 727)	969 (946 – 1,020)	280
60 years and older	726 (700 – 753)	546 (524 – 566)	733 (695 – 770)	940 (900 – 1,020)	412
Males					
Total, 20 years and older	691 (669 – 715)	512 (480 – 533)	678 (644 – 720)	959 (919 – 1,010)	472
20–39 years	662 (629 – 696)	484 (433 – 513)	654 (615 – 675)	844 (810 – 1,250)	128
40–59 years	723 (691 – 757)	558 (513 – 576)	709 (640 – 749)	1,020 (975 – 1,040)	140
60 years and older	681 (653 – 711)	508 (471 – 545)	687 (652 – 726)	880 (819 – 1,030)	204
Females					
Total, 20 years and older	693 (673 – 713)	516 (481 – 537)	689 (664 – 713)	923 (899 – 954)	520
20–39 years	636 (607 – 666)	460 (427 – 510)	627 (608 – 658)	874 (818 – 1,000)	172
40–59 years	698 (672 – 725)	519 (441 – 554)	699 (675 – 730)	934 (902 – 966)	140
60 years and older	766 (733 – 801)	611 (543 – 630)	767 (735 – 801)	981 (911 – 1,050)	208

Table 2.17.a.1. Plasma arachidic acid (20:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	23.4 (23.0 – 23.9)	15.1 (14.4 – 15.5)	16.2 (15.4 – 16.7)	23.2 (22.9 – 23.6)	33.6 (32.5 – 35.9)	36.7 (35.0 – 39.1)	1,757	
Age group								
20–39 years	22.2 (21.6 – 22.9)	14.8 (13.3 – 15.2)	15.6 (15.0 – 16.2)	22.1 (21.4 – 23.0)	31.6 (30.3 – 34.0)	33.9 (32.4 – 36.6)	592	
40–59 years	23.9 (23.3 – 24.5)	15.4 (14.4 – 16.3)	16.8 (15.6 – 17.5)	23.5 (22.9 – 24.2)	34.0 (32.4 – 36.8)	36.9 (34.2 – 43.6)	500	
60 years and older	24.8 (24.1 – 25.4)	15.6 (13.7 – 16.3)	16.7 (15.6 – 18.0)	24.9 (23.8 – 25.7)	36.1 (33.8 – 38.6)	38.6 (36.5 – 42.2)	665	
Gender								
Males	22.3 (21.8 – 22.8)	14.4 (12.7 – 15.2)	15.5 (14.5 – 16.3)	22.0 (21.7 – 22.3)	32.0 (31.4 – 32.8)	33.8 (32.5 – 36.4)	843	
Females	24.5 (23.9 – 25.1)	15.9 (15.0 – 16.5)	16.9 (16.1 – 17.7)	24.3 (23.7 – 25.1)	35.7 (33.6 – 38.4)	38.5 (36.4 – 42.2)	914	
Race/ethnicity								
Mexican Americans	22.5 (21.3 – 23.8)	13.5† (11.4 – 15.6)	15.6 (12.7 – 16.8)	22.4 (21.1 – 23.7)	32.7 (31.2 – 35.5)	35.1† (33.2 – 41.0)	367	
Non-Hispanic Blacks	23.2 (22.1 – 24.3)	14.6† (9.41 – 15.3)	15.4 (13.6 – 16.7)	22.7 (21.9 – 23.5)	33.4 (31.2 – 40.8)	35.9† (33.6 – 76.6)	307	
Non-Hispanic Whites	23.6 (23.0 – 24.2)	15.3 (14.1 – 15.8)	16.3 (15.3 – 16.8)	23.5 (22.9 – 24.0)	34.1 (32.6 – 36.9)	37.5 (35.6 – 39.5)	962	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.17.a. Plasma arachidic acid (20:0): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

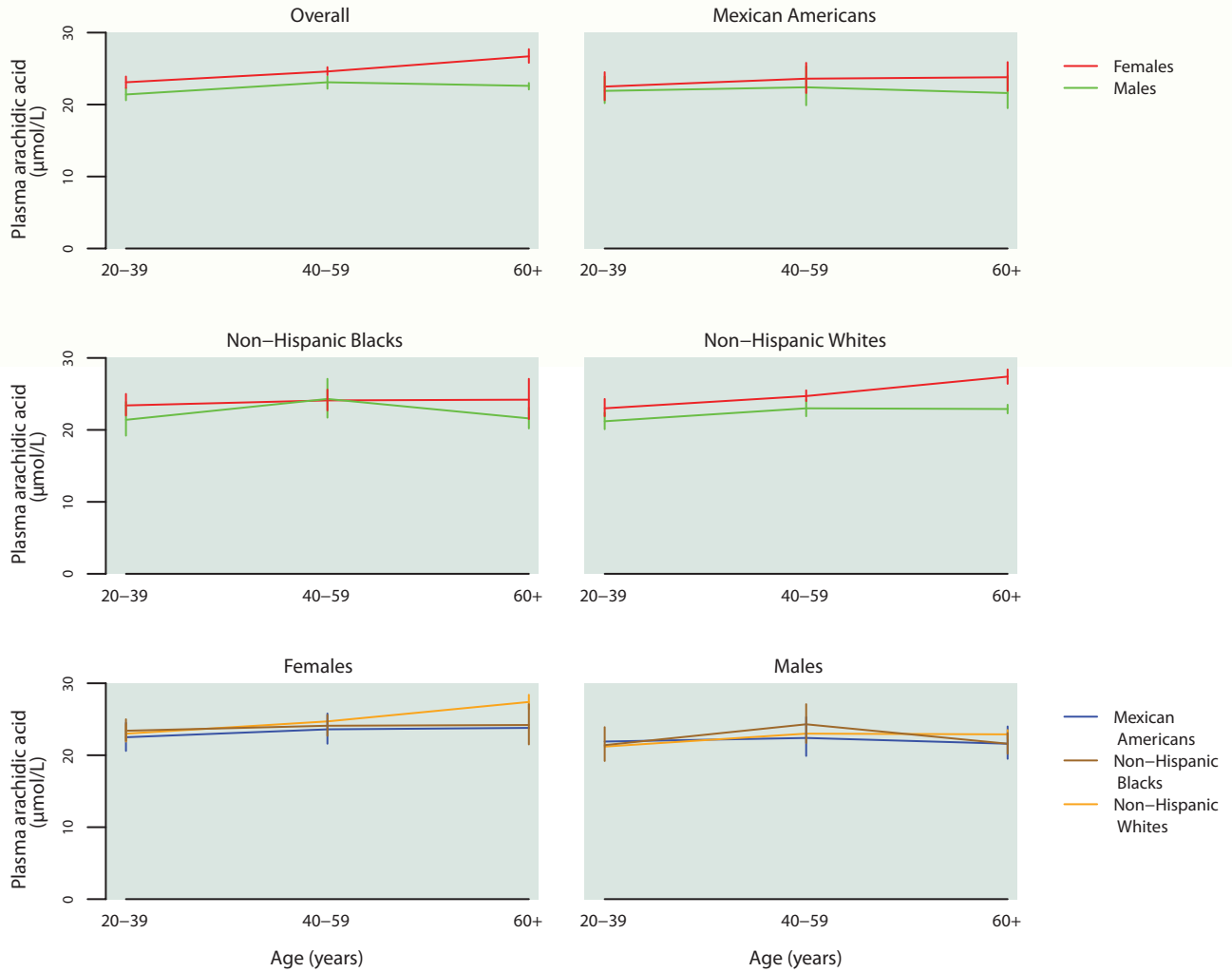


Table 2.17.a.2. Plasma arachidic acid (20:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	23.4 (23.0 – 23.9)	17.6 (16.9 – 18.1)	23.2 (22.9 – 23.6)	31.2 (30.4 – 32.1)	1,757
20–39 years	22.2 (21.6 – 22.9)	16.6 (16.0 – 17.2)	22.1 (21.4 – 23.0)	29.5 (28.7 – 30.6)	592
40–59 years	23.9 (23.3 – 24.5)	18.3 (17.5 – 18.8)	23.5 (22.9 – 24.2)	31.4 (30.2 – 32.9)	500
60 years and older	24.8 (24.1 – 25.4)	18.5 (18.0 – 19.1)	24.9 (23.8 – 25.7)	32.9 (31.9 – 34.2)	665
Males					
Total, 20 years and older	22.3 (21.8 – 22.8)	16.8 (16.0 – 17.5)	22.0 (21.7 – 22.3)	29.6 (29.0 – 31.0)	843
20–39 years	21.4 (20.6 – 22.3)	16.4 (15.2 – 17.1)	21.0 (20.5 – 21.8)	28.1 (26.1 – 31.6)	275
40–59 years	23.1 (22.2 – 23.9)	17.4 (16.6 – 18.0)	22.7 (22.0 – 23.8)	31.1 (29.2 – 32.1)	241
60 years and older	22.6 (22.1 – 23.0)	16.8 (15.8 – 18.1)	22.4 (21.8 – 23.0)	29.4 (28.9 – 30.4)	327
Females					
Total, 20 years and older	24.5 (23.9 – 25.1)	18.7 (18.0 – 19.0)	24.3 (23.7 – 25.1)	32.3 (31.2 – 33.6)	914
20–39 years	23.1 (22.3 – 23.9)	16.9 (16.2 – 18.5)	23.4 (22.6 – 23.8)	30.1 (29.2 – 31.2)	317
40–59 years	24.6 (24.1 – 25.2)	18.9 (18.3 – 19.3)	24.2 (23.5 – 25.3)	32.6 (30.7 – 34.4)	259
60 years and older	26.7 (25.8 – 27.7)	20.1 (18.8 – 21.2)	26.9 (25.7 – 28.1)	35.4 (33.2 – 38.1)	338

Table 2.17.a.3. Plasma arachidic acid (20:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	22.5 (21.3 – 23.8)	16.9 (15.3 – 18.2)	22.4 (21.1 – 23.7)	29.6 (27.9 – 33.1)	367
20–39 years	22.2 (20.8 – 23.6)	16.5 (12.4 – 18.3)	21.8 (20.6 – 23.6)	29.5 (27.1 – 36.1)	130
40–59 years	23.0 (21.1 – 25.0)	16.9† (13.9 – 18.7)	23.0 (21.4 – 25.2)	30.6† (27.4 – 41.6)	91
60 years and older	22.7 (21.2 – 24.4)	17.4 (14.6 – 18.7)	22.9 (21.8 – 24.2)	29.3 (27.4 – 34.1)	146
Males					
Total, 20 years and older	22.1 (20.6 – 23.7)	16.8 (9.37 – 18.3)	22.4 (20.5 – 23.8)	28.3 (26.9 – 32.7)	185
20–39 years	21.9 (20.2 – 23.9)	16.6† (11.7 – 19.0)	21.7 (19.6 – 23.9)	27.6† (24.5 – 36.3)	66
40–59 years	22.4 (19.9 – 25.3)	15.9† (12.5 – 19.1)	23.0 (19.4 – 25.4)	29.3† (26.8 – 31.9)	47
60 years and older	21.6 (19.5 – 24.0)	15.8† (9.37 – 18.7)	21.9 (20.2 – 24.7)	27.8† (25.5 – 32.7)	72
Females					
Total, 20 years and older	23.0 (21.6 – 24.5)	16.8 (15.9 – 18.5)	22.5 (21.3 – 24.0)	31.0 (28.3 – 43.0)	182
20–39 years	22.5 (20.6 – 24.5)	16.4† (12.9 – 18.5)	21.8 (20.2 – 23.9)	29.7† (27.3 – 43.7)	64
40–59 years	23.6 (21.6 – 25.8)	17.3† (15.6 – 19.2)	22.8 (21.3 – 25.3)	31.8† (27.5 – 41.6)	44
60 years and older	23.8 (21.9 – 25.9)	18.5† (13.1 – 20.6)	23.9 (22.2 – 24.5)	30.2† (27.2 – 40.1)	74

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.17.a.4. Plasma arachidic acid (20:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	23.2 (22.1 – 24.3)	17.4 (15.9 – 18.4)	22.7 (21.9 – 23.5)	31.0 (29.3 – 33.1)	307
20–39 years	22.5 (21.3 – 23.8)	17.0 (13.7 – 18.5)	22.0 (21.4 – 22.8)	30.5 (28.0 – 34.0)	124
40–59 years	24.2 (22.6 – 25.8)	17.0† (15.3 – 19.1)	23.5 (22.5 – 25.2)	31.9† (29.4 – 35.9)	98
60 years and older	23.2 (21.7 – 24.7)	18.3† (15.4 – 18.8)	22.9 (21.1 – 25.6)	29.5† (28.3 – 35.6)	85
Males					
Total, 20 years and older	22.4 (21.2 – 23.7)	15.9 (11.7 – 18.2)	21.5 (20.7 – 22.8)	31.2 (29.0 – 35.8)	142
20–39 years	21.4 (19.2 – 23.9)	14.9† (11.3 – 18.3)	20.7 (18.6 – 22.4)	31.2† (23.2 – 71.3)	57
40–59 years	24.3 (21.7 – 27.1)	16.1† (14.7 – 19.7)	23.1 (21.3 – 26.5)	31.7† (29.4 – 48.6)	42
60 years and older	21.6 (20.2 – 23.1)	15.5† (8.59 – 18.4)	21.2 (20.3 – 24.1)	27.9† (25.6 – 33.8)	43
Females					
Total, 20 years and older	23.8 (22.6 – 25.1)	18.4 (16.2 – 19.9)	23.4 (22.2 – 25.1)	30.3 (28.7 – 34.8)	165
20–39 years	23.4 (22.0 – 25.0)	18.7† (14.9 – 20.5)	22.8 (21.9 – 25.3)	29.5† (27.8 – 32.5)	67
40–59 years	24.1 (22.7 – 25.6)	17.0† (14.8 – 20.5)	23.6 (21.8 – 25.8)	31.8† (27.7 – 54.9)	56
60 years and older	24.2 (21.5 – 27.1)	18.6† (14.3 – 20.6)	23.9 (19.8 – 29.5)	29.9† (29.3 – 37.1)	42

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.17.a.5. Plasma arachidic acid (20:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	23.6 (23.0 – 24.2)	17.6 (16.7 – 18.4)	23.5 (22.9 – 24.0)	31.6 (30.6 – 32.6)	962
20–39 years	22.2 (21.3 – 23.1)	16.5 (15.4 – 17.0)	22.0 (20.9 – 23.5)	29.6 (28.3 – 31.3)	290
40–59 years	23.8 (23.1 – 24.6)	18.4 (17.4 – 19.3)	23.4 (22.9 – 24.1)	31.5 (29.9 – 34.3)	270
60 years and older	25.2 (24.6 – 25.9)	19.0 (18.0 – 19.4)	25.3 (24.4 – 26.4)	33.5 (32.2 – 35.6)	402
Males					
Total, 20 years and older	22.4 (21.7 – 23.0)	16.7 (16.1 – 17.6)	22.0 (21.7 – 22.4)	29.8 (29.0 – 31.2)	460
20–39 years	21.2 (20.1 – 22.4)	16.3 (13.6 – 17.0)	20.8 (19.9 – 22.0)	28.5 (25.8 – 32.1)	125
40–59 years	23.0 (21.9 – 24.2)	17.6 (15.6 – 18.6)	22.5 (21.9 – 23.8)	31.1 (28.9 – 32.4)	136
60 years and older	22.9 (22.3 – 23.5)	16.9 (16.1 – 18.3)	22.8 (22.1 – 23.5)	29.6 (29.0 – 31.6)	199
Females					
Total, 20 years and older	24.8 (24.0 – 25.7)	18.7 (17.7 – 19.1)	24.8 (23.8 – 25.7)	32.9 (31.4 – 35.6)	502
20–39 years	23.0 (21.9 – 24.3)	16.7 (15.9 – 17.7)	23.6 (22.3 – 24.4)	30.1 (29.3 – 31.3)	165
40–59 years	24.7 (24.0 – 25.5)	18.9 (18.2 – 19.7)	24.2 (23.3 – 25.5)	32.7 (30.5 – 37.1)	134
60 years and older	27.4 (26.4 – 28.4)	20.9 (19.1 – 21.7)	27.6 (26.5 – 28.8)	36.0 (33.6 – 38.6)	203

Table 2.18.a.1. Plasma docosanoic acid (22:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	41.5 (38.1 – 43.2)	45.2 (42.9 – 47.6)	69.5 (68.0 – 71.4)	102 (99.0 – 108)	110 (106 – 117)	1,739		
Age group								
20–39 years	42.6 (38.0 – 44.3)	46.1 (43.0 – 48.1)	66.5 (65.0 – 68.5)	97.4 (94.4 – 98.7)	99.9 (98.3 – 104)	589		
40–59 years	41.6 (20.1 – 45.2)	46.4 (40.2 – 49.5)	74.0 (68.3 – 76.6)	105 (99.0 – 111)	111 (106 – 134)	496		
60 years and older	39.2 (31.7 – 42.9)	43.0 (40.1 – 46.2)	70.9 (68.1 – 73.4)	109 (105 – 114)	115 (111 – 128)	654		
Gender								
Males	39.3 (34.2 – 42.4)	43.0 (39.7 – 45.1)	66.2 (64.2 – 68.3)	96.4 (94.9 – 98.2)	105 (98.2 – 111)	834		
Females	43.4 (40.5 – 47.0)	48.4 (45.1 – 50.3)	73.7 (70.7 – 75.6)	106 (102 – 111)	113 (108 – 128)	905		
Race/ethnicity								
Mexican Americans	39.0† (35.4 – 41.8)	42.0 (37.4 – 46.5)	64.4 (60.9 – 67.4)	95.3 (87.1 – 129)	97.9† (94.9 – 129)	367		
Non-Hispanic Blacks	41.1† (20.8 – 47.2)	46.3 (34.5 – 51.1)	69.4 (64.3 – 74.7)	106 (104 – 107)	115† (107 – 123)	306		
Non-Hispanic Whites	42.6 (39.4 – 43.7)	46.9 (43.4 – 48.5)	70.9 (69.4 – 72.8)	104 (99.2 – 110)	111 (108 – 121)	947		

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.18.a. Plasma docosanoic acid (22:0): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

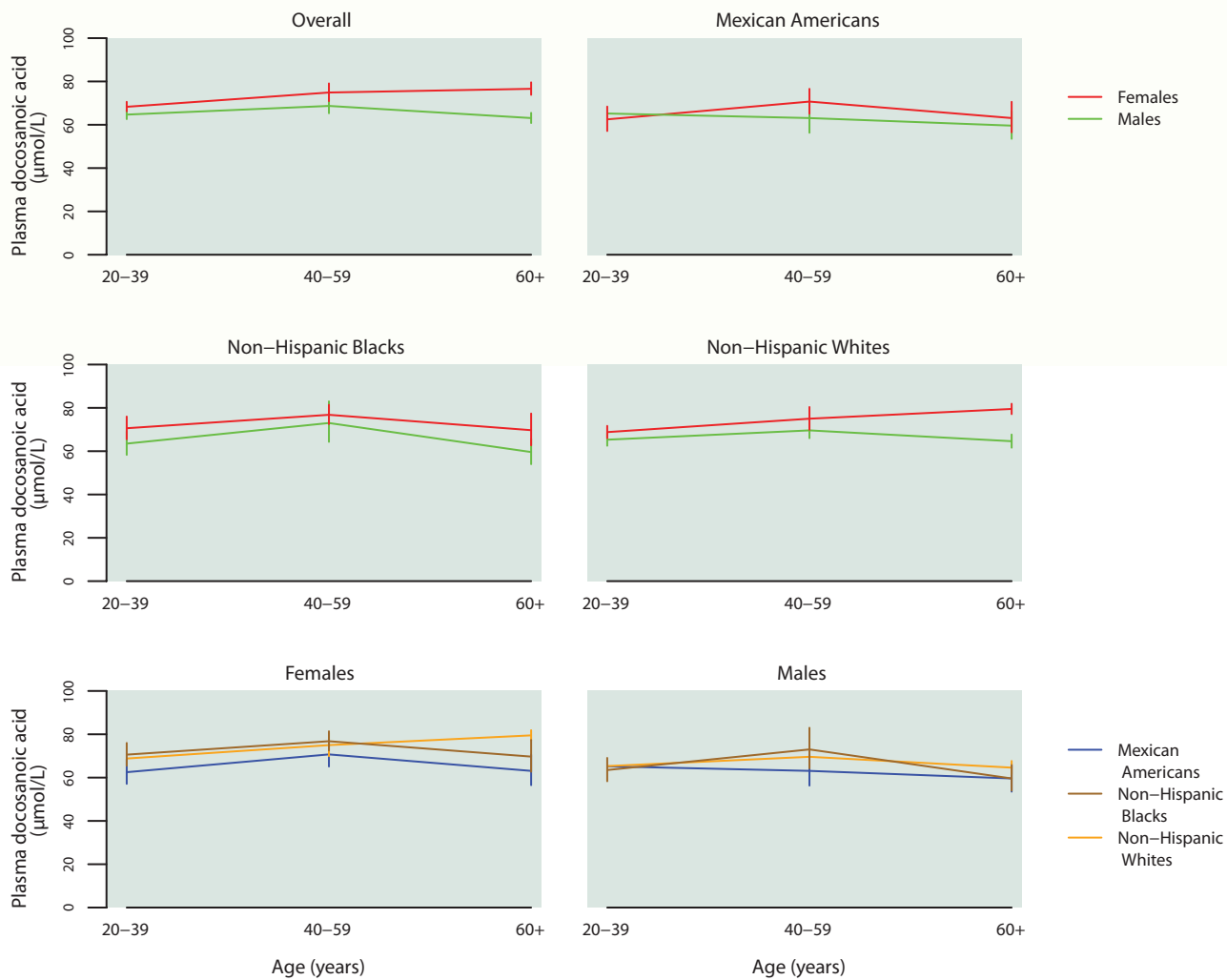


Table 2.18.a.2. Plasma docosanoic acid (22:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	69.3 (67.7 – 71.0)	50.1 (48.7 – 51.5)	69.5 (68.0 – 71.4)	95.3 (93.0 – 97.7)	1,739
20–39 years	66.5 (65.1 – 67.9)	49.7 (48.9 – 51.0)	66.5 (65.0 – 68.5)	89.5 (86.7 – 93.6)	589
40–59 years	71.8 (68.5 – 75.2)	51.9 (47.5 – 55.9)	74.0 (68.3 – 76.6)	96.4 (93.8 – 100)	496
60 years and older	70.2 (68.2 – 72.4)	49.1 (46.2 – 50.7)	70.9 (68.1 – 73.4)	100 (96.1 – 105)	654
Males					
Total, 20 years and older	65.8 (64.0 – 67.7)	48.1 (45.1 – 49.7)	66.2 (64.2 – 68.3)	90.5 (88.2 – 92.5)	834
20–39 years	64.7 (62.6 – 66.8)	49.3 (46.8 – 51.2)	63.7 (61.0 – 66.2)	88.7 (82.6 – 93.6)	274
40–59 years	68.7 (65.3 – 72.2)	48.3 (43.0 – 51.4)	70.9 (66.0 – 74.5)	92.2 (89.0 – 96.9)	238
60 years and older	63.1 (60.8 – 65.5)	43.6 (40.8 – 47.0)	64.3 (60.6 – 67.9)	88.2 (85.2 – 91.7)	322
Females					
Total, 20 years and older	72.8 (70.4 – 75.2)	52.4 (50.4 – 55.1)	73.7 (70.7 – 75.6)	98.7 (96.1 – 102)	905
20–39 years	68.3 (66.2 – 70.6)	50.9 (48.4 – 51.7)	69.4 (66.8 – 71.6)	91.4 (86.0 – 97.4)	315
40–59 years	74.9 (70.9 – 79.1)	56.6 (48.1 – 58.3)	76.5 (70.1 – 80.6)	99.0 (94.7 – 108)	258
60 years and older	76.6 (73.8 – 79.6)	54.1 (49.1 – 58.5)	75.7 (73.2 – 80.1)	107 (103 – 112)	332

Table 2.18.a.3. Plasma docosanoic acid (22:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	64.4 (61.3 – 67.7)	47.8 (41.7 – 51.6)	64.4 (60.9 – 67.4)	87.1 (81.5 – 95.4)	367
20–39 years	64.0 (60.8 – 67.4)	48.4 (42.0 – 50.6)	63.1 (59.7 – 66.8)	85.7 (80.1 – 95.4)	129
40–59 years	66.5 (61.6 – 71.8)	48.1† (35.5 – 55.5)	67.7 (64.3 – 71.7)	87.9† (80.6 – 106)	91
60 years and older	61.4 (56.4 – 66.9)	42.7 (38.6 – 47.2)	61.4 (59.8 – 64.2)	85.0 (74.6 – 120)	147
Males					
Total, 20 years and older	64.0 (60.5 – 67.7)	48.2 (38.9 – 52.7)	64.4 (60.8 – 67.1)	85.2 (80.7 – 90.4)	185
20–39 years	65.2 (62.2 – 68.3)	49.6† (31.7 – 55.2)	63.8 (60.7 – 66.9)	86.8† (77.5 – 116)	65
40–59 years	63.1 (56.3 – 70.6)	44.8† (35.5 – 55.6)	65.0 (55.7 – 72.0)	81.4† (74.8 – 97.7)	47
60 years and older	59.6 (53.5 – 66.3)	38.8† (35.0 – 43.0)	61.3 (55.7 – 65.1)	87.6† (68.0 – 112)	73
Females					
Total, 20 years and older	64.9 (60.6 – 69.6)	46.5 (41.2 – 50.7)	64.5 (59.9 – 71.3)	92.9 (79.5 – 120)	182
20–39 years	62.5 (57.1 – 68.4)	42.2† (38.2 – 50.3)	61.3 (55.1 – 70.9)	83.6† (76.3 – 97.3)	64
40–59 years	70.7 (65.1 – 76.6)	53.4† (37.4 – 57.1)	68.7 (65.7 – 76.7)	93.5† (85.0 – 106)	44
60 years and older	63.1 (56.5 – 70.6)	47.0† (34.0 – 54.2)	62.0 (57.9 – 66.5)	82.9† (75.2 – 116)	74

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.18.a.4. Plasma docosanoic acid (22:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	69.6 (66.5 – 73.0)	52.1 (46.8 – 53.9)	69.4 (64.3 – 74.7)	94.2 (91.4 – 101)	306
20–39 years	67.3 (63.9 – 70.8)	52.3 (42.4 – 54.1)	65.0 (62.8 – 71.2)	89.8 (86.7 – 97.6)	124
40–59 years	75.2 (70.9 – 79.7)	53.1† (42.9 – 59.2)	78.6 (71.7 – 82.9)	104† (91.6 – 118)	98
60 years and older	65.6 (61.9 – 69.5)	47.9† (27.8 – 53.2)	65.4 (61.9 – 68.1)	91.3† (81.1 – 118)	84
Males					
Total, 20 years and older	66.1 (62.1 – 70.3)	47.6 (33.1 – 53.2)	64.6 (61.6 – 68.4)	90.2 (87.9 – 98.0)	141
20–39 years	63.5 (58.3 – 69.1)	49.2† (34.5 – 53.7)	61.5 (57.0 – 66.1)	86.6† (76.7 – 119)	57
40–59 years	73.0 (64.3 – 83.0)	44.8† (39.5 – 59.2)	74.5 (62.0 – 85.4)	93.5† (86.7 – 171)	42
60 years and older	59.6 (54.0 – 65.7)	41.2† (20.8 – 47.8)	60.2 (53.4 – 67.0)	81.3† (73.0 – 95.8)	42
Females					
Total, 20 years and older	72.5 (69.2 – 76.0)	53.8 (50.3 – 56.1)	73.9 (66.3 – 78.4)	99.7 (91.4 – 106)	165
20–39 years	70.6 (65.5 – 76.0)	53.0† (40.9 – 57.0)	71.3 (63.1 – 79.9)	91.5† (88.3 – 96.2)	67
40–59 years	76.8 (72.5 – 81.4)	55.8† (43.3 – 61.0)	80.4 (72.4 – 84.5)	105† (91.6 – 117)	56
60 years and older	69.7 (62.7 – 77.4)	53.1† (41.5 – 55.8)	67.8 (59.0 – 76.7)	100† (79.0 – 123)	42

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.18.a.5. Plasma docosanoic acid (22:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	70.4 (68.9 – 72.0)	50.8 (49.4 – 51.7)	70.9 (69.4 – 72.8)	96.4 (94.6 – 98.5)	947
20–39 years	67.1 (65.4 – 68.8)	49.9 (48.6 – 51.2)	68.1 (65.9 – 69.5)	90.6 (85.6 – 96.6)	288
40–59 years	72.3 (68.7 – 76.0)	52.1 (48.5 – 56.3)	74.3 (68.3 – 76.9)	96.5 (93.4 – 103)	267
60 years and older	72.3 (70.5 – 74.1)	50.1 (47.1 – 53.0)	72.5 (70.4 – 74.6)	102 (98.0 – 108)	392
Males					
Total, 20 years and older	66.9 (64.8 – 69.0)	49.2 (46.5 – 51.0)	67.8 (65.4 – 69.6)	92.0 (88.7 – 94.5)	453
20–39 years	65.3 (62.5 – 68.2)	49.5 (44.6 – 51.7)	64.4 (61.8 – 68.6)	89.1 (80.8 – 97.3)	125
40–59 years	69.6 (66.0 – 73.4)	49.9 (41.9 – 55.0)	72.3 (66.0 – 75.2)	93.1 (90.8 – 96.8)	134
60 years and older	64.6 (61.6 – 67.7)	46.9 (43.1 – 49.4)	65.3 (62.4 – 69.7)	88.4 (85.6 – 92.0)	194
Females					
Total, 20 years and older	73.9 (71.2 – 76.8)	52.8 (49.8 – 56.8)	74.4 (71.7 – 76.5)	99.3 (96.1 – 108)	494
20–39 years	68.8 (66.0 – 71.7)	51.0 (47.5 – 52.1)	69.4 (67.8 – 72.6)	92.8 (85.6 – 98.1)	163
40–59 years	75.0 (69.9 – 80.4)	56.4 (44.8 – 59.1)	76.5 (67.5 – 81.7)	98.6 (94.6 – 110)	133
60 years and older	79.5 (77.1 – 81.9)	57.0 (49.9 – 62.1)	78.5 (75.6 – 83.3)	109 (105 – 113)	198

Table 2.19.a.1. Plasma lignoceric acid (24:0): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)				Sample size
	2.5th	5th	50th	95th	97.5th		
Total, 20 years and older	31.2 (29.5 – 33.0)	35.3 (32.7 – 36.8)	53.8 (52.6 – 55.6)	80.9 (79.0 – 83.6)	87.0 (84.9 – 90.2)	1,743	
Age group							
20–39 years	31.8 (26.8 – 35.2)	35.6 (32.4 – 36.6)	51.3 (49.8 – 52.9)	73.6 (71.8 – 78.6)	82.0 (76.0 – 88.3)	583	
40–59 years	33.2 (28.7 – 37.6)	37.8 (32.9 – 39.6)	56.6 (54.1 – 59.6)	81.1 (77.4 – 88.0)	86.8 (83.6 – 94.4)	495	
60 years and older	29.1 (21.7 – 31.0)	31.6 (30.0 – 34.2)	54.8 (52.4 – 57.5)	86.9 (81.9 – 91.9)	92.3 (89.1 – 97.5)	665	
Gender							
Males	30.6 (28.5 – 33.0)	34.6 (30.7 – 37.7)	53.7 (51.6 – 55.8)	80.8 (76.4 – 84.9)	86.1 (84.5 – 93.1)	836	
Females	32.4 (29.8 – 35.0)	35.8 (32.6 – 37.0)	53.8 (52.7 – 56.1)	80.7 (78.7 – 84.5)	87.3 (83.8 – 91.9)	907	
Race/ethnicity							
Mexican Americans	29.9† (19.2 – 32.6)	32.4 (28.7 – 36.0)	50.1 (47.2 – 53.8)	76.4 (71.1 – 83.0)	80.7† (76.9 – 117)	355	
Non-Hispanic Blacks	30.8† (24.0 – 35.4)	34.8 (27.0 – 38.0)	53.1 (49.6 – 57.0)	79.0 (73.3 – 84.2)	83.9† (79.0 – 112)	302	
Non-Hispanic Whites	31.5 (28.7 – 33.6)	35.8 (33.1 – 37.2)	54.8 (53.0 – 56.5)	81.4 (79.1 – 85.0)	87.2 (85.1 – 92.1)	966	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.19.a. Plasma lignoceric acid (24:0): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

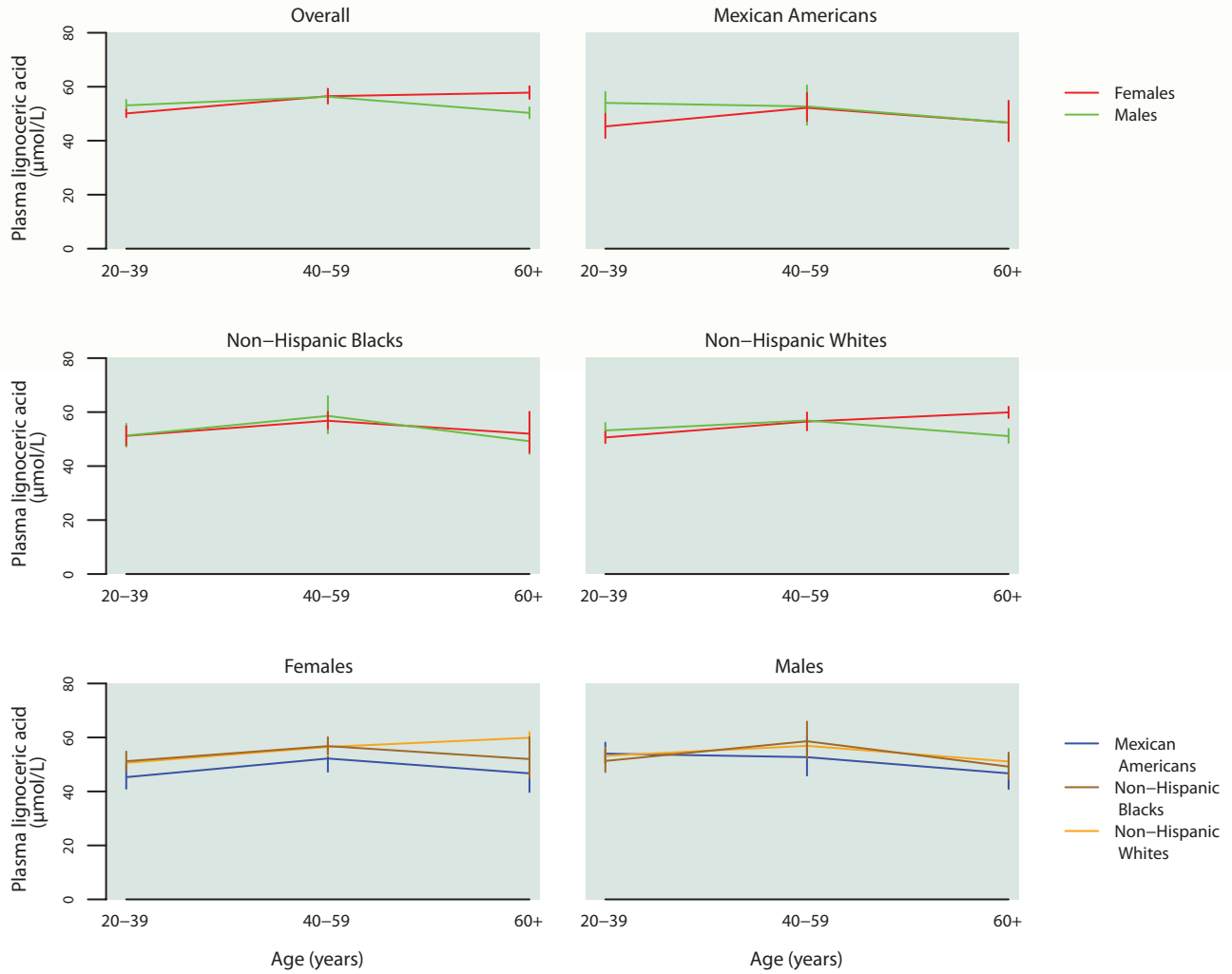


Table 2.19.a.2. Plasma lignoceric acid (24:0): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	54.0 (52.8 – 55.3)	39.0 (37.4 – 40.6)	53.8 (52.6 – 55.6)	74.2 (72.2 – 76.4)	1,743
20–39 years	51.6 (50.3 – 53.0)	37.9 (36.6 – 39.6)	51.3 (49.8 – 52.9)	69.0 (66.5 – 71.8)	583
40–59 years	56.4 (54.2 – 58.7)	41.4 (37.9 – 43.7)	56.6 (54.1 – 59.6)	76.0 (72.9 – 79.2)	495
60 years and older	54.3 (52.7 – 56.0)	37.1 (33.6 – 39.5)	54.8 (52.4 – 57.5)	77.9 (76.4 – 81.4)	665
Males					
Total, 20 years and older	53.7 (52.2 – 55.2)	39.1 (37.1 – 41.0)	53.7 (51.6 – 55.8)	72.6 (70.8 – 74.8)	836
20–39 years	53.1 (51.2 – 55.1)	39.5 (37.9 – 42.3)	52.1 (50.1 – 55.5)	70.9 (67.6 – 74.9)	272
40–59 years	56.3 (53.6 – 59.0)	41.1 (34.7 – 44.2)	56.1 (53.5 – 60.5)	75.1 (71.7 – 83.1)	238
60 years and older	50.3 (48.3 – 52.4)	33.6 (30.2 – 37.8)	50.4 (47.1 – 55.0)	70.2 (68.5 – 74.4)	326
Females					
Total, 20 years and older	54.4 (52.6 – 56.2)	39.0 (36.5 – 41.6)	53.8 (52.7 – 56.1)	76.1 (72.5 – 78.4)	907
20–39 years	50.1 (48.7 – 51.6)	36.6 (34.8 – 37.9)	50.2 (48.9 – 51.9)	67.3 (64.9 – 69.6)	311
40–59 years	56.5 (53.9 – 59.3)	42.2 (39.0 – 43.6)	57.0 (53.5 – 60.0)	76.0 (72.2 – 79.6)	257
60 years and older	57.8 (55.5 – 60.2)	39.9 (35.3 – 42.3)	58.5 (55.2 – 61.3)	82.8 (78.9 – 89.0)	339

Table 2.19.a.3. Plasma lignoceric acid (24:0): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	50.4 (47.3 – 53.7)	37.1 (31.5 – 39.5)	50.1 (47.2 – 53.8)	69.4 (66.9 – 73.7)	355
20–39 years	50.1 (46.5 – 53.9)	37.1 (30.6 – 38.8)	49.2 (44.7 – 56.1)	68.7 (63.7 – 76.3)	120
40–59 years	52.5 (47.5 – 58.0)	38.8† (21.0 – 44.5)	53.3 (47.1 – 59.6)	71.6† (65.8 – 81.4)	89
60 years and older	46.7 (41.5 – 52.7)	33.0 (19.2 – 36.9)	47.1 (40.1 – 53.9)	66.4 (58.7 – 97.3)	146
Males					
Total, 20 years and older	52.9 (49.2 – 56.9)	39.3 (33.0 – 43.1)	52.4 (48.7 – 56.2)	72.2 (67.8 – 77.5)	176
20–39 years	54.0 (50.3 – 58.1)	40.7† (37.8 – 44.4)	52.3 (48.1 – 57.7)	69.7† (63.8 – 84.8)	61
40–59 years	52.7 (45.9 – 60.5)	36.7† (28.8 – 45.9)	53.2 (46.0 – 60.5)	72.4† (65.3 – 81.2)	45
60 years and older	46.7 (40.9 – 53.4)	32.2† (19.2 – 36.7)	48.2 (38.4 – 54.3)	69.1† (55.8 – 89.1)	70
Females					
Total, 20 years and older	47.6 (44.6 – 50.7)	32.6 (30.3 – 36.7)	46.5 (43.4 – 51.0)	67.8 (61.8 – 71.1)	179
20–39 years	45.3 (41.0 – 50.0)	32.0† (29.8 – 36.6)	43.2 (37.9 – 52.6)	64.6† (57.6 – 78.7)	59
40–59 years	52.2 (47.3 – 57.7)	39.2† (21.0 – 43.4)	53.3 (44.8 – 60.2)	69.6† (61.1 – 83.2)	44
60 years and older	46.7 (39.8 – 54.8)	34.7† (25.4 – 38.0)	45.3 (39.4 – 54.7)	63.8† (54.4 – 97.3)	76

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.19.a.4. Plasma lignoceric acid (24:0): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	53.3 (50.5 – 56.2)	38.6 (35.4 – 40.9)	53.1 (49.6 – 57.0)	71.8 (70.3 – 74.3)	302
20–39 years	51.2 (48.2 – 54.5)	37.2 (29.9 – 41.6)	49.9 (48.0 – 55.7)	67.9 (65.1 – 74.2)	123
40–59 years	57.6 (54.6 – 60.8)	40.9† (33.9 – 46.2)	58.1 (54.2 – 63.3)	73.0† (71.0 – 85.7)	95
60 years and older	50.9 (46.1 – 56.2)	37.3† (29.8 – 40.2)	50.8 (43.5 – 55.2)	74.1† (63.0 – 94.8)	84
Males					
Total, 20 years and older	53.4 (50.0 – 56.9)	38.8 (27.0 – 43.3)	52.8 (49.1 – 58.6)	71.8 (68.1 – 80.6)	140
20–39 years	51.3 (47.2 – 55.7)	38.8† (26.2 – 43.5)	49.9 (46.3 – 55.9)	66.5† (63.1 – 83.8)	57
40–59 years	58.6 (52.1 – 65.9)	40.9† (32.2 – 48.9)	60.1 (50.6 – 70.1)	73.8† (70.1 – 112)	41
60 years and older	49.2 (44.5 – 54.4)	30.6† (24.0 – 40.9)	49.5 (44.5 – 54.7)	70.7† (62.3 – 79.1)	42
Females					
Total, 20 years and older	53.2 (50.1 – 56.6)	38.2 (35.3 – 40.8)	53.3 (49.2 – 57.7)	72.0 (69.6 – 78.2)	162
20–39 years	51.2 (47.7 – 54.8)	36.8† (28.1 – 41.1)	49.7 (46.0 – 57.4)	69.3† (65.3 – 72.9)	66
40–59 years	56.8 (53.8 – 60.1)	39.9† (34.9 – 46.2)	56.6 (51.9 – 61.3)	72.2† (70.3 – 85.2)	54
60 years and older	52.0 (45.0 – 60.1)	39.7† (31.4 – 40.4)	52.4 (40.8 – 62.0)	78.2† (62.0 – 95.2)	42

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.19.a.5. Plasma lignoceric acid (24:0): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	54.7 (53.4 – 56.0)	39.6 (37.7 – 41.6)	54.8 (53.0 – 56.5)	75.3 (73.0 – 77.3)	966
20–39 years	51.8 (50.1 – 53.6)	37.9 (35.9 – 41.2)	51.5 (49.4 – 53.9)	68.9 (66.0 – 72.6)	293
40–59 years	56.7 (54.2 – 59.3)	42.0 (38.6 – 43.2)	57.0 (53.6 – 60.8)	76.4 (72.8 – 80.8)	270
60 years and older	55.7 (54.1 – 57.3)	38.2 (33.4 – 41.0)	56.3 (54.0 – 58.6)	78.7 (76.9 – 82.3)	403
Males					
Total, 20 years and older	54.1 (52.5 – 55.8)	39.4 (36.1 – 41.8)	54.7 (51.8 – 56.5)	72.8 (70.5 – 77.2)	461
20–39 years	53.2 (50.5 – 56.0)	39.4 (35.8 – 42.8)	52.5 (49.5 – 56.8)	70.5 (66.0 – 82.9)	126
40–59 years	56.9 (53.9 – 60.0)	42.1 (35.0 – 44.7)	57.1 (53.1 – 61.8)	76.6 (71.7 – 85.9)	135
60 years and older	51.1 (48.6 – 53.8)	34.8 (29.7 – 39.0)	51.4 (47.1 – 56.4)	70.2 (68.4 – 75.8)	200
Females					
Total, 20 years and older	55.2 (53.1 – 57.4)	39.7 (36.6 – 42.5)	55.1 (53.0 – 57.3)	76.6 (74.2 – 79.2)	505
20–39 years	50.6 (48.5 – 52.8)	36.7 (32.4 – 41.2)	51.3 (48.6 – 53.2)	67.3 (64.8 – 69.9)	167
40–59 years	56.5 (53.2 – 59.9)	41.8 (38.2 – 43.1)	56.9 (53.0 – 62.0)	76.4 (71.8 – 81.2)	135
60 years and older	59.9 (57.8 – 62.0)	40.9 (36.7 – 44.9)	60.4 (58.3 – 62.5)	85.4 (79.9 – 91.5)	203

Table 2.20.a.1. Plasma myristoleic acid (14:1n-5): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)				Sample size
	2.5th	5th	50th	95th	97.5th		
Total, 20 years and older	1.45 (1.31 – 1.56)	1.79 (1.68 – 1.96)	6.50 (5.90 – 6.99)	23.9 (21.4 – 29.3)	32.1 (27.0 – 40.2)	1,808	
Age group							
20–39 years	1.47 (1.17 – 1.64)	1.76 (1.64 – 2.01)	6.05 (5.34 – 6.75)	24.0 (19.3 – 32.6)	31.9 (24.8 – 67.0)	610	
40–59 years	1.44 (1.11 – 1.69)	1.86 (1.63 – 2.02)	6.87 (6.20 – 7.62)	25.8 (21.4 – 34.6)	34.6 (27.0 – 52.9)	515	
60 years and older	1.40 (1.17 – 1.67)	1.73 (1.56 – 1.99)	6.40 (5.53 – 7.45)	23.3 (19.3 – 30.9)	26.9 (23.4 – 40.7)	683	
Gender							
Males	1.25 (1.05 – 1.39)	1.70 (1.41 – 1.82)	6.47 (5.47 – 7.28)	24.9 (22.8 – 29.7)	33.0 (29.4 – 40.6)	865	
Females	1.59 (1.46 – 1.75)	1.94 (1.71 – 2.32)	6.51 (5.96 – 6.96)	23.4 (19.9 – 31.2)	30.7 (23.9 – 48.1)	943	
Race/ethnicity							
Mexican Americans	1.53† (1.02 – 1.80)	1.82 (1.51 – 2.05)	6.83 (5.44 – 8.30)	26.1 (21.1 – 35.6)	33.1† (27.4 – 68.4)	376	
Non-Hispanic Blacks	1.06† (.703 – 1.17)	1.18 (1.06 – 1.42)	3.78 (3.17 – 4.49)	12.8 (11.5 – 21.4)	20.3† (13.7 – 31.3)	310	
Non-Hispanic Whites	1.65 (1.42 – 1.79)	2.06 (1.80 – 2.33)	6.84 (6.22 – 7.46)	24.9 (22.3 – 31.8)	32.7 (27.0 – 43.6)	992	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.20.a. Plasma myristoleic acid (14:1n-5): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

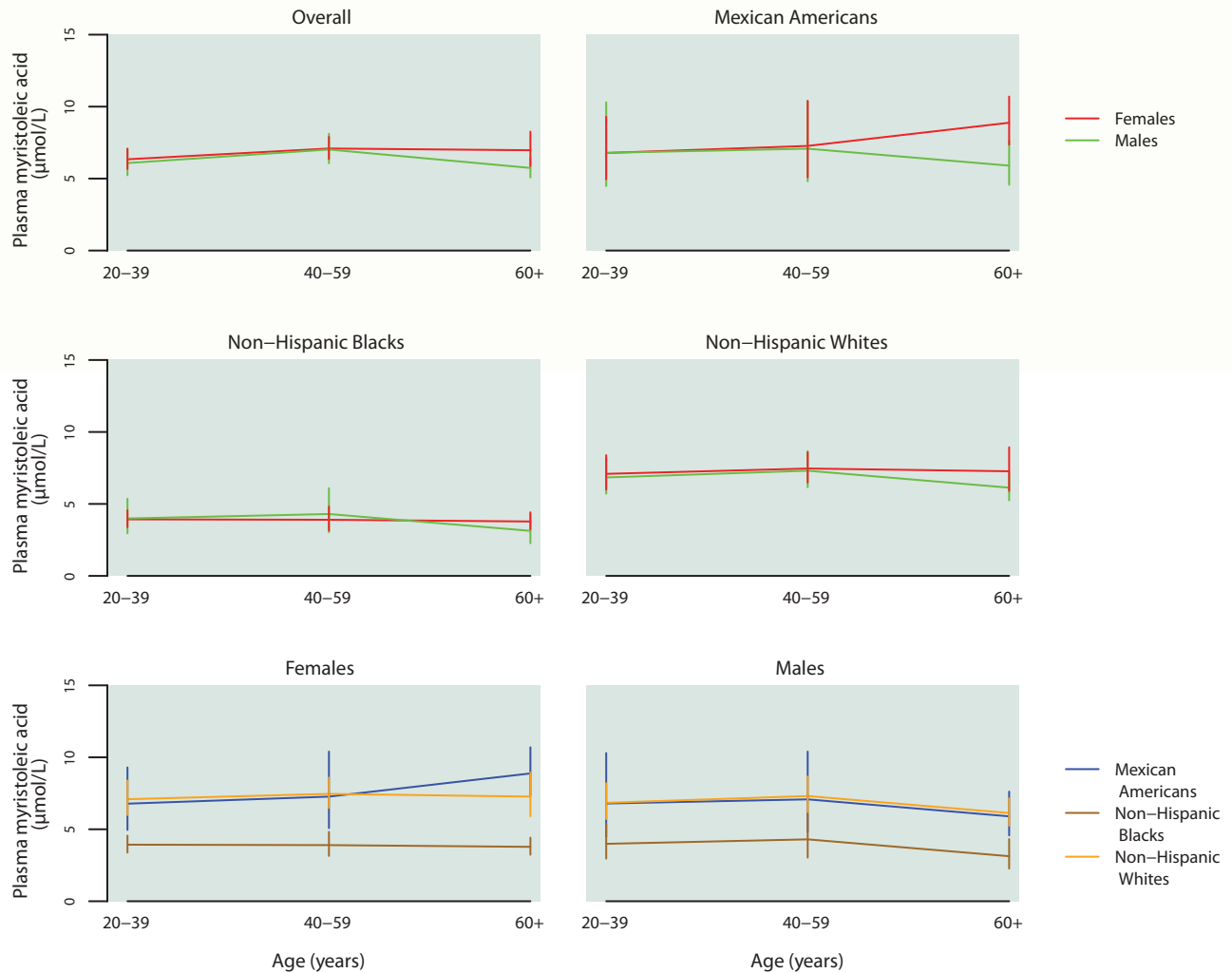


Table 2.20.a.2. Plasma myristoleic acid (14:1n-5): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	6.57 (6.08 – 7.09)	2.41 (2.26 – 2.59)	6.50 (5.90 – 6.99)	18.5 (16.7 – 20.5)	1,808
20–39 years	6.21 (5.67 – 6.80)	2.33 (2.08 – 2.52)	6.05 (5.34 – 6.75)	16.9 (14.8 – 20.4)	610
40–59 years	7.06 (6.30 – 7.90)	2.53 (2.20 – 2.94)	6.87 (6.20 – 7.62)	19.6 (18.0 – 22.2)	515
60 years and older	6.39 (5.61 – 7.26)	2.43 (2.04 – 2.89)	6.40 (5.53 – 7.45)	17.3 (13.1 – 23.4)	683
Males					
Total, 20 years and older	6.35 (5.70 – 7.07)	2.20 (2.01 – 2.35)	6.47 (5.47 – 7.28)	18.5 (16.5 – 21.2)	865
20–39 years	6.08 (5.23 – 7.08)	2.10 (2.03 – 2.33)	6.09 (5.00 – 7.32)	16.9 (14.5 – 23.9)	282
40–59 years	7.02 (6.06 – 8.12)	2.27 (1.80 – 2.81)	6.98 (5.49 – 8.66)	21.0 (18.5 – 26.2)	248
60 years and older	5.74 (5.08 – 6.48)	2.26 (1.68 – 2.61)	5.82 (5.44 – 6.42)	13.7 (10.9 – 20.0)	335
Females					
Total, 20 years and older	6.77 (6.26 – 7.32)	2.73 (2.52 – 2.96)	6.51 (5.96 – 6.96)	18.4 (15.3 – 21.6)	943
20–39 years	6.34 (5.67 – 7.08)	2.62 (2.06 – 2.94)	5.91 (5.31 – 6.92)	17.2 (13.9 – 22.4)	328
40–59 years	7.09 (6.37 – 7.90)	2.87 (2.39 – 3.40)	6.81 (6.29 – 7.17)	18.7 (13.8 – 23.3)	267
60 years and older	6.97 (5.87 – 8.26)	2.91 (1.76 – 3.22)	6.89 (5.55 – 8.06)	20.0 (16.1 – 23.8)	348

Table 2.20.a.3. Plasma myristoleic acid (14:1n-5): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	6.95 (5.89 – 8.20)	2.26 (1.82 – 2.82)	6.83 (5.44 – 8.30)	19.4 (17.2 – 22.5)	376
20–39 years	6.79 (5.03 – 9.17)	2.11 (1.71 – 2.75)	6.39 (4.79 – 9.10)	18.7 (15.2 – 32.7)	132
40–59 years	7.17 (5.73 – 8.97)	2.48† (1.66 – 2.92)	6.96 (5.46 – 9.72)	20.0† (16.1 – 32.0)	93
60 years and older	7.30 (6.27 – 8.49)	3.03 (2.65 – 3.26)	7.48 (5.22 – 9.67)	16.7 (14.6 – 24.9)	151
Males					
Total, 20 years and older	6.79 (5.24 – 8.79)	2.27 (1.79 – 2.93)	6.58 (4.63 – 8.66)	20.0 (15.8 – 24.9)	189
20–39 years	6.79 (4.48 – 10.3)	2.15† (1.85 – 2.42)	6.56 (3.74 – 11.8)	20.2† (15.3 – 42.7)	67
40–59 years	7.08 (4.81 – 10.4)	2.69† (1.87 – 3.06)	6.77 (3.71 – 12.3)	18.8† (14.0 – 52.0)	48
60 years and older	5.90 (4.57 – 7.62)	2.72† (1.76 – 3.30)	5.60 (3.54 – 8.59)	13.6† (9.90 – 18.3)	74
Females					
Total, 20 years and older	7.16 (6.00 – 8.55)	2.03 (1.53 – 3.55)	6.86 (5.60 – 9.13)	18.7 (16.3 – 23.9)	187
20–39 years	6.78 (4.95 – 9.30)	1.96† (1.51 – 3.90)	6.02 (4.64 – 9.28)	16.3† (12.9 – 156)	65
40–59 years	7.27 (5.08 – 10.4)	1.93† (1.62 – 2.55)	7.32 (3.75 – 13.4)	22.2† (16.4 – 30.1)	45
60 years and older	8.88 (7.36 – 10.7)	3.63† (2.33 – 4.14)	9.24 (7.46 – 12.9)	17.4† (14.8 – 43.2)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.20.a.4. Plasma myristoleic acid (14:1n-5): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3.91 (3.50 – 4.38)	1.48 (1.28 – 1.69)	3.78 (3.17 – 4.49)	10.4 (8.24 – 12.7)	310
20–39 years	3.95 (3.33 – 4.70)	1.68 (1.29 – 1.90)	3.54 (3.05 – 4.70)	10.2 (7.80 – 12.7)	126
40–59 years	4.07 (3.55 – 4.66)	1.44† (1.07 – 1.66)	4.21 (2.82 – 4.90)	11.7† (8.28 – 21.4)	98
60 years and older	3.51 (3.15 – 3.92)	1.30† (1.07 – 1.63)	3.37 (2.94 – 4.54)	9.13† (7.34 – 11.4)	86
Males					
Total, 20 years and older	3.95 (3.24 – 4.80)	1.23 (1.06 – 1.46)	4.23 (2.79 – 4.93)	11.3 (8.12 – 21.6)	143
20–39 years	3.99 (2.96 – 5.36)	1.37† (0.992 – 1.92)	3.41 (2.61 – 5.34)	10.7† (7.65 – 61.3)	58
40–59 years	4.30 (3.03 – 6.10)	1.08† (0.703 – 1.28)	4.74 (4.11 – 6.89)	12.4† (8.22 – 24.7)	42
60 years and older	3.13 (2.27 – 4.32)	1.30† (1.16 – 1.49)	2.53 (1.60 – 5.17)	8.55† (6.21 – 14.2)	43
Females					
Total, 20 years and older	3.89 (3.46 – 4.37)	1.70 (1.43 – 2.07)	3.60 (3.10 – 4.46)	8.84 (7.45 – 12.7)	167
20–39 years	3.93 (3.38 – 4.56)	1.77† (1.45 – 1.94)	3.65 (3.11 – 4.77)	8.32† (6.65 – 12.6)	68
40–59 years	3.90 (3.15 – 4.82)	1.66† (1.44 – 2.21)	3.42 (2.47 – 4.70)	8.90† (7.34 – 19.3)	56
60 years and older	3.78 (3.23 – 4.42)	1.25† (0.999 – 2.33)	3.54 (3.09 – 4.69)	9.24† (5.98 – 19.5)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.20.a.5. Plasma myristoleic acid (14:1n-5): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	7.07 (6.45 – 7.74)	2.83 (2.49 – 3.02)	6.84 (6.22 – 7.46)	19.5 (16.9 – 23.0)	992
20–39 years	6.97 (6.26 – 7.77)	2.79 (2.35 – 3.08)	6.61 (5.91 – 7.53)	18.5 (15.1 – 24.6)	300
40–59 years	7.39 (6.43 – 8.48)	2.87 (2.24 – 3.54)	6.97 (6.17 – 7.94)	19.8 (17.0 – 26.7)	280
60 years and older	6.72 (5.80 – 7.78)	2.63 (2.26 – 3.01)	6.72 (5.74 – 7.72)	17.9 (13.8 – 23.5)	412
Males					
Total, 20 years and older	6.84 (6.01 – 7.79)	2.47 (2.07 – 2.86)	6.77 (5.68 – 7.91)	18.7 (16.9 – 22.7)	472
20–39 years	6.84 (5.71 – 8.20)	2.39 (2.03 – 2.95)	6.53 (5.25 – 8.27)	17.0 (14.4 – 31.7)	128
40–59 years	7.31 (6.16 – 8.67)	2.49 (1.82 – 2.96)	7.03 (4.70 – 10.4)	21.0 (18.1 – 27.6)	140
60 years and older	6.13 (5.25 – 7.15)	2.43 (1.75 – 2.89)	6.36 (5.73 – 6.86)	15.9 (11.0 – 23.9)	204
Females					
Total, 20 years and older	7.28 (6.68 – 7.93)	3.16 (2.81 – 3.49)	6.86 (6.52 – 7.22)	19.6 (15.9 – 23.8)	520
20–39 years	7.09 (5.99 – 8.39)	2.94 (2.37 – 3.49)	6.67 (5.66 – 8.11)	19.0 (14.7 – 28.0)	172
40–59 years	7.46 (6.48 – 8.59)	3.56 (2.06 – 4.04)	6.84 (6.33 – 7.23)	18.9 (13.4 – 43.3)	140
60 years and older	7.27 (5.90 – 8.94)	3.01 (1.59 – 3.69)	7.09 (5.55 – 8.67)	20.7 (17.0 – 25.2)	208

Table 2.21.a.1. Plasma palmitoleic acid (16:1n-7): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	217 (205 – 229)		73.3 (65.1 – 78.1)	84.0 (79.0 – 89.6)	213 (196 – 230)	563 (526 – 664)	727 (657 – 806)	1,805
Age group								
20–39 years	195 (185 – 205)		72.5 (60.4 – 78.7)	82.0 (75.0 – 84.1)	185 (173 – 194)	539 (450 – 674)	685 (611 – 840)	610
40–59 years	228 (210 – 248)		69.3 (45.2 – 78.1)	82.4 (71.3 – 96.8)	228 (206 – 251)	572 (525 – 772)	770 (671 – 837)	514
60 years and older	238 (220 – 259)		84.8 (65.4 – 94.1)	100 (87.9 – 113)	241 (216 – 263)	559 (528 – 649)	676 (589 – 763)	681
Gender								
Males	207 (190 – 225)		69.0 (53.4 – 74.7)	77.7 (68.8 – 84.0)	203 (182 – 225)	562 (495 – 683)	682 (578 – 926)	863
Females	226 (214 – 239)		83.2 (71.2 – 88.4)	93.4 (89.1 – 104)	226 (204 – 243)	567 (528 – 679)	729 (630 – 846)	942
Race/ethnicity								
Mexican Americans	240 (209 – 277)		78.6† (60.0 – 86.2)	87.0 (64.2 – 95.4)	239 (204 – 281)	692 (594 – 780)	769† (699 – 1,110)	375
Non-Hispanic Blacks	157 (148 – 167)		64.8† (47.2 – 68.9)	70.3 (64.2 – 73.2)	151 (142 – 162)	429 (352 – 529)	523† (433 – 755)	310
Non-Hispanic Whites	221 (208 – 236)		74.9 (53.0 – 83.5)	88.9 (79.3 – 96.5)	221 (201 – 237)	554 (522 – 661)	722 (615 – 831)	990

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.21.a. Plasma palmitoleic acid (16:1n-7): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

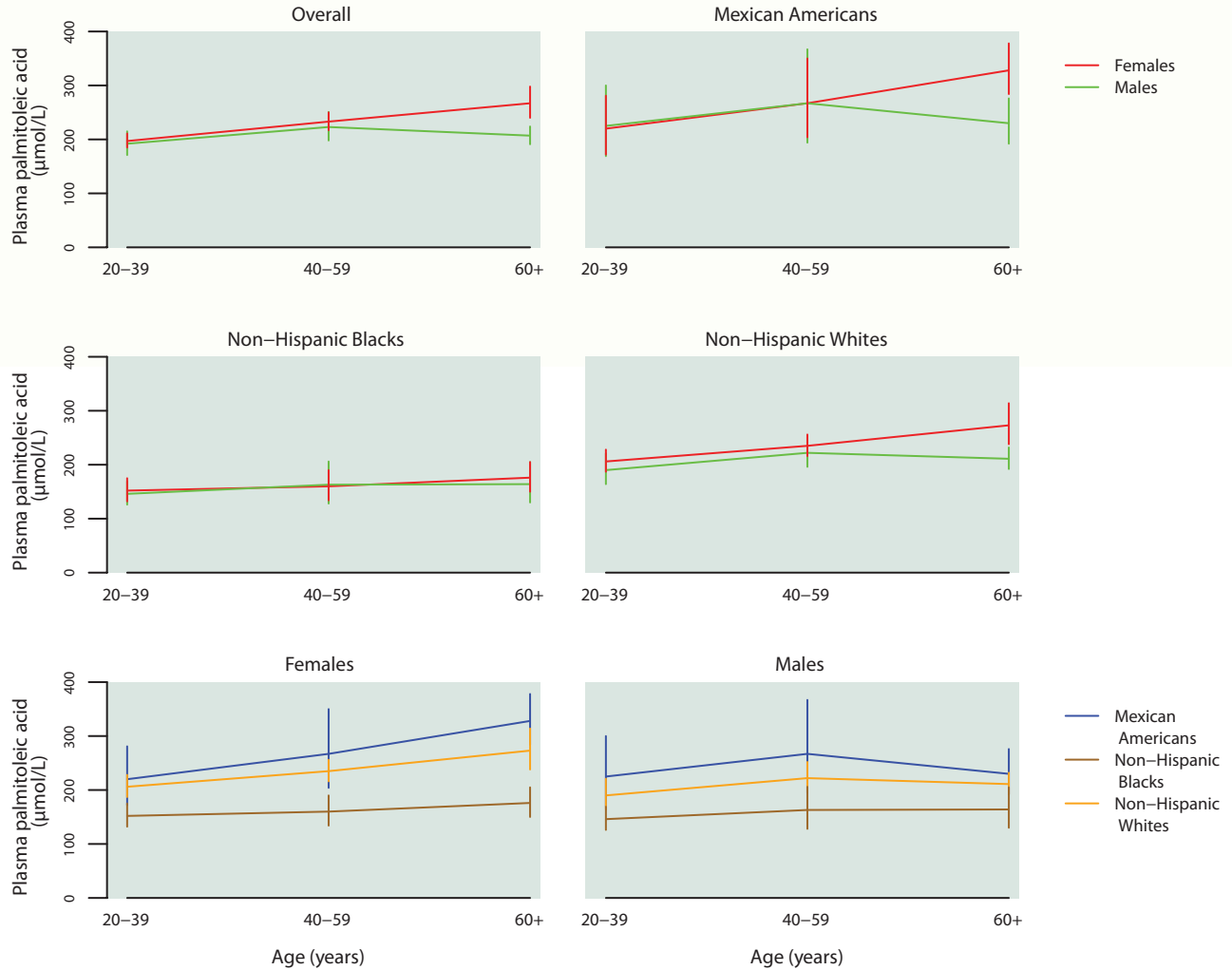


Table 2.21.a.2. Plasma palmitoleic acid (16:1n-7): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	217 (205 – 229)	105 (97.7 – 109)	213 (196 – 230)	454 (424 – 497)	1,805
20–39 years	195 (185 – 205)	92.3 (86.5 – 98.3)	185 (173 – 194)	411 (357 – 472)	610
40–59 years	228 (210 – 248)	106 (92.9 – 118)	228 (206 – 251)	475 (444 – 549)	514
60 years and older	238 (220 – 259)	122 (111 – 135)	241 (216 – 263)	467 (429 – 540)	681
Males					
Total, 20 years and older	207 (190 – 225)	92.6 (84.0 – 98.9)	203 (182 – 225)	456 (400 – 525)	863
20–39 years	192 (171 – 215)	83.9 (76.9 – 93.8)	185 (169 – 211)	410 (344 – 542)	282
40–59 years	223 (198 – 251)	97.4 (78.0 – 108)	218 (184 – 273)	501 (450 – 594)	248
60 years and older	207 (191 – 224)	112 (92.6 – 121)	206 (186 – 228)	386 (339 – 450)	333
Females					
Total, 20 years and older	226 (214 – 239)	114 (108 – 123)	226 (204 – 243)	453 (421 – 525)	942
20–39 years	197 (185 – 211)	108 (92.2 – 111)	184 (170 – 199)	406 (352 – 495)	328
40–59 years	233 (217 – 250)	126 (99.4 – 133)	231 (213 – 256)	455 (395 – 534)	266
60 years and older	267 (240 – 298)	137 (115 – 150)	271 (242 – 297)	537 (493 – 585)	348

Table 2.21.a.3. Plasma palmitoleic acid (16:1n-7): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	240 (209 – 277)	101 (64.3 – 131)	239 (204 – 281)	571 (498 – 645)	375
20–39 years	223 (181 – 274)	95.2 (60.0 – 129)	221 (175 – 274)	498 (386 – 737)	132
40–59 years	267 (232 – 307)	117† (79.8 – 143)	250 (233 – 272)	639† (545 – 804)	93
60 years and older	277 (262 – 292)	144 (136 – 158)	281 (250 – 308)	510 (446 – 587)	150
Males					
Total, 20 years and older	237 (192 – 292)	96.0 (61.6 – 134)	226 (178 – 290)	578 (489 – 687)	188
20–39 years	225 (169 – 300)	92.8† (61.6 – 130)	215 (153 – 314)	519† (406 – 844)	67
40–59 years	267 (194 – 367)	111† (79.8 – 150)	240 (190 – 353)	715† (438 – 942)	48
60 years and older	230 (192 – 276)	131† (64.1 – 158)	223 (180 – 280)	375† (309 – 876)	73
Females					
Total, 20 years and older	245 (207 – 291)	110 (61.1 – 132)	248 (188 – 316)	558 (421 – 749)	187
20–39 years	220 (172 – 281)	98.4† (60.0 – 130)	225 (161 – 293)	449† (352 – 1,110)	65
40–59 years	267 (204 – 350)	119† (88.5 – 144)	252 (148 – 396)	613† (517 – 766)	45
60 years and older	328 (284 – 378)	166† (120 – 215)	353 (281 – 398)	528† (469 – 739)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.21.a.4. Plasma palmitoleic acid (16:1n-7): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	157 (148 – 167)	78.0 (72.0 – 84.1)	151 (142 – 162)	326 (270 – 421)	310
20–39 years	149 (136 – 164)	78.7 (71.8 – 85.0)	148 (126 – 164)	309 (221 – 430)	126
40–59 years	161 (144 – 180)	72.4† (65.0 – 82.5)	149 (135 – 175)	333† (288 – 508)	98
60 years and older	171 (155 – 189)	89.5† (61.4 – 102)	171 (152 – 193)	316† (265 – 397)	86
Males					
Total, 20 years and older	154 (138 – 172)	74.0 (53.3 – 82.4)	157 (132 – 174)	323 (267 – 437)	143
20–39 years	146 (126 – 169)	71.0† (47.0 – 79.4)	145 (122 – 168)	305† (220 – 863)	58
40–59 years	163 (128 – 206)	72.7† (42.6 – 81.3)	168 (115 – 204)	371† (231 – 814)	42
60 years and older	164 (130 – 205)	98.3† (60.8 – 114)	152 (123 – 206)	280† (222 – 430)	43
Females					
Total, 20 years and older	159 (142 – 178)	84.4 (71.0 – 90.6)	149 (134 – 172)	331 (254 – 494)	167
20–39 years	152 (132 – 175)	85.4† (75.5 – 94.4)	147 (121 – 167)	314† (190 – 543)	68
40–59 years	160 (134 – 190)	71.3† (58.4 – 86.2)	144 (112 – 205)	317† (255 – 1,360)	56
60 years and older	176 (150 – 205)	89.4† (49.9 – 104)	178 (142 – 235)	322† (251 – 548)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.21.a.5. Plasma palmitoleic acid (16:1n-7): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	221 (208 – 236)	109 (99.2 – 116)	221 (201 – 237)	453 (411 – 498)	990
20–39 years	199 (184 – 215)	95.5 (84.0 – 109)	191 (174 – 207)	406 (348 – 496)	300
40–59 years	229 (208 – 251)	107 (96.8 – 126)	230 (214 – 253)	462 (409 – 525)	279
60 years and older	243 (221 – 267)	125 (114 – 136)	247 (219 – 272)	484 (415 – 556)	411
Males					
Total, 20 years and older	208 (189 – 229)	95.8 (81.2 – 108)	202 (182 – 231)	447 (386 – 520)	471
20–39 years	190 (164 – 221)	83.9 (69.1 – 97.2)	185 (159 – 215)	359 (319 – 554)	128
40–59 years	222 (196 – 252)	98.2 (74.3 – 111)	223 (175 – 277)	470 (410 – 582)	140
60 years and older	211 (192 – 232)	113 (92.1 – 124)	201 (182 – 241)	392 (343 – 481)	203
Females					
Total, 20 years and older	234 (219 – 249)	122 (108 – 133)	232 (220 – 250)	455 (408 – 538)	519
20–39 years	206 (187 – 228)	109 (91.9 – 118)	194 (173 – 221)	414 (346 – 644)	172
40–59 years	235 (216 – 256)	130 (99.9 – 146)	239 (220 – 257)	452 (362 – 532)	139
60 years and older	273 (238 – 314)	138 (108 – 165)	274 (243 – 303)	550 (460 – 661)	208

Table 2.22.a.1. Plasma cis-vaccenic acid (18:1n-7): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	146 (141 – 150)		75.3 (65.1 – 81.0)	83.6 (76.2 – 89.7)	143 (139 – 148)	262 (251 – 274)	303 (283 – 344)	1,762
Age group								
20–39 years	131 (126 – 138)		65.6 (58.6 – 75.3)	76.9 (63.3 – 82.7)	129 (122 – 137)	235 (214 – 259)	269 (248 – 344)	589
40–59 years	148 (143 – 154)		76.4 (64.4 – 85.5)	86.6 (75.1 – 95.5)	144 (139 – 150)	282 (251 – 309)	333 (298 – 533)	501
60 years and older	168 (162 – 173)		94.1 (85.3 – 102)	103 (93.4 – 109)	166 (162 – 172)	266 (258 – 297)	301 (278 – 344)	672
Gender								
Males	145 (139 – 151)		71.5 (62.4 – 81.2)	83.4 (70.4 – 90.3)	141 (135 – 148)	265 (242 – 301)	325 (277 – 390)	845
Females	147 (141 – 153)		77.7 (61.8 – 81.7)	85.8 (75.4 – 92.0)	145 (139 – 151)	260 (240 – 282)	301 (273 – 345)	917
Race/ethnicity								
Mexican Americans	152 (138 – 166)		65.9† (55.7 – 82.7)	80.9 (58.0 – 93.1)	146 (136 – 164)	304 (258 – 378)	336† (326 – 384)	373
Non-Hispanic Blacks	129 (120 – 138)		69.5† (54.5 – 74.7)	74.8 (68.0 – 80.3)	125 (117 – 134)	237 (206 – 354)	295† (251 – 429)	305
Non-Hispanic Whites	146 (140 – 152)		77.0 (62.1 – 85.4)	86.7 (75.1 – 93.1)	144 (139 – 149)	260 (242 – 275)	298 (275 – 337)	958

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.22.a. Plasma cis-vaccenic acid (18:1n-7): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

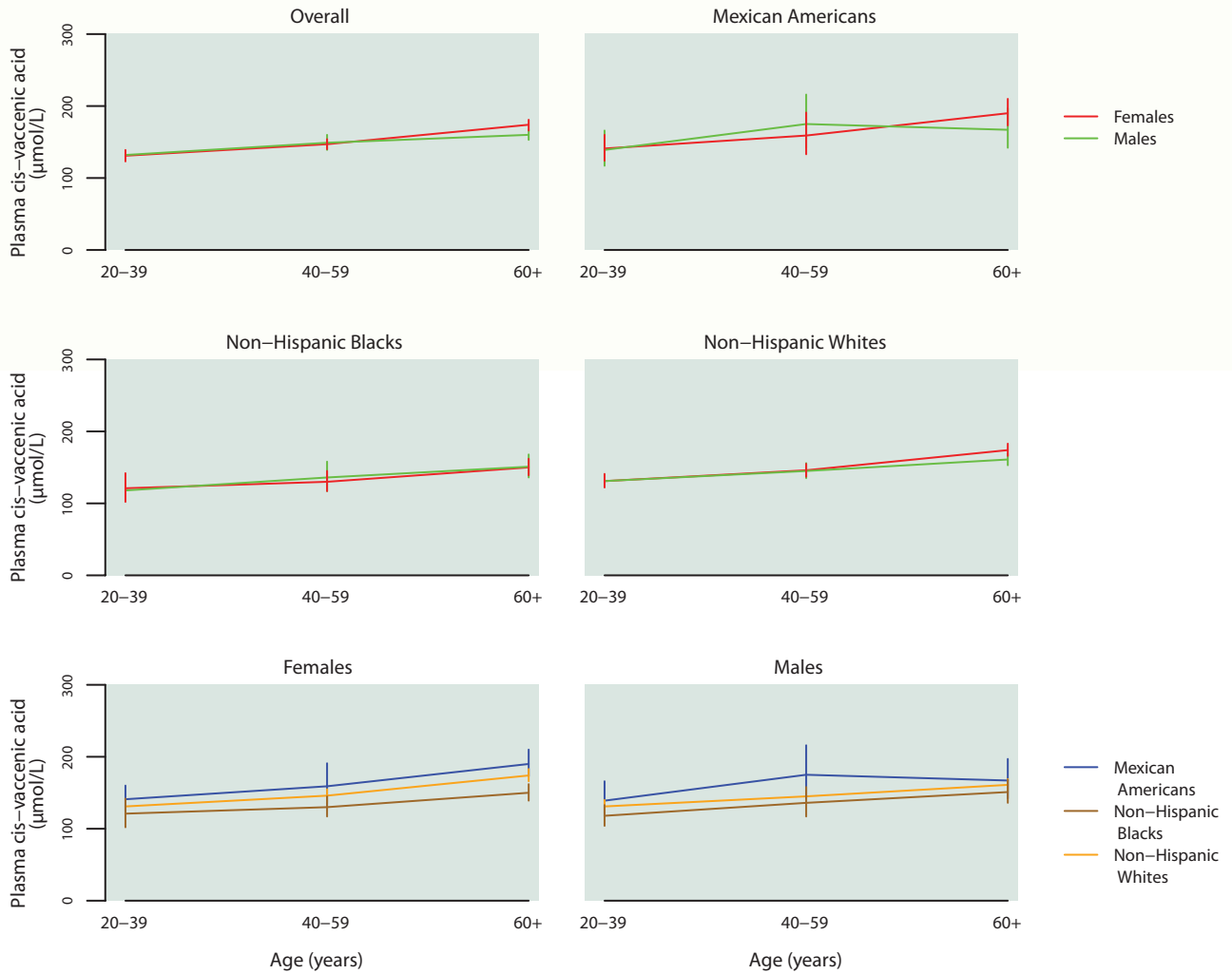


Table 2.22.a.2. Plasma cis-vaccenic acid (18:1n-7): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	146 (141 – 150)	95.1 (89.2 – 99.8)	143 (139 – 148)	225 (216 – 234)	1,762
20–39 years	131 (126 – 138)	87.0 (78.0 – 93.7)	129 (122 – 137)	200 (190 – 215)	589
40–59 years	148 (143 – 154)	99.9 (92.1 – 104)	144 (139 – 150)	229 (211 – 262)	501
60 years and older	168 (162 – 173)	113 (107 – 119)	166 (162 – 172)	242 (231 – 259)	672
Males					
Total, 20 years and older	145 (139 – 151)	95.1 (87.8 – 102)	141 (135 – 148)	222 (210 – 241)	845
20–39 years	132 (126 – 139)	87.9 (73.4 – 94.8)	129 (123 – 138)	197 (184 – 222)	273
40–59 years	149 (139 – 160)	99.8 (85.5 – 105)	146 (133 – 159)	240 (208 – 301)	242
60 years and older	160 (153 – 167)	109 (97.2 – 117)	161 (150 – 168)	226 (215 – 258)	330
Females					
Total, 20 years and older	147 (141 – 153)	95.0 (88.5 – 99.8)	145 (139 – 151)	227 (213 – 238)	917
20–39 years	131 (123 – 139)	85.8 (78.0 – 92.8)	129 (119 – 138)	203 (190 – 222)	316
40–59 years	147 (140 – 154)	99.8 (87.5 – 105)	144 (139 – 147)	219 (187 – 301)	259
60 years and older	174 (166 – 181)	117 (107 – 127)	172 (163 – 182)	248 (237 – 273)	342

Table 2.22.a.3. Plasma cis-vaccenic acid (18:1n-7): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	152 (138 – 166)	97.2 (66.3 – 108)	146 (136 – 164)	240 (222 – 324)	373
20–39 years	140 (125 – 157)	83.4 (55.7 – 108)	140 (125 – 154)	226 (188 – 347)	130
40–59 years	168 (146 – 192)	102† (90.0 – 110)	157 (145 – 183)	270† (240 – 375)	92
60 years and older	179 (171 – 187)	123 (73.1 – 139)	177 (169 – 184)	277 (247 – 310)	151
Males					
Total, 20 years and older	151 (130 – 176)	94.6 (58.1 – 111)	144 (127 – 178)	255 (217 – 331)	187
20–39 years	139 (117 – 166)	83.3† (58.1 – 108)	136 (117 – 168)	224† (179 – 350)	66
40–59 years	175 (142 – 216)	103† (88.8 – 127)	159 (139 – 212)	321† (229 – 454)	47
60 years and older	167 (142 – 197)	101† (68.8 – 140)	155 (140 – 209)	263† (217 – 634)	74
Females					
Total, 20 years and older	152 (142 – 162)	97.2 (72.8 – 104)	153 (137 – 167)	235 (222 – 261)	186
20–39 years	141 (124 – 160)	87.7† (57.9 – 102)	144 (113 – 169)	221† (186 – 410)	64
40–59 years	159 (133 – 191)	98.6† (81.2 – 109)	151 (125 – 188)	246† (197 – 421)	45
60 years and older	190 (173 – 210)	130† (110 – 142)	187 (165 – 214)	284† (228 – 375)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.22.a.4. Plasma cis-vaccenic acid (18:1n-7): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	129 (120 – 138)	82.6 (74.8 – 88.4)	125 (117 – 134)	202 (186 – 225)	305
20–39 years	119 (107 – 134)	80.5 (63.7 – 84.9)	112 (99.8 – 134)	184 (155 – 395)	124
40–59 years	133 (121 – 146)	80.1† (69.5 – 89.8)	124 (118 – 135)	204† (187 – 266)	96
60 years and older	151 (145 – 157)	108† (99.6 – 115)	143 (141 – 147)	218† (191 – 303)	85
Males					
Total, 20 years and older	129 (119 – 139)	79.8 (71.9 – 84.8)	124 (117 – 134)	205 (185 – 235)	141
20–39 years	118 (104 – 133)	72.2† (54.1 – 82.8)	114 (89.0 – 136)	185† (136 – 435)	57
40–59 years	136 (117 – 158)	80.3† (69.7 – 90.3)	121 (117 – 132)	221† (188 – 409)	41
60 years and older	151 (136 – 168)	108† (89.1 – 116)	147 (136 – 168)	217† (179 – 250)	43
Females					
Total, 20 years and older	129 (116 – 143)	84.9 (67.1 – 94.9)	126 (111 – 139)	197 (165 – 284)	164
20–39 years	121 (102 – 142)	82.6† (56.8 – 94.3)	111 (99.1 – 140)	177† (153 – 284)	67
40–59 years	130 (117 – 145)	76.7† (66.9 – 92.1)	128 (115 – 136)	197† (163 – 575)	55
60 years and older	150 (139 – 162)	108† (102 – 124)	141 (136 – 148)	214† (180 – 323)	42

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.22.a.5. Plasma cis-vaccenic acid (18:1n-7): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	146 (140 – 152)	95.8 (89.8 – 102)	144 (139 – 149)	222 (211 – 234)	958
20–39 years	131 (123 – 139)	88.8 (70.0 – 95.5)	127 (120 – 138)	200 (183 – 218)	285
40–59 years	145 (139 – 153)	100 (89.1 – 104)	144 (137 – 149)	219 (199 – 244)	270
60 years and older	168 (162 – 174)	113 (106 – 117)	167 (162 – 172)	247 (231 – 261)	403
Males					
Total, 20 years and older	144 (138 – 150)	96.3 (89.6 – 103)	141 (132 – 149)	217 (205 – 240)	456
20–39 years	131 (122 – 140)	92.8 (67.7 – 97.1)	125 (117 – 139)	185 (173 – 229)	121
40–59 years	145 (135 – 156)	99.8 (84.1 – 105)	144 (127 – 158)	224 (203 – 276)	136
60 years and older	161 (153 – 169)	109 (95.0 – 116)	163 (151 – 170)	229 (216 – 260)	199
Females					
Total, 20 years and older	148 (141 – 154)	95.6 (87.9 – 103)	147 (141 – 152)	226 (209 – 240)	502
20–39 years	131 (122 – 141)	87.7 (61.8 – 95.4)	130 (121 – 139)	204 (187 – 234)	164
40–59 years	146 (137 – 155)	100 (86.2 – 105)	144 (139 – 148)	212 (180 – 322)	134
60 years and older	174 (166 – 183)	116 (103 – 128)	171 (162 – 183)	253 (235 – 279)	204

Table 2.23.a.1. Plasma oleic acid (18:1 n-9): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size					
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th						
Total, 20 years and older	2,100	(2,050 – 2,150)	1,110	(1,030 – 1,170)	1,220	(1,170 – 1,270)	2,070	(2,000 – 2,150)	3,850	(3,590 – 4,220)	4,480	(4,230 – 4,940)	1,798
Age group													
20–39 years	1,910	(1,840 – 1,980)	1,020	(955 – 1,080)	1,130	(1,080 – 1,170)	1,840	(1,750 – 1,970)	3,710	(3,120 – 4,140)	4,190	(3,770 – 8,650)	608
40–59 years	2,160	(2,100 – 2,230)	1,160	(993 – 1,220)	1,280	(1,180 – 1,350)	2,120	(2,010 – 2,190)	4,150	(3,610 – 4,800)	4,790	(4,290 – 5,320)	512
60 years and older	2,360	(2,290 – 2,440)	1,330	(1,290 – 1,400)	1,430	(1,340 – 1,550)	2,380	(2,290 – 2,450)	3,850	(3,490 – 4,410)	4,410	(4,120 – 4,930)	678
Gender													
Males	2,140	(2,060 – 2,220)	1,140	(1,040 – 1,210)	1,230	(1,160 – 1,300)	2,100	(2,010 – 2,200)	4,110	(3,560 – 4,930)	4,930	(4,500 – 5,530)	858
Females	2,070	(2,000 – 2,140)	1,090	(972 – 1,140)	1,200	(1,130 – 1,270)	2,020	(1,940 – 2,140)	3,810	(3,490 – 4,020)	4,240	(4,030 – 4,400)	940
Race/ethnicity													
Mexican Americans	2,240	(2,060 – 2,430)	1,110†	(871 – 1,240)	1,270	(987 – 1,340)	2,170	(1,990 – 2,470)	4,280	(3,850 – 5,240)	4,940†	(4,400 – 6,640)	375
Non-Hispanic Blacks	1,810	(1,730 – 1,890)	1,020†	(892 – 1,080)	1,150	(1,010 – 1,180)	1,710	(1,620 – 1,830)	3,180	(2,890 – 3,760)	3,760†	(3,350 – 8,200)	308
Non-Hispanic Whites	2,130	(2,060 – 2,200)	1,120	(990 – 1,210)	1,230	(1,140 – 1,320)	2,120	(2,020 – 2,180)	3,840	(3,580 – 4,190)	4,380	(4,160 – 4,930)	986

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.23.a. Plasma oleic acid (18:1n-9): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

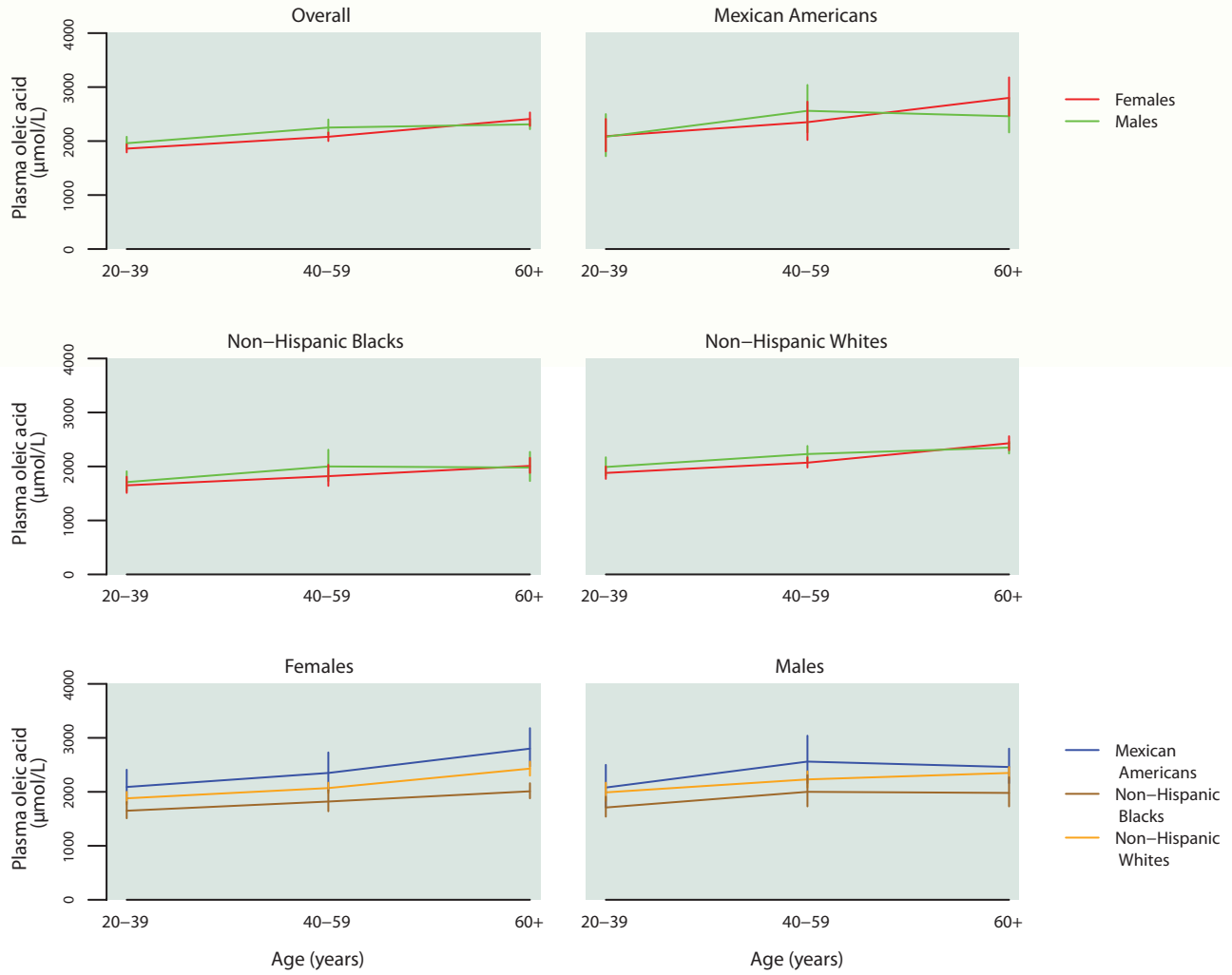


Table 2.23.a.2. Plasma oleic acid (18:1n-9): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,100 (2,050 – 2,150)	1,360 (1,310 – 1,400)	2,070 (2,000 – 2,150)	3,230 (3,090 – 3,440)	1,798
20–39 years	1,910 (1,840 – 1,980)	1,240 (1,200 – 1,300)	1,840 (1,750 – 1,970)	2,900 (2,710 – 3,160)	608
40–59 years	2,160 (2,100 – 2,230)	1,410 (1,350 – 1,530)	2,120 (2,010 – 2,190)	3,380 (3,100 – 3,660)	512
60 years and older	2,360 (2,290 – 2,440)	1,630 (1,550 – 1,690)	2,380 (2,290 – 2,450)	3,360 (3,200 – 3,640)	678
Males					
Total, 20 years and older	2,140 (2,060 – 2,220)	1,360 (1,310 – 1,410)	2,100 (2,010 – 2,200)	3,340 (3,060 – 3,660)	858
20–39 years	1,960 (1,850 – 2,080)	1,240 (1,220 – 1,310)	1,890 (1,770 – 2,060)	2,950 (2,640 – 3,700)	281
40–59 years	2,250 (2,120 – 2,400)	1,410 (1,310 – 1,550)	2,200 (1,970 – 2,350)	3,580 (3,180 – 4,480)	247
60 years and older	2,310 (2,220 – 2,400)	1,600 (1,400 – 1,730)	2,340 (2,170 – 2,420)	3,310 (3,040 – 3,850)	330
Females					
Total, 20 years and older	2,070 (2,000 – 2,140)	1,380 (1,300 – 1,410)	2,020 (1,940 – 2,140)	3,180 (2,960 – 3,370)	940
20–39 years	1,860 (1,790 – 1,940)	1,220 (1,140 – 1,300)	1,780 (1,700 – 1,940)	2,820 (2,570 – 3,620)	327
40–59 years	2,080 (2,000 – 2,160)	1,400 (1,330 – 1,520)	2,000 (1,920 – 2,140)	3,100 (2,830 – 3,700)	265
60 years and older	2,410 (2,280 – 2,530)	1,660 (1,480 – 1,740)	2,430 (2,270 – 2,530)	3,410 (3,260 – 3,820)	348

Table 2.23.a.3. Plasma oleic acid (18:1n-9): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,240 (2,060 – 2,430)	1,410 (1,250 – 1,500)	2,170 (1,990 – 2,470)	3,680 (3,330 – 4,270)	375
20–39 years	2,080 (1,850 – 2,350)	1,320 (882 – 1,470)	2,020 (1,710 – 2,390)	3,330 (2,900 – 4,590)	132
40–59 years	2,460 (2,220 – 2,730)	1,610† (1,140 – 1,790)	2,330 (2,090 – 2,670)	4,210† (3,520 – 5,160)	93
60 years and older	2,630 (2,460 – 2,820)	1,800 (1,740 – 1,820)	2,650 (2,320 – 2,900)	3,730 (3,570 – 4,720)	150
Males					
Total, 20 years and older	2,240 (1,970 – 2,540)	1,410 (1,150 – 1,510)	2,160 (1,820 – 2,570)	3,940 (3,120 – 4,880)	188
20–39 years	2,080 (1,720 – 2,500)	1,340† (989 – 1,480)	1,930 (1,530 – 2,550)	3,390† (2,640 – 5,270)	67
40–59 years	2,560 (2,160 – 3,040)	1,550† (1,280 – 1,980)	2,490 (2,000 – 3,090)	4,270† (3,570 – 5,640)	48
60 years and older	2,460 (2,160 – 2,800)	1,790† (1,030 – 1,830)	2,350 (1,900 – 3,040)	3,440† (3,270 – 4,860)	73
Females					
Total, 20 years and older	2,240 (2,060 – 2,450)	1,400 (859 – 1,680)	2,160 (2,020 – 2,500)	3,500 (3,280 – 3,970)	187
20–39 years	2,090 (1,810 – 2,410)	1,240† (831 – 1,570)	2,020 (1,750 – 2,330)	3,210† (2,850 – 4,200)	65
40–59 years	2,350 (2,020 – 2,730)	1,590† (1,080 – 1,770)	2,200 (1,990 – 2,730)	3,760† (2,920 – 5,280)	45
60 years and older	2,800 (2,470 – 3,180)	1,890† (1,600 – 2,040)	2,730 (2,320 – 3,420)	4,260† (3,660 – 5,490)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.23.a.4. Plasma oleic acid (18:1n-9): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	1,810 (1,730 – 1,890)	1,210 (1,170 – 1,260)	1,710 (1,620 – 1,830)	2,750 (2,610 – 2,990)	308
20–39 years	1,680 (1,560 – 1,810)	1,170 (1,050 – 1,210)	1,540 (1,470 – 1,760)	2,470 (2,310 – 3,740)	125
40–59 years	1,900 (1,750 – 2,050)	1,240† (1,060 – 1,310)	1,790 (1,640 – 1,970)	2,840† (2,610 – 3,590)	97
60 years and older	2,000 (1,870 – 2,150)	1,400† (1,190 – 1,570)	1,960 (1,800 – 2,190)	2,800† (2,670 – 3,020)	86
Males					
Total, 20 years and older	1,850 (1,720 – 1,990)	1,200 (1,140 – 1,240)	1,720 (1,570 – 1,920)	2,930 (2,470 – 4,190)	142
20–39 years	1,710 (1,540 – 1,910)	1,140† (887 – 1,230)	1,560 (1,380 – 1,830)	2,480† (2,400 – 6,770)	57
40–59 years	2,000 (1,730 – 2,310)	1,290† (1,010 – 1,410)	1,850 (1,600 – 2,060)	3,160† (2,570 – 8,560)	42
60 years and older	1,980 (1,730 – 2,270)	1,350† (1,080 – 1,620)	1,960 (1,700 – 2,140)	2,870† (2,440 – 4,520)	43
Females					
Total, 20 years and older	1,770 (1,670 – 1,890)	1,210 (1,150 – 1,280)	1,700 (1,600 – 1,840)	2,660 (2,460 – 2,960)	166
20–39 years	1,650 (1,510 – 1,810)	1,160† (1,080 – 1,250)	1,540 (1,470 – 1,710)	2,430† (2,130 – 3,240)	68
40–59 years	1,820 (1,640 – 2,030)	1,200† (863 – 1,280)	1,760 (1,620 – 2,010)	2,620† (2,360 – 6,740)	55
60 years and older	2,010 (1,880 – 2,160)	1,410† (1,280 – 1,590)	1,930 (1,700 – 2,400)	2,780† (2,640 – 3,030)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.23.a.5. Plasma oleic acid (18:1n-9): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	2,130 (2,060 – 2,200)	1,390 (1,320 – 1,480)	2,120 (2,020 – 2,180)	3,240 (3,100 – 3,430)	986
20–39 years	1,940 (1,820 – 2,050)	1,260 (1,140 – 1,360)	1,870 (1,750 – 2,040)	2,820 (2,630 – 3,710)	299
40–59 years	2,150 (2,070 – 2,220)	1,400 (1,320 – 1,550)	2,140 (2,030 – 2,180)	3,320 (3,020 – 3,600)	279
60 years and older	2,390 (2,310 – 2,470)	1,650 (1,530 – 1,730)	2,420 (2,330 – 2,480)	3,410 (3,250 – 3,700)	408
Males					
Total, 20 years and older	2,170 (2,070 – 2,280)	1,380 (1,290 – 1,520)	2,150 (2,040 – 2,240)	3,300 (3,030 – 3,630)	468
20–39 years	1,990 (1,830 – 2,170)	1,250 (1,070 – 1,380)	1,960 (1,760 – 2,130)	2,830 (2,610 – 4,110)	128
40–59 years	2,230 (2,080 – 2,380)	1,390 (1,220 – 1,570)	2,200 (1,950 – 2,370)	3,460 (3,020 – 4,000)	140
60 years and older	2,350 (2,240 – 2,460)	1,600 (1,390 – 1,730)	2,400 (2,320 – 2,470)	3,340 (3,070 – 4,100)	200
Females					
Total, 20 years and older	2,090 (2,010 – 2,180)	1,390 (1,320 – 1,470)	2,080 (1,970 – 2,160)	3,200 (2,910 – 3,660)	518
20–39 years	1,880 (1,770 – 2,000)	1,260 (1,120 – 1,360)	1,790 (1,670 – 2,010)	2,810 (2,530 – 3,860)	171
40–59 years	2,070 (1,980 – 2,170)	1,410 (1,100 – 1,560)	2,010 (1,890 – 2,160)	3,100 (2,720 – 3,910)	139
60 years and older	2,430 (2,300 – 2,560)	1,670 (1,470 – 1,810)	2,430 (2,250 – 2,540)	3,470 (3,220 – 4,060)	208

Table 2.24.a.1. Plasma eicosenoic acid (20:1 n-9): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	13.6 (13.2 – 14.1)		6.69 (6.33 – 7.03)	7.56 (6.83 – 7.98)	13.3 (12.8 – 13.8)	25.9 (24.2 – 30.5)	33.1 (29.9 – 38.3)	1,805
Age group								
20–39 years	12.6 (12.0 – 13.3)		6.35 (5.53 – 6.66)	6.82 (6.35 – 7.49)	12.1 (11.4 – 12.9)	25.8 (22.7 – 37.3)	34.7 (26.3 – 45.2)	608
40–59 years	13.5 (13.0 – 14.1)		6.96 (4.20 – 7.54)	7.59 (7.00 – 8.25)	13.2 (12.3 – 13.8)	25.7 (23.6 – 31.7)	31.8 (27.6 – 47.0)	514
60 years and older	15.6 (15.1 – 16.1)		8.94 (7.50 – 9.41)	9.74 (8.98 – 10.3)	15.1 (14.7 – 15.8)	26.0 (24.4 – 30.4)	31.1 (28.1 – 39.5)	683
Gender								
Males	13.9 (13.3 – 14.5)		6.70 (6.12 – 7.50)	7.68 (6.72 – 8.27)	13.5 (12.9 – 14.2)	28.7 (24.6 – 33.4)	37.1 (31.8 – 42.5)	865
Females	13.4 (12.8 – 14.0)		6.66 (5.98 – 7.01)	7.48 (6.83 – 7.84)	13.0 (12.6 – 13.6)	24.9 (23.2 – 26.6)	30.1 (26.1 – 35.3)	940
Race/ethnicity								
Mexican Americans	15.4 (14.4 – 16.5)		6.86† (6.00 – 8.62)	8.65 (6.33 – 9.25)	14.7 (13.7 – 16.4)	33.1 (27.9 – 40.8)	38.7† (33.2 – 45.9)	376
Non-Hispanic Blacks	11.7 (11.0 – 12.4)		6.11† (5.11 – 6.37)	6.39 (6.08 – 6.85)	11.1 (10.2 – 12.1)	23.4 (21.3 – 28.1)	29.4† (25.1 – 51.3)	310
Non-Hispanic Whites	13.6 (13.1 – 14.2)		6.83 (5.83 – 7.46)	7.63 (6.70 – 8.15)	13.4 (12.9 – 13.8)	24.9 (23.5 – 30.1)	31.7 (26.5 – 39.3)	989

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.24.a. Plasma eicosenoic acid (20:1n-9): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

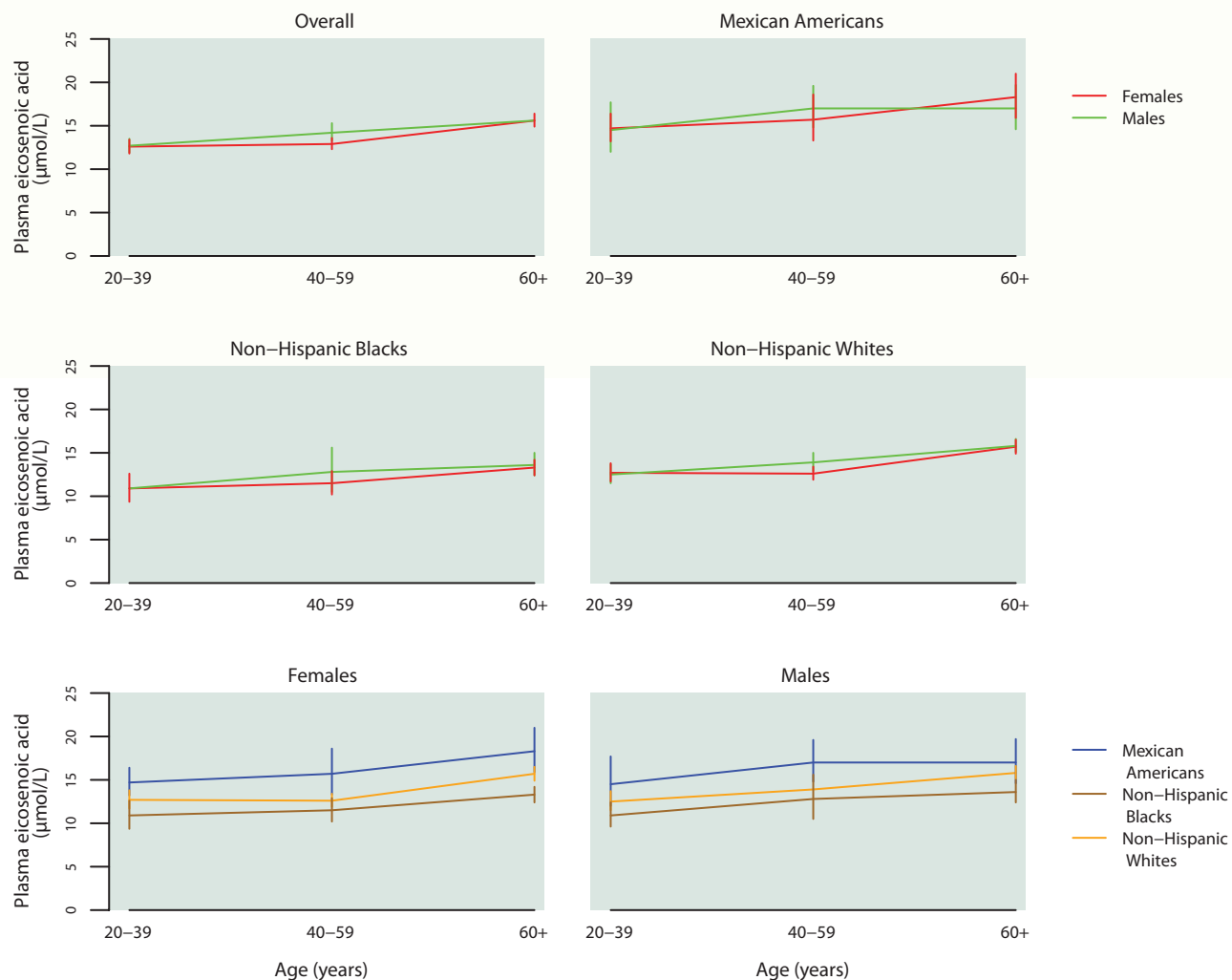


Table 2.24.a.2. Plasma eicosenoic acid (20:1n-9): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	13.6 (13.2 – 14.1)	8.46 (7.94 – 8.95)	13.3 (12.8 – 13.8)	22.2 (21.4 – 23.2)	1,805
20–39 years	12.6 (12.0 – 13.3)	7.85 (6.91 – 8.20)	12.1 (11.4 – 12.9)	21.6 (20.3 – 23.2)	608
40–59 years	13.5 (13.0 – 14.1)	8.71 (7.75 – 9.34)	13.2 (12.3 – 13.8)	22.3 (20.3 – 24.2)	514
60 years and older	15.6 (15.1 – 16.1)	10.7 (10.3 – 10.9)	15.1 (14.7 – 15.8)	23.1 (21.8 – 24.6)	683
Males					
Total, 20 years and older	13.9 (13.3 – 14.5)	8.77 (8.41 – 8.97)	13.5 (12.9 – 14.2)	22.8 (21.2 – 24.7)	865
20–39 years	12.7 (11.9 – 13.5)	7.88 (6.97 – 8.43)	12.2 (11.6 – 13.0)	21.2 (17.8 – 25.8)	282
40–59 years	14.2 (13.3 – 15.3)	8.96 (8.39 – 9.70)	13.9 (12.7 – 14.7)	23.2 (20.5 – 31.5)	248
60 years and older	15.6 (15.0 – 16.2)	10.5 (10.2 – 10.9)	14.9 (14.4 – 16.1)	23.5 (21.8 – 24.8)	335
Females					
Total, 20 years and older	13.4 (12.8 – 14.0)	8.18 (7.55 – 8.94)	13.0 (12.6 – 13.6)	21.8 (21.0 – 22.9)	940
20–39 years	12.6 (11.8 – 13.4)	7.74 (6.79 – 8.08)	12.0 (10.8 – 13.2)	21.7 (20.6 – 23.4)	326
40–59 years	12.9 (12.3 – 13.6)	8.31 (7.29 – 9.14)	12.5 (11.9 – 13.1)	19.9 (18.5 – 23.0)	266
60 years and older	15.6 (14.9 – 16.4)	10.8 (9.70 – 11.4)	15.1 (14.6 – 15.9)	22.6 (21.6 – 25.1)	348

Table 2.24.a.3. Plasma eicosenoic acid (20:1n-9): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	15.4 (14.4 – 16.5)	9.39 (8.68 – 10.3)	14.7 (13.7 – 16.4)	26.9 (22.7 – 33.2)	376
20–39 years	14.6 (13.2 – 16.2)	8.93 (7.04 – 9.80)	14.1 (12.1 – 16.5)	23.5 (20.3 – 40.8)	132
40–59 years	16.4 (14.8 – 18.2)	10.2† (7.11 – 11.7)	15.2 (14.6 – 16.8)	28.4† (25.1 – 32.9)	93
60 years and older	17.6 (16.3 – 19.1)	12.0 (10.4 – 12.6)	16.7 (14.6 – 19.8)	27.7 (24.8 – 37.1)	151
Males					
Total, 20 years and older	15.4 (13.7 – 17.3)	9.18 (8.78 – 10.6)	14.7 (13.3 – 16.8)	26.1 (21.8 – 39.8)	189
20–39 years	14.5 (12.0 – 17.7)	8.87† (7.99 – 9.35)	14.2 (11.5 – 16.7)	22.7† (17.5 – 40.9)	67
40–59 years	17.0 (14.8 – 19.6)	10.5† (7.01 – 12.6)	15.3 (14.5 – 17.7)	30.7† (24.6 – 44.8)	48
60 years and older	17.0 (14.6 – 19.7)	11.7† (5.88 – 13.3)	16.4 (12.8 – 21.4)	25.3† (21.4 – 59.6)	74
Females					
Total, 20 years and older	15.4 (14.4 – 16.5)	9.59 (6.32 – 10.4)	15.0 (13.6 – 16.6)	27.1 (22.6 – 35.3)	187
20–39 years	14.7 (13.2 – 16.4)	9.04† (6.32 – 10.1)	14.0 (11.6 – 16.6)	23.8† (21.5 – 38.7)	65
40–59 years	15.7 (13.3 – 18.6)	9.79† (6.66 – 11.9)	14.9 (12.8 – 18.8)	26.4† (19.1 – 38.4)	45
60 years and older	18.3 (15.9 – 21.0)	11.9† (9.58 – 13.0)	16.8 (14.6 – 21.4)	32.3† (24.3 – 38.0)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.24.a.4. Plasma eicosenoic acid (20:1n-9): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	11.7 (11.0 – 12.4)	7.28 (6.35 – 7.86)	11.1 (10.2 – 12.1)	20.0 (17.7 – 22.1)	310
20–39 years	10.9 (9.78 – 12.1)	6.75 (6.07 – 7.51)	9.90 (9.05 – 11.4)	19.7 (15.0 – 25.9)	126
40–59 years	12.1 (10.9 – 13.3)	7.40† (5.83 – 8.31)	11.4 (10.1 – 12.4)	20.0† (16.8 – 33.4)	98
60 years and older	13.4 (12.7 – 14.1)	9.43† (8.18 – 9.88)	13.1 (12.2 – 14.6)	19.7† (17.7 – 24.3)	86
Males					
Total, 20 years and older	11.9 (11.1 – 12.8)	7.12 (6.18 – 7.71)	11.0 (9.88 – 12.3)	21.2 (17.6 – 35.8)	143
20–39 years	10.9 (9.62 – 12.4)	6.33† (5.90 – 7.47)	9.97 (8.73 – 12.2)	17.2† (14.7 – 35.2)	58
40–59 years	12.8 (10.5 – 15.6)	7.86† (5.24 – 8.80)	11.1 (9.28 – 14.0)	21.3† (16.6 – 61.1)	42
60 years and older	13.6 (12.4 – 15.0)	9.07† (6.71 – 10.5)	12.3 (11.2 – 15.0)	22.3† (18.9 – 25.7)	43
Females					
Total, 20 years and older	11.5 (10.4 – 12.7)	7.29 (6.37 – 7.99)	11.3 (9.96 – 12.5)	19.0 (15.8 – 25.1)	167
20–39 years	10.9 (9.36 – 12.6)	6.88† (5.96 – 7.70)	9.60 (8.86 – 11.9)	20.2† (14.6 – 26.0)	68
40–59 years	11.5 (10.2 – 12.9)	7.20† (5.09 – 7.95)	11.6 (9.98 – 12.5)	17.6† (14.1 – 40.8)	56
60 years and older	13.3 (12.4 – 14.2)	9.42† (8.21 – 9.77)	13.3 (12.6 – 14.6)	18.0† (15.3 – 24.3)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.24.a.5. Plasma eicosenoic acid (20:1n-9): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	13.6 (13.1 – 14.2)	8.60 (7.88 – 9.22)	13.4 (12.9 – 13.8)	22.0 (20.7 – 23.3)	989
20–39 years	12.6 (11.8 – 13.6)	7.88 (6.83 – 8.26)	12.1 (11.4 – 13.0)	21.6 (19.4 – 24.2)	298
40–59 years	13.3 (12.7 – 13.9)	8.71 (7.53 – 9.56)	13.0 (11.9 – 13.7)	21.7 (19.0 – 23.1)	279
60 years and older	15.8 (15.2 – 16.3)	10.8 (10.4 – 11.1)	15.2 (14.7 – 15.9)	23.1 (21.7 – 25.4)	412
Males					
Total, 20 years and older	13.9 (13.2 – 14.5)	8.91 (8.24 – 9.44)	13.6 (12.9 – 14.2)	22.2 (20.4 – 24.2)	472
20–39 years	12.5 (11.5 – 13.7)	7.92 (6.33 – 8.95)	11.9 (11.4 – 13.0)	18.2 (15.7 – 42.2)	128
40–59 years	13.9 (12.9 – 15.0)	8.97 (7.92 – 9.80)	13.8 (11.9 – 14.7)	22.2 (19.9 – 25.5)	140
60 years and older	15.8 (15.1 – 16.6)	10.6 (10.2 – 11.2)	15.3 (14.7 – 16.4)	23.4 (21.7 – 26.6)	204
Females					
Total, 20 years and older	13.4 (12.8 – 14.1)	8.17 (7.57 – 9.08)	13.1 (12.6 – 13.7)	21.8 (20.5 – 23.4)	517
20–39 years	12.7 (11.7 – 13.8)	7.83 (5.75 – 8.15)	12.3 (10.7 – 13.7)	21.7 (20.6 – 25.6)	170
40–59 years	12.6 (11.9 – 13.4)	8.42 (6.89 – 9.47)	12.1 (11.7 – 13.0)	19.0 (17.2 – 22.9)	139
60 years and older	15.7 (14.9 – 16.5)	10.9 (10.5 – 11.4)	15.1 (14.5 – 15.9)	22.8 (21.2 – 26.1)	208

Table 2.25.a.1. Plasma docosenoic acid (22:1n-9): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

Age group	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	< LOD	.712 (< LOD – 1.25)	3.62 (3.30 – 4.07)	10.3 (9.50 – 12.2)	13.6 (11.8 – 16.6)	1,604		
Age group								
20–39 years	< LOD	.612 (< LOD – 1.38)	3.46 (3.10 – 4.06)	11.6 (9.32 – 16.7)	14.7 (12.4 – 20.1)	533		
40–59 years	.310 (< LOD – .677)	.729 (< LOD – 1.15)	3.51 (3.16 – 4.23)	9.45 (8.62 – 13.4)	12.6 (10.8 – 16.6)	454		
60 years and older	.421 (< LOD – .890)	.831 (< LOD – 1.46)	3.93 (3.55 – 4.47)	9.69 (8.60 – 10.9)	11.2 (9.74 – 15.5)	617		
Gender								
Males	< LOD	.620 (< LOD – 1.11)	3.54 (3.24 – 4.04)	10.1 (9.39 – 11.9)	12.9 (10.9 – 14.0)	767		
Females	.334 (< LOD – .936)	.941 (< LOD – 1.41)	3.66 (3.33 – 4.23)	11.0 (8.65 – 14.7)	14.7 (11.9 – 17.7)	837		
Race/ethnicity								
Mexican Americans	< LOD†	.692 (< LOD – 1.46)	3.69 (3.32 – 4.29)	10.5 (7.40 – 23.0)	13.3† (8.78 – 23.8)	345		
Non-Hispanic Blacks	.673† (< LOD – 1.47)	1.43 (< LOD – 1.72)	3.83 (3.46 – 4.50)	10.8 (9.41 – 15.0)	13.4† (11.0 – 20.1)	280		
Non-Hispanic Whites	< LOD	.613 (< LOD – 1.15)	3.54 (3.16 – 4.23)	10.1 (9.13 – 12.6)	13.6 (11.4 – 16.8)	863		

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.25.a. Plasma docosenoic acid (22:1n-9): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

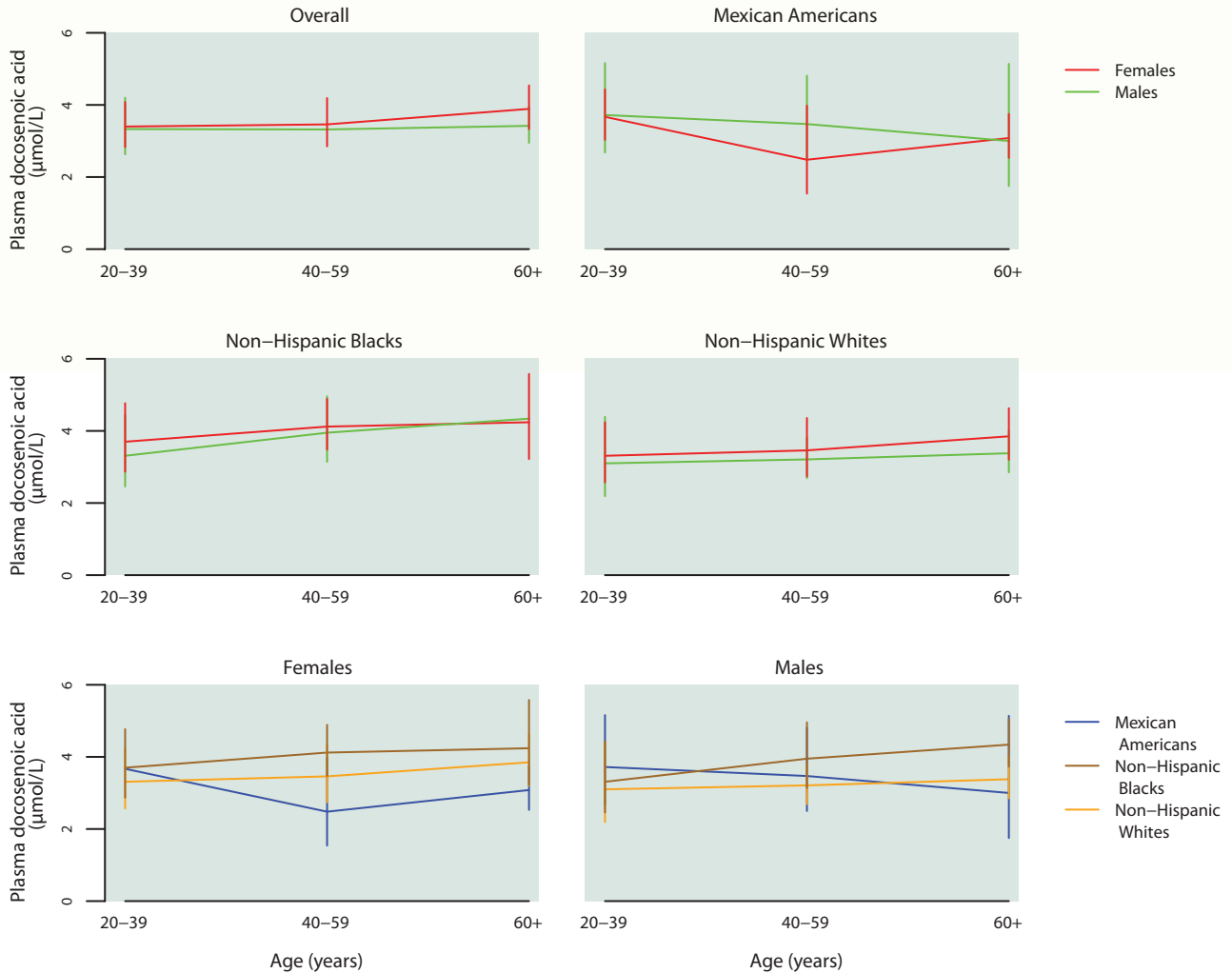


Table 2.25.a.2. Plasma docosenoic acid (22:1n-9): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3.44 (2.97 – 3.99)	1.38 (.670 – 1.82)	3.62 (3.30 – 4.07)	8.15 (7.41 – 9.51)	1,604
20–39 years	3.36 (2.75 – 4.11)	1.38 (< LOD – 1.87)	3.46 (3.10 – 4.06)	8.64 (7.27 – 11.3)	533
40–59 years	3.39 (2.89 – 3.97)	1.21 (.624 – 1.79)	3.51 (3.16 – 4.23)	8.03 (7.04 – 9.44)	454
60 years and older	3.67 (3.18 – 4.24)	1.55 (.813 – 1.94)	3.93 (3.55 – 4.47)	7.86 (7.43 – 8.68)	617
Males					
Total, 20 years and older	3.34 (2.85 – 3.92)	1.22 (.372 – 1.85)	3.54 (3.24 – 4.04)	8.37 (7.59 – 9.60)	767
20–39 years	3.33 (2.63 – 4.20)	1.11 (< LOD – 1.89)	3.38 (2.94 – 4.18)	9.18 (7.58 – 12.3)	249
40–59 years	3.32 (2.85 – 3.86)	1.21 (.324 – 1.87)	3.68 (3.16 – 4.39)	8.06 (6.79 – 9.60)	219
60 years and older	3.42 (2.95 – 3.95)	1.33 (.641 – 1.75)	3.65 (3.35 – 3.95)	7.93 (7.45 – 9.69)	299
Females					
Total, 20 years and older	3.54 (3.04 – 4.12)	1.47 (.937 – 1.84)	3.66 (3.33 – 4.23)	7.82 (7.24 – 9.41)	837
20–39 years	3.40 (2.83 – 4.08)	1.44 (.483 – 1.70)	3.58 (2.95 – 4.23)	7.58 (6.98 – 14.6)	284
40–59 years	3.46 (2.85 – 4.19)	1.16 (.666 – 1.76)	3.44 (3.03 – 4.43)	7.92 (7.18 – 11.5)	235
60 years and older	3.89 (3.33 – 4.54)	1.77 (.727 – 2.27)	4.25 (3.69 – 5.32)	7.69 (7.38 – 8.54)	318

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

Table 2.25.a.3. Plasma docosenoic acid (22:1n-9): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3.38 (2.83 – 4.03)	1.47 (.698 – 1.86)	3.69 (3.32 – 4.29)	7.40 (6.31 – 12.3)	345
20–39 years	3.70 (2.96 – 4.62)	1.58 (< LOD – 2.35)	3.97 (3.54 – 4.50)	7.41 (6.18 – 16.2)	117
40–59 years	2.97 (2.04 – 4.31)	1.20† (< LOD – 1.85)	3.45 (2.09 – 4.69)	7.48† (5.26 – 12.2)	91
60 years and older	3.04 (2.44 – 3.79)	1.48 (< LOD – 1.90)	3.41 (2.89 – 3.83)	6.86 (5.67 – 12.0)	137
Males					
Total, 20 years and older	3.57 (2.84 – 4.49)	1.51 (< LOD – 1.96)	3.93 (3.52 – 4.30)	8.15 (6.07 – 23.8)	170
20–39 years	3.72 (2.68 – 5.16)	1.38† (< LOD – 2.15)	4.00 (3.27 – 4.92)	7.88† (6.00 – 23.8)	58
40–59 years	3.47 (2.50 – 4.81)	1.47† (< LOD – 2.04)	3.82 (2.77 – 4.66)	8.18† (5.28 – 11.5)	47
60 years and older	3.00 (1.75 – 5.14)	1.47† (< LOD – 2.17)	3.41 (1.76 – 5.76)	7.10† (5.04 – 13.1)	65
Females					
Total, 20 years and older	3.16 (2.54 – 3.92)	1.43 (< LOD – 1.87)	3.55 (2.85 – 4.70)	6.83 (5.85 – 7.88)	175
20–39 years	3.67 (3.03 – 4.43)	1.68† (< LOD – 2.49)	3.76 (3.30 – 4.88)	7.10† (5.69 – 18.2)	59
40–59 years	2.48 (1.54 – 3.98)	.740† (< LOD – 1.71)	2.87 (1.88 – 4.31)	6.29† (4.79 – 12.2)	44
60 years and older	3.08 (2.53 – 3.75)	1.48† (< LOD – 2.10)	3.39 (2.65 – 3.84)	6.46† (4.82 – 10.8)	72

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.25.a.4. Plasma docosenoic acid (22:1n-9): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3.81 (3.39 – 4.29)	1.76 (.712 – 2.22)	3.83 (3.46 – 4.50)	8.37 (7.02 – 13.4)	280
20–39 years	3.52 (2.85 – 4.34)	1.68 (< LOD – 2.11)	3.54 (3.15 – 4.17)	8.10 (5.61 – 23.4)	116
40–59 years	4.04 (3.53 – 4.64)	1.64† (< LOD – 2.46)	4.52 (3.73 – 5.02)	8.15† (7.20 – 11.6)	82
60 years and older	4.28 (3.65 – 5.01)	2.24† (.542 – 2.55)	4.19 (3.30 – 5.58)	8.49† (7.12 – 19.0)	82
Males					
Total, 20 years and older	3.66 (3.11 – 4.30)	1.82 (< LOD – 2.26)	3.63 (3.08 – 4.53)	9.58 (7.05 – 13.4)	130
20–39 years	3.31 (2.46 – 4.44)	1.50† (< LOD – 2.27)	3.28 (2.35 – 4.53)	7.50† (5.46 – 23.8)	54
40–59 years	3.95 (3.14 – 4.96)	1.76† (< LOD – 2.60)	4.00 (3.07 – 5.03)	9.73† (6.86 – 14.6)	35
60 years and older	4.34 (3.73 – 5.05)	1.86† (< LOD – 2.52)	3.87 (3.28 – 6.41)	9.45† (8.02 – 19.0)	41
Females					
Total, 20 years and older	3.94 (3.40 – 4.56)	1.75 (1.28 – 2.16)	4.14 (3.39 – 4.92)	8.10 (6.84 – 16.2)	150
20–39 years	3.70 (2.87 – 4.77)	1.68† (< LOD – 2.25)	3.57 (3.18 – 4.43)	8.27† (5.30 – 19.7)	62
40–59 years	4.12 (3.48 – 4.89)	1.57† (.381 – 2.46)	4.86 (3.40 – 6.24)	8.08† (6.93 – 11.9)	47
60 years and older	4.24 (3.22 – 5.58)	2.30† (1.77 – 2.61)	4.23 (2.58 – 6.59)	7.56† (6.37 – 11.8)	41

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.25.a.5. Plasma docosenoic acid (22:1n-9): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3.36 (2.79 – 4.05)	1.18 (.420 – 1.78)	3.54 (3.16 – 4.23)	8.12 (7.40 – 9.59)	863
20–39 years	3.21 (2.41 – 4.27)	1.09 (< LOD – 1.87)	3.37 (2.71 – 4.30)	8.51 (7.27 – 11.9)	255
40–59 years	3.33 (2.77 – 4.01)	1.11 (.402 – 1.71)	3.44 (2.98 – 4.49)	8.10 (6.96 – 11.0)	242
60 years and older	3.63 (3.07 – 4.29)	1.49 (.647 – 1.90)	3.93 (3.52 – 4.55)	7.77 (7.44 – 8.50)	366
Males					
Total, 20 years and older	3.21 (2.64 – 3.91)	1.09 (< LOD – 1.85)	3.48 (3.05 – 4.20)	8.14 (7.22 – 9.56)	412
20–39 years	3.10 (2.19 – 4.39)	.749† (< LOD – 1.86)	3.20 (2.56 – 4.88)	8.97† (7.37 – 12.8)	110
40–59 years	3.21 (2.69 – 3.82)	1.08 (< LOD – 1.91)	3.52 (3.01 – 4.38)	7.62 (5.91 – 9.68)	122
60 years and older	3.38 (2.85 – 4.02)	1.37 (.534 – 1.82)	3.63 (3.33 – 4.15)	7.79 (6.98 – 9.24)	180
Females					
Total, 20 years and older	3.51 (2.89 – 4.25)	1.36 (.604 – 1.76)	3.66 (3.21 – 4.30)	7.92 (7.38 – 10.4)	451
20–39 years	3.31 (2.57 – 4.24)	1.37 (< LOD – 1.89)	3.61 (2.73 – 4.30)	7.62 (6.64 – 16.9)	145
40–59 years	3.46 (2.74 – 4.36)	1.09 (.381 – 1.71)	3.43 (2.89 – 5.00)	8.43 (7.34 – 13.9)	120
60 years and older	3.85 (3.20 – 4.63)	1.54 (.484 – 2.18)	4.22 (3.61 – 5.48)	7.71 (7.39 – 8.61)	186

< LOD means less than the limit of detection, which may vary for some compounds by year. See Appendix D for LOD.

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.26.a.1. Plasma nervonic acid (24:1 n-9): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size					
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th						
Total, 20 years and older	74.9	(72.4 – 77.4)	45.6	(42.9 – 47.8)	49.8	(45.9 – 52.0)	75.0	(72.0 – 77.7)	116	(112 – 121)	126	(122 – 134)	1,696
Age group													
20–39 years	72.2	(68.7 – 75.8)	44.5	(40.1 – 45.9)	47.8	(44.5 – 51.6)	72.1	(67.8 – 77.2)	109	(103 – 115)	118	(112 – 126)	573
40–59 years	74.3	(71.5 – 77.1)	46.4	(34.9 – 50.4)	51.2	(46.2 – 53.2)	74.1	(71.4 – 77.6)	109	(105 – 121)	123	(113 – 140)	492
60 years and older	81.0	(77.7 – 84.6)	44.1	(41.8 – 49.9)	50.7	(44.6 – 53.2)	79.9	(77.2 – 84.8)	128	(121 – 138)	137	(129 – 161)	631
Gender													
Males	72.0	(69.5 – 74.5)	44.3	(40.3 – 45.9)	47.0	(44.5 – 50.9)	71.9	(69.8 – 74.4)	109	(105 – 114)	118	(113 – 127)	816
Females	77.7	(74.8 – 80.7)	47.9	(44.6 – 50.0)	51.6	(47.0 – 55.3)	77.6	(74.3 – 80.0)	121	(116 – 126)	131	(124 – 141)	880
Race/ethnicity													
Mexican Americans	74.4	(71.0 – 78.0)	46.4†	(32.6 – 52.8)	51.4	(43.8 – 54.3)	76.0	(71.1 – 77.9)	108	(101 – 121)	115†	(108 – 157)	373
Non-Hispanic Blacks	77.3	(72.1 – 82.8)	44.4†	(23.7 – 49.2)	49.3	(38.9 – 53.8)	77.5	(72.6 – 81.8)	123	(115 – 131)	129†	(124 – 161)	288
Non-Hispanic Whites	74.1	(71.3 – 77.0)	45.0	(42.5 – 46.4)	49.2	(45.4 – 51.8)	74.0	(71.0 – 77.4)	117	(111 – 122)	127	(122 – 135)	914

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.26.a. Plasma nervonic acid (24:1n-9): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

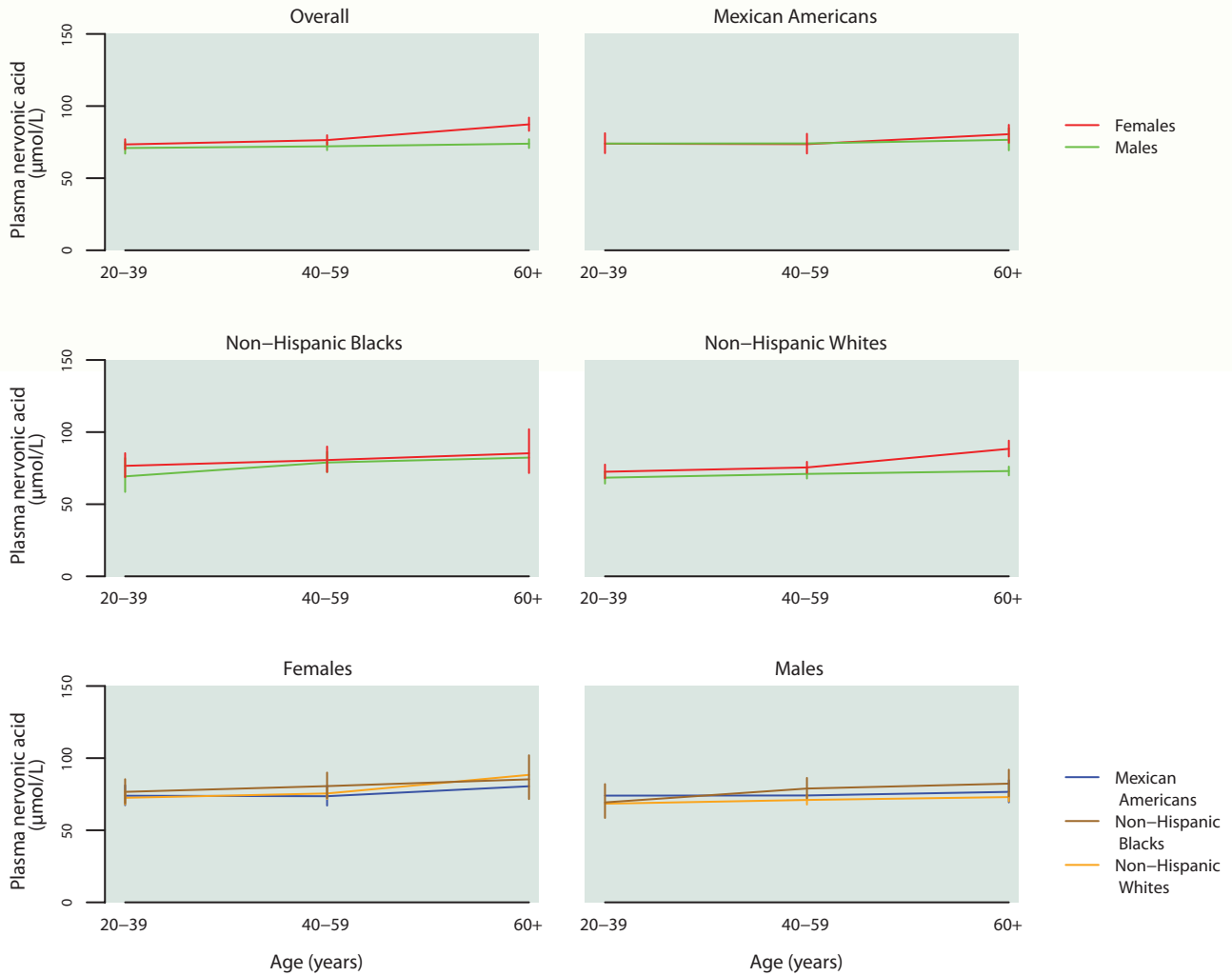


Table 2.26.a.2. Plasma nervonic acid (24:1n-9): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	74.9 (72.4 – 77.4)	54.4 (51.9 – 56.6)	75.0 (72.0 – 77.7)	103 (99.6 – 108)	1,696
20–39 years	72.2 (68.7 – 75.8)	53.0 (48.3 – 56.2)	72.1 (67.8 – 77.2)	97.3 (94.2 – 103)	573
40–59 years	74.3 (71.5 – 77.1)	55.0 (52.8 – 57.6)	74.1 (71.4 – 77.6)	98.7 (94.9 – 105)	492
60 years and older	81.0 (77.7 – 84.6)	55.9 (51.8 – 60.0)	79.9 (77.2 – 84.8)	118 (110 – 124)	631
Males					
Total, 20 years and older	72.0 (69.5 – 74.5)	52.8 (49.8 – 54.8)	71.9 (69.8 – 74.4)	98.6 (95.6 – 102)	816
20–39 years	70.9 (67.0 – 75.0)	52.5 (46.1 – 55.4)	69.2 (64.8 – 76.3)	99.1 (94.0 – 106)	267
40–59 years	72.1 (69.4 – 74.9)	53.1 (47.3 – 57.2)	72.6 (71.1 – 74.6)	96.2 (88.9 – 104)	240
60 years and older	73.9 (70.9 – 77.0)	51.4 (46.3 – 55.2)	74.2 (71.1 – 78.3)	103 (98.0 – 112)	309
Females					
Total, 20 years and older	77.7 (74.8 – 80.7)	56.9 (52.7 – 59.5)	77.6 (74.3 – 80.0)	107 (101 – 115)	880
20–39 years	73.4 (70.0 – 77.0)	53.9 (48.4 – 58.2)	74.9 (71.5 – 77.6)	96.9 (92.9 – 104)	306
40–59 years	76.4 (73.2 – 79.8)	57.4 (51.9 – 59.8)	76.8 (70.4 – 81.2)	101 (97.7 – 109)	252
60 years and older	87.3 (82.8 – 92.0)	62.0 (55.7 – 65.4)	86.3 (80.7 – 92.6)	123 (119 – 135)	322

Table 2.26.a.3. Plasma nervonic acid (24:1n-9): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	74.4 (71.0 – 78.0)	55.3 (50.7 – 58.6)	76.0 (71.1 – 77.9)	99.1 (93.7 – 107)	373
20–39 years	73.9 (69.6 – 78.6)	55.3 (43.9 – 58.9)	75.8 (70.4 – 77.8)	96.1 (93.3 – 108)	129
40–59 years	73.9 (69.3 – 78.6)	54.3† (46.6 – 58.8)	74.0 (69.0 – 81.3)	96.6† (89.4 – 122)	93
60 years and older	78.6 (74.8 – 82.7)	58.7 (50.2 – 62.1)	80.2 (76.6 – 82.5)	105 (98.7 – 115)	151
Males					
Total, 20 years and older	74.2 (71.0 – 77.6)	55.5 (52.7 – 57.7)	73.5 (70.5 – 77.7)	99.6 (93.4 – 107)	187
20–39 years	74.0 (70.5 – 77.6)	54.5† (46.3 – 58.7)	72.2 (69.5 – 78.7)	94.9† (91.2 – 107)	65
40–59 years	74.1 (68.4 – 80.2)	55.7† (46.0 – 59.9)	70.1 (66.9 – 80.6)	102† (89.0 – 127)	48
60 years and older	76.6 (69.3 – 84.7)	53.2† (39.5 – 63.4)	78.0 (66.3 – 88.3)	104† (97.5 – 157)	74
Females					
Total, 20 years and older	74.6 (69.7 – 79.9)	55.2 (45.9 – 59.3)	77.2 (67.2 – 82.0)	96.6 (90.8 – 116)	186
20–39 years	73.9 (67.3 – 81.2)	55.3† (43.1 – 59.1)	77.1 (63.6 – 79.7)	98.6† (89.2 – 129)	64
40–59 years	73.6 (67.1 – 80.8)	50.9† (44.5 – 59.4)	78.4 (63.4 – 85.5)	92.1† (86.2 – 121)	45
60 years and older	80.5 (74.5 – 87.0)	60.5† (32.6 – 67.0)	80.6 (73.5 – 88.3)	104† (92.5 – 159)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.26.a.4. Plasma nervonic acid (24:1n-9): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	77.3 (72.1 – 82.8)	54.4 (49.3 – 57.4)	77.5 (72.6 – 81.8)	110 (102 – 121)	288
20–39 years	73.1 (67.2 – 79.6)	50.9 (44.3 – 55.8)	74.1 (67.5 – 79.8)	101 (93.6 – 128)	116
40–59 years	79.9 (74.1 – 86.2)	56.3† (50.0 – 61.9)	78.7 (72.8 – 81.6)	112† (99.6 – 137)	93
60 years and older	84.1 (74.8 – 94.6)	55.3† (43.3 – 59.2)	87.7 (77.2 – 94.2)	122† (114 – 131)	79
Males					
Total, 20 years and older	74.4 (67.7 – 81.8)	53.3 (45.2 – 55.5)	74.4 (67.4 – 81.1)	111 (97.0 – 128)	133
20–39 years	69.3 (58.5 – 82.0)	45.2† (23.7 – 53.9)	67.4 (60.3 – 80.6)	104† (81.7 – 129)	54
40–59 years	78.9 (72.2 – 86.3)	56.7† (53.9 – 66.2)	76.6 (68.8 – 81.4)	109† (94.2 – 133)	40
60 years and older	82.3 (73.6 – 92.0)	54.7† (49.6 – 62.2)	84.5 (59.7 – 104)	117† (104 – 129)	39
Females					
Total, 20 years and older	79.6 (73.4 – 86.4)	55.7 (50.1 – 60.1)	79.3 (73.1 – 88.6)	109 (101 – 123)	155
20–39 years	76.6 (68.7 – 85.4)	55.6† (48.6 – 61.3)	75.4 (70.3 – 86.2)	98.9† (92.0 – 123)	62
40–59 years	80.6 (72.3 – 90.0)	55.5† (43.4 – 62.9)	79.2 (71.0 – 89.5)	112† (101 – 160)	53
60 years and older	85.3 (71.6 – 102)	51.8† (39.7 – 62.8)	89.2 (75.8 – 95.2)	123† (101 – 167)	40

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.26.a.5. Plasma nervonic acid (24:1n-9): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	74.1 (71.3 – 77.0)	53.5 (51.3 – 56.2)	74.0 (71.0 – 77.4)	102 (98.6 – 109)	914
20–39 years	70.5 (66.5 – 74.8)	51.9 (45.2 – 56.2)	70.7 (64.8 – 76.2)	94.0 (88.1 – 109)	281
40–59 years	73.2 (70.1 – 76.5)	53.9 (51.0 – 57.6)	73.6 (69.8 – 77.6)	97.6 (91.9 – 108)	265
60 years and older	81.0 (77.1 – 85.1)	55.4 (51.8 – 58.7)	79.9 (75.7 – 85.4)	118 (109 – 132)	368
Males					
Total, 20 years and older	70.6 (68.1 – 73.1)	52.1 (48.1 – 54.1)	71.0 (68.4 – 73.4)	97.2 (90.7 – 101)	437
20–39 years	68.4 (64.3 – 72.7)	52.0 (43.7 – 55.7)	66.3 (61.7 – 73.0)	92.2 (84.4 – 109)	120
40–59 years	71.0 (67.8 – 74.5)	52.8 (46.3 – 54.4)	72.3 (70.9 – 74.2)	93.2 (86.4 – 107)	135
60 years and older	73.0 (70.0 – 76.1)	50.9 (43.5 – 54.8)	73.7 (68.5 – 78.8)	102 (93.9 – 113)	182
Females					
Total, 20 years and older	77.5 (73.8 – 81.3)	56.2 (51.9 – 59.2)	77.4 (72.4 – 81.0)	108 (101 – 119)	477
20–39 years	72.5 (67.9 – 77.5)	51.9 (45.2 – 57.6)	74.1 (68.9 – 78.3)	96.1 (90.0 – 115)	161
40–59 years	75.5 (71.7 – 79.4)	57.2 (51.9 – 59.3)	74.7 (68.4 – 80.7)	100 (94.7 – 109)	130
60 years and older	88.4 (83.1 – 94.1)	61.8 (53.5 – 68.4)	88.3 (79.8 – 96.5)	126 (119 – 137)	186

Table 2.27.a.1. Plasma linoleic acid (18:2n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)						Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th		
Total, 20 years and older	3,450 (3,390 – 3,510)		2,210 (2,070 – 2,300)	2,370 (2,310 – 2,450)	3,430 (3,370 – 3,520)	4,980 (4,810 – 5,190)	5,410 (5,140 – 5,840)	1,806	
Age group									
20–39 years	3,340 (3,260 – 3,410)		2,150 (1,830 – 2,290)	2,340 (2,200 – 2,460)	3,310 (3,240 – 3,370)	4,810 (4,630 – 5,230)	5,250 (4,910 – 6,260)	610	
40–59 years	3,520 (3,440 – 3,600)		2,230 (1,740 – 2,360)	2,420 (2,250 – 2,570)	3,500 (3,410 – 3,620)	5,060 (4,830 – 5,610)	5,550 (5,110 – 5,880)	515	
60 years and older	3,520 (3,430 – 3,600)		2,250 (1,960 – 2,320)	2,360 (2,280 – 2,490)	3,570 (3,480 – 3,640)	5,090 (4,870 – 5,220)	5,440 (5,160 – 5,890)	681	
Gender									
Males	3,380 (3,300 – 3,470)		2,240 (2,120 – 2,310)	2,340 (2,310 – 2,410)	3,360 (3,240 – 3,450)	4,900 (4,640 – 5,360)	5,240 (5,090 – 5,810)	863	
Females	3,500 (3,430 – 3,580)		2,170 (1,910 – 2,340)	2,420 (2,300 – 2,540)	3,530 (3,450 – 3,600)	5,040 (4,880 – 5,280)	5,500 (5,100 – 5,900)	943	
Race/ethnicity									
Mexican Americans	3,730 (3,570 – 3,900)		2,320† (1,840 – 2,480)	2,490 (2,330 – 2,610)	3,660 (3,510 – 3,900)	5,800 (5,270 – 6,570)	6,320† (5,810 – 7,000)	375	
Non-Hispanic Blacks	3,210 (3,090 – 3,340)		2,140† (1,850 – 2,200)	2,250 (2,110 – 2,360)	3,130 (3,030 – 3,230)	4,610 (4,460 – 4,810)	4,960† (4,640 – 8,680)	310	
Non-Hispanic Whites	3,440 (3,370 – 3,510)		2,210 (2,020 – 2,300)	2,360 (2,270 – 2,500)	3,440 (3,360 – 3,540)	4,950 (4,800 – 5,080)	5,190 (5,050 – 5,780)	991	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.27.a. Plasma linoleic acid (18:2n-6): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

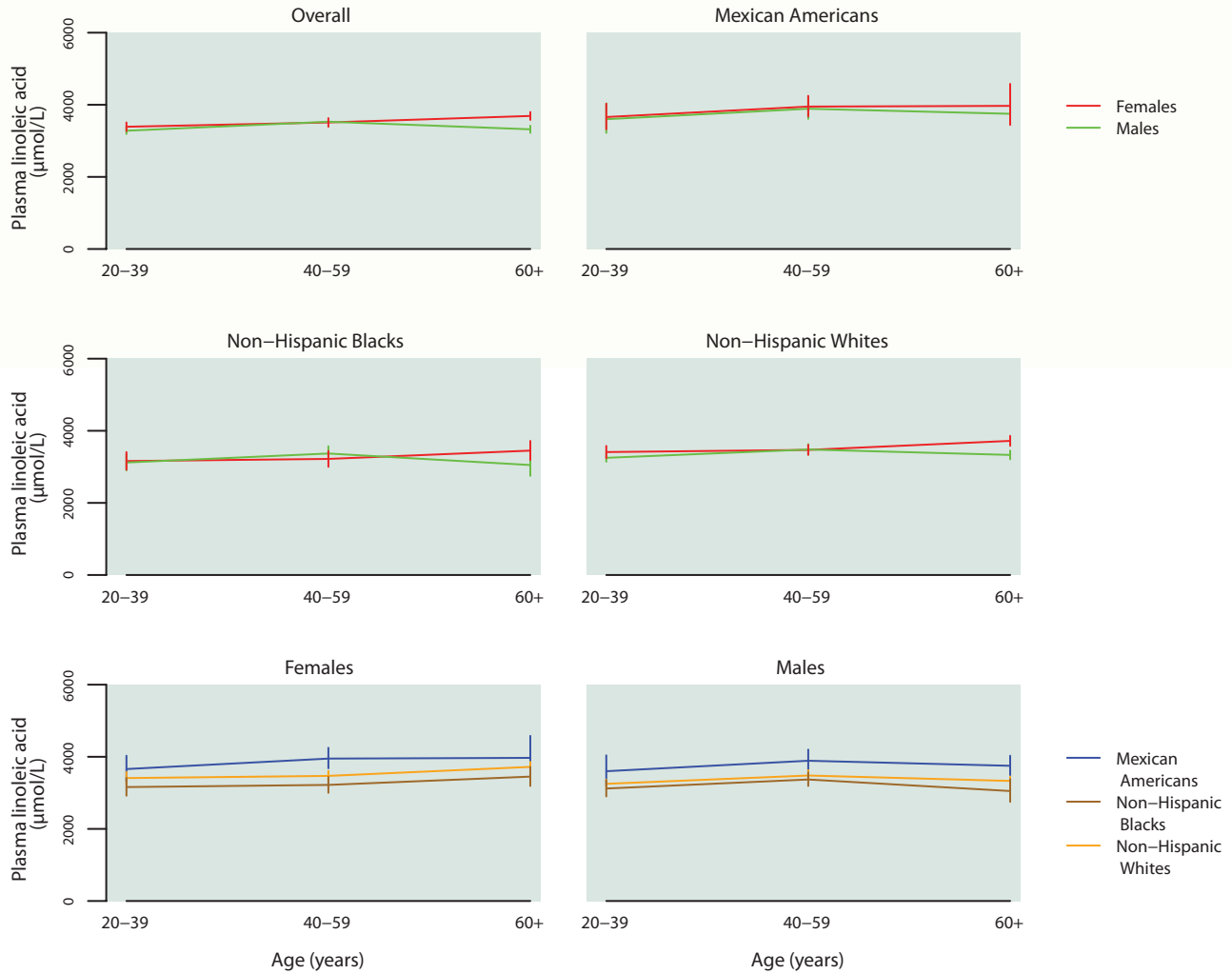


Table 2.27.a.2. Plasma linoleic acid (18:2n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3,450 (3,390 – 3,510)	2,610 (2,550 – 2,700)	3,430 (3,370 – 3,520)	4,570 (4,410 – 4,730)	1,806
20–39 years	3,340 (3,260 – 3,410)	2,570 (2,470 – 2,610)	3,310 (3,240 – 3,370)	4,410 (4,280 – 4,670)	610
40–59 years	3,520 (3,440 – 3,600)	2,700 (2,520 – 2,780)	3,500 (3,410 – 3,620)	4,700 (4,510 – 4,830)	515
60 years and older	3,520 (3,430 – 3,600)	2,690 (2,480 – 2,790)	3,570 (3,480 – 3,640)	4,580 (4,410 – 4,870)	681
Males					
Total, 20 years and older	3,380 (3,300 – 3,470)	2,590 (2,480 – 2,680)	3,360 (3,240 – 3,450)	4,510 (4,240 – 4,720)	863
20–39 years	3,280 (3,190 – 3,380)	2,510 (2,420 – 2,600)	3,210 (3,150 – 3,320)	4,380 (4,030 – 4,910)	282
40–59 years	3,530 (3,430 – 3,620)	2,710 (2,600 – 2,790)	3,490 (3,350 – 3,640)	4,610 (4,350 – 4,860)	248
60 years and older	3,320 (3,220 – 3,420)	2,420 (2,320 – 2,570)	3,370 (3,180 – 3,510)	4,310 (4,160 – 4,680)	333
Females					
Total, 20 years and older	3,500 (3,430 – 3,580)	2,640 (2,580 – 2,740)	3,530 (3,450 – 3,600)	4,660 (4,490 – 4,820)	943
20–39 years	3,390 (3,270 – 3,510)	2,590 (2,530 – 2,630)	3,390 (3,280 – 3,520)	4,420 (4,270 – 4,860)	328
40–59 years	3,510 (3,390 – 3,630)	2,630 (2,350 – 2,860)	3,530 (3,420 – 3,620)	4,790 (4,380 – 5,030)	267
60 years and older	3,690 (3,580 – 3,800)	2,870 (2,770 – 2,940)	3,700 (3,600 – 3,790)	4,820 (4,540 – 5,080)	348

Table 2.27.a.3. Plasma linoleic acid (18:2n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3,730 (3,570 – 3,900)	2,700 (2,500 – 2,900)	3,660 (3,510 – 3,900)	5,170 (4,740 – 5,900)	375
20–39 years	3,630 (3,350 – 3,920)	2,620 (2,350 – 2,730)	3,530 (3,280 – 3,960)	5,120 (4,570 – 6,320)	132
40–59 years	3,920 (3,720 – 4,130)	2,900† (2,410 – 3,150)	3,810 (3,690 – 4,100)	5,370† (4,730 – 7,050)	93
60 years and older	3,860 (3,540 – 4,210)	2,910 (2,120 – 3,360)	3,840 (3,530 – 4,250)	5,050 (4,590 – 6,170)	150
Males					
Total, 20 years and older	3,700 (3,460 – 3,950)	2,630 (2,330 – 2,910)	3,640 (3,280 – 4,140)	5,100 (4,650 – 6,350)	188
20–39 years	3,600 (3,220 – 4,040)	2,490† (2,310 – 2,860)	3,500 (3,030 – 4,300)	5,020† (4,440 – 6,640)	67
40–59 years	3,890 (3,610 – 4,200)	3,010† (2,020 – 3,250)	3,860 (3,600 – 4,150)	5,050† (4,530 – 7,450)	48
60 years and older	3,750 (3,490 – 4,030)	2,750† (2,170 – 3,290)	3,760 (3,580 – 3,990)	4,960† (4,330 – 5,580)	73
Females					
Total, 20 years and older	3,780 (3,610 – 3,960)	2,710 (2,260 – 3,040)	3,680 (3,530 – 3,920)	5,260 (4,810 – 5,960)	187
20–39 years	3,660 (3,320 – 4,030)	2,710† (1,840 – 3,050)	3,550 (3,470 – 3,910)	5,130† (4,350 – 6,500)	65
40–59 years	3,950 (3,680 – 4,250)	2,720† (2,350 – 3,130)	3,780 (3,580 – 4,330)	5,440† (4,800 – 6,970)	45
60 years and older	3,970 (3,440 – 4,580)	2,920† (2,120 – 3,520)	3,930 (3,450 – 4,570)	5,080† (4,570 – 6,220)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.27.a.4. Plasma linoleic acid (18:2n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3,210 (3,090 – 3,340)	2,430 (2,350 – 2,490)	3,130 (3,030 – 3,230)	4,250 (4,120 – 4,540)	310
20–39 years	3,140 (2,940 – 3,340)	2,360 (2,150 – 2,460)	3,050 (2,860 – 3,230)	4,200 (4,030 – 4,570)	126
40–59 years	3,280 (3,110 – 3,470)	2,540† (2,240 – 2,690)	3,160 (3,040 – 3,260)	4,330† (4,100 – 5,000)	98
60 years and older	3,290 (3,080 – 3,510)	2,470† (1,190 – 2,710)	3,410 (3,090 – 3,550)	4,210† (3,930 – 5,080)	86
Males					
Total, 20 years and older	3,190 (3,070 – 3,320)	2,350 (2,180 – 2,480)	3,070 (2,980 – 3,190)	4,380 (3,940 – 4,840)	143
20–39 years	3,120 (2,900 – 3,350)	2,320† (1,800 – 2,450)	3,030 (2,790 – 3,290)	4,110† (3,750 – 7,040)	58
40–59 years	3,370 (3,190 – 3,570)	2,610† (2,200 – 2,750)	3,160 (2,990 – 3,280)	4,570† (4,110 – 8,980)	42
60 years and older	3,050 (2,750 – 3,380)	2,300† (1,190 – 2,500)	3,070 (2,730 – 3,650)	4,010† (3,800 – 4,250)	43
Females					
Total, 20 years and older	3,230 (3,050 – 3,410)	2,460 (2,390 – 2,560)	3,180 (2,970 – 3,380)	4,210 (4,040 – 5,050)	167
20–39 years	3,160 (2,920 – 3,410)	2,410† (2,220 – 2,470)	3,100 (2,820 – 3,340)	4,230† (3,900 – 5,030)	68
40–59 years	3,220 (3,000 – 3,440)	2,490† (2,160 – 2,630)	3,100 (2,910 – 3,410)	4,120† (3,720 – 7,490)	56
60 years and older	3,450 (3,190 – 3,720)	2,640† (2,420 – 2,910)	3,430 (3,050 – 3,750)	4,350† (4,100 – 5,080)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.27.a.5. Plasma linoleic acid (18:2n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	3,440 (3,370 – 3,510)	2,620 (2,530 – 2,710)	3,440 (3,360 – 3,540)	4,520 (4,340 – 4,720)	991
20–39 years	3,330 (3,250 – 3,420)	2,580 (2,520 – 2,620)	3,310 (3,250 – 3,380)	4,360 (4,130 – 4,730)	300
40–59 years	3,470 (3,370 – 3,580)	2,690 (2,360 – 2,830)	3,480 (3,340 – 3,620)	4,560 (4,300 – 4,820)	280
60 years and older	3,530 (3,430 – 3,630)	2,680 (2,420 – 2,800)	3,590 (3,490 – 3,690)	4,600 (4,440 – 4,930)	411
Males					
Total, 20 years and older	3,360 (3,260 – 3,470)	2,580 (2,440 – 2,690)	3,370 (3,210 – 3,500)	4,330 (4,130 – 4,740)	471
20–39 years	3,250 (3,140 – 3,370)	2,530 (2,420 – 2,600)	3,210 (3,130 – 3,330)	4,150 (3,860 – 5,070)	128
40–59 years	3,480 (3,340 – 3,630)	2,710 (2,430 – 2,830)	3,480 (3,290 – 3,650)	4,430 (4,200 – 4,930)	140
60 years and older	3,330 (3,210 – 3,450)	2,420 (2,300 – 2,580)	3,370 (3,090 – 3,600)	4,320 (4,110 – 4,780)	203
Females					
Total, 20 years and older	3,510 (3,430 – 3,590)	2,660 (2,570 – 2,770)	3,530 (3,420 – 3,610)	4,660 (4,480 – 4,820)	520
20–39 years	3,410 (3,240 – 3,580)	2,610 (2,430 – 2,740)	3,390 (3,250 – 3,580)	4,390 (4,180 – 4,970)	172
40–59 years	3,470 (3,330 – 3,610)	2,570 (2,220 – 2,870)	3,480 (3,340 – 3,610)	4,720 (4,290 – 4,940)	140
60 years and older	3,720 (3,580 – 3,860)	2,900 (2,810 – 2,970)	3,760 (3,640 – 3,840)	4,860 (4,530 – 5,140)	208

Table 2.28.a.1. Plasma alpha-linolenic acid (18:3n-3): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	63.1 (60.5 – 65.8)	30.0 (26.0 – 33.1)	61.4 (58.9 – 63.7)	137 (128 – 151)	165 (153 – 192)	1,801		
Age group								
20–39 years	58.1 (55.8 – 60.6)	24.9 (19.9 – 26.6)	27.3 (25.2 – 30.3)	127 (117 – 150)	159 (137 – 221)	610		
40–59 years	65.0 (60.7 – 69.6)	25.1 (14.3 – 30.3)	30.8 (22.7 – 35.6)	134 (127 – 162)	174 (157 – 203)	513		
60 years and older	69.0 (65.2 – 73.0)	29.3 (20.8 – 33.2)	33.5 (28.4 – 36.4)	143 (138 – 154)	159 (147 – 234)	678		
Gender								
Males	62.1 (58.8 – 65.5)	23.0 (17.0 – 26.2)	27.6 (22.4 – 31.7)	142 (128 – 172)	173 (155 – 210)	859		
Females	64.1 (61.1 – 67.2)	27.2 (23.6 – 30.6)	32.8 (27.5 – 34.7)	131 (123 – 150)	158 (146 – 184)	942		
Race/ethnicity								
Mexican Americans	69.0 (63.8 – 74.5)	23.9† (20.1 – 30.7)	31.8 (24.3 – 36.1)	160 (135 – 246)	199† (159 – 421)	375		
Non-Hispanic Blacks	53.8 (50.4 – 57.4)	24.5† (13.3 – 28.8)	28.8 (23.7 – 30.8)	115 (107 – 147)	149† (121 – 362)	310		
Non-Hispanic Whites	63.3 (59.9 – 66.8)	25.2 (20.0 – 27.5)	29.5 (25.8 – 33.0)	133 (124 – 153)	157 (143 – 193)	986		

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.28.a. Plasma alpha–linolenic acid (18:3n–3): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

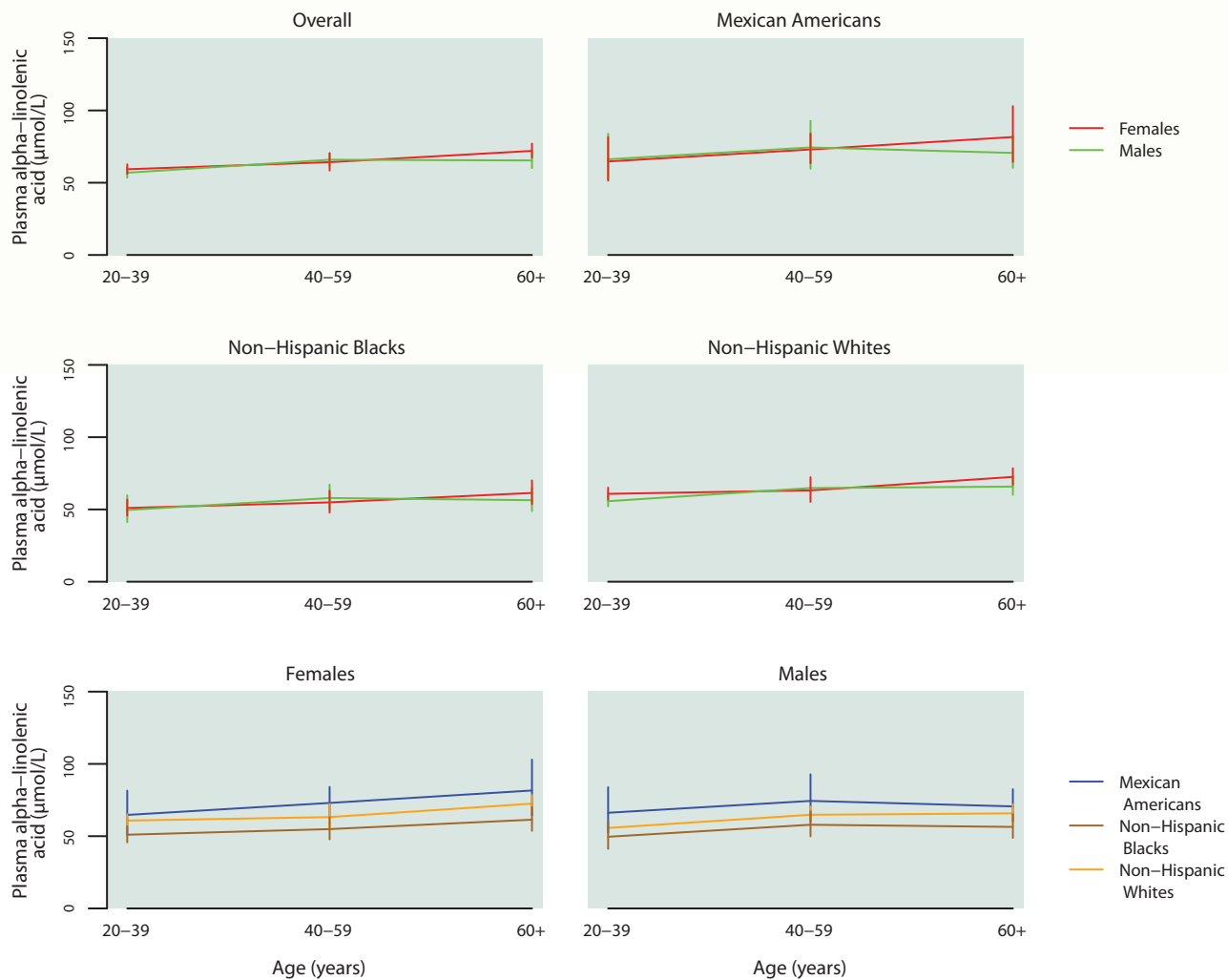


Table 2.28.a.2. Plasma alpha-linolenic acid (18:3n-3): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	63.1 (60.5 – 65.8)	35.3 (33.1 – 38.0)	61.4 (58.9 – 63.7)	114 (110 – 121)	1,801
20–39 years	58.1 (55.8 – 60.6)	32.9 (30.8 – 34.2)	57.5 (55.2 – 59.9)	107 (98.2 – 116)	610
40–59 years	65.0 (60.7 – 69.6)	37.6 (31.3 – 40.5)	61.2 (58.2 – 66.9)	117 (110 – 128)	513
60 years and older	69.0 (65.2 – 73.0)	39.3 (34.8 – 43.2)	68.3 (64.9 – 72.3)	123 (112 – 137)	678
Males					
Total, 20 years and older	62.1 (58.8 – 65.5)	33.6 (28.6 – 37.0)	59.9 (57.3 – 64.2)	116 (110 – 127)	859
20–39 years	56.9 (53.5 – 60.6)	31.6 (27.5 – 34.3)	55.7 (51.2 – 59.6)	107 (98.1 – 121)	282
40–59 years	65.9 (61.5 – 70.6)	34.5 (23.9 – 43.7)	63.6 (58.1 – 72.9)	125 (112 – 132)	246
60 years and older	65.4 (60.1 – 71.2)	35.3 (31.7 – 39.8)	63.8 (57.2 – 73.8)	120 (107 – 147)	331
Females					
Total, 20 years and older	64.1 (61.1 – 67.2)	38.1 (35.1 – 39.7)	62.4 (59.9 – 65.5)	113 (106 – 122)	942
20–39 years	59.3 (56.1 – 62.7)	34.0 (30.7 – 36.2)	59.1 (56.0 – 62.6)	105 (93.4 – 125)	328
40–59 years	64.2 (58.4 – 70.4)	38.5 (34.1 – 40.6)	58.8 (55.3 – 65.7)	112 (103 – 125)	267
60 years and older	72.0 (67.3 – 77.1)	42.9 (36.5 – 47.5)	71.1 (66.9 – 76.6)	123 (109 – 141)	347

Table 2.28.a.3. Plasma alpha-linolenic acid (18:3n-3): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	69.0 (63.8 – 74.5)	39.4 (30.2 – 43.0)	66.2 (59.6 – 73.9)	133 (117 – 159)	375
20–39 years	65.6 (56.2 – 76.6)	36.8 (25.2 – 41.3)	61.4 (54.6 – 73.8)	125 (111 – 215)	132
40–59 years	73.8 (65.4 – 83.2)	43.8† (30.1 – 47.8)	70.5 (59.0 – 88.4)	133† (115 – 146)	93
60 years and older	76.1 (65.5 – 88.5)	43.6 (34.4 – 47.4)	75.9 (67.6 – 82.9)	136 (108 – 292)	150
Males					
Total, 20 years and older	68.9 (61.1 – 77.7)	40.5 (25.8 – 43.5)	65.9 (54.6 – 80.2)	134 (113 – 201)	188
20–39 years	66.2 (52.3 – 83.9)	39.3† (22.8 – 42.6)	58.5 (44.6 – 86.5)	130† (91.9 – 222)	67
40–59 years	74.4 (59.7 – 92.8)	43.7† (22.7 – 50.8)	70.4 (55.6 – 95.9)	133† (105 – 421)	48
60 years and older	70.6 (60.3 – 82.5)	39.6† (31.8 – 47.0)	69.6 (55.1 – 79.4)	125† (94.7 – 292)	73
Females					
Total, 20 years and older	69.1 (62.1 – 76.8)	37.5 (23.1 – 44.8)	66.2 (60.2 – 73.2)	131 (118 – 147)	187
20–39 years	64.7 (51.4 – 81.5)	32.7† (20.1 – 43.7)	63.6 (55.0 – 73.4)	125† (102 – 278)	65
40–59 years	73.0 (63.4 – 84.1)	41.4† (23.1 – 52.1)	69.0 (54.1 – 87.9)	132† (110 – 194)	45
60 years and older	81.6 (64.4 – 103)	45.2† (32.3 – 58.1)	82.0 (64.8 – 94.8)	144† (111 – 197)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.28.a.4. Plasma alpha-linolenic acid (18:3n-3): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	53.8 (50.4 – 57.4)	31.8 (29.4 – 34.0)	50.5 (48.2 – 53.1)	91.7 (81.0 – 112)	310
20–39 years	50.4 (44.6 – 56.8)	30.7 (26.4 – 33.1)	48.1 (43.0 – 53.0)	76.8 (69.0 – 142)	126
40–59 years	56.2 (52.0 – 60.6)	32.8† (23.4 – 36.2)	51.5 (47.1 – 55.1)	99.0† (81.8 – 315)	98
60 years and older	59.4 (53.3 – 66.2)	35.9† (29.4 – 40.4)	60.0 (53.5 – 63.0)	92.9† (81.4 – 142)	86
Males					
Total, 20 years and older	53.4 (48.6 – 58.7)	29.4 (24.1 – 32.4)	51.7 (44.9 – 55.3)	93.3 (78.9 – 149)	143
20–39 years	49.6 (41.2 – 59.8)	28.8† (13.3 – 33.5)	45.5 (42.4 – 57.9)	75.7† (65.3 – 523)	58
40–59 years	57.9 (49.9 – 67.2)	29.7† (18.1 – 35.2)	51.6 (40.9 – 63.7)	124† (97.4 – 284)	42
60 years and older	56.4 (48.8 – 65.1)	30.6† (25.3 – 39.9)	59.8 (46.2 – 72.5)	90.7† (79.0 – 105)	43
Females					
Total, 20 years and older	54.1 (50.0 – 58.5)	34.4 (32.1 – 37.0)	50.3 (47.5 – 54.6)	88.9 (77.4 – 120)	167
20–39 years	51.0 (45.7 – 56.9)	32.7† (28.1 – 35.9)	48.2 (41.2 – 57.7)	80.1† (67.0 – 134)	68
40–59 years	54.9 (47.8 – 62.9)	35.2† (23.1 – 39.9)	51.2 (44.3 – 57.6)	84.7† (75.8 – 332)	56
60 years and older	61.4 (53.7 – 70.1)	38.8† (32.9 – 43.2)	59.2 (52.0 – 64.8)	101† (81.5 – 142)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.28.a.5. Plasma alpha-linolenic acid (18:3n-3): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	63.3 (59.9 – 66.8)	34.9 (32.3 – 38.0)	62.3 (58.9 – 65.7)	113 (109 – 120)	986
20–39 years	58.3 (55.5 – 61.3)	32.4 (30.2 – 34.1)	58.4 (56.4 – 61.9)	103 (93.8 – 116)	300
40–59 years	64.0 (57.9 – 70.7)	37.5 (28.1 – 40.8)	60.5 (57.3 – 68.0)	114 (108 – 123)	278
60 years and older	69.4 (65.1 – 74.0)	39.4 (34.3 – 44.1)	69.0 (65.1 – 72.7)	125 (111 – 140)	408
Males					
Total, 20 years and older	61.8 (58.1 – 65.7)	33.0 (27.5 – 36.6)	60.6 (57.4 – 65.4)	113 (108 – 124)	467
20–39 years	55.7 (52.2 – 59.5)	30.6 (26.4 – 33.7)	55.1 (47.7 – 60.6)	103 (95.6 – 113)	128
40–59 years	64.8 (59.6 – 70.5)	33.7 (16.1 – 45.7)	63.6 (58.1 – 70.8)	116 (108 – 132)	138
60 years and older	65.8 (60.1 – 72.1)	36.0 (29.2 – 41.6)	63.8 (57.1 – 74.4)	118 (109 – 145)	201
Females					
Total, 20 years and older	64.7 (61.0 – 68.5)	38.2 (34.6 – 40.0)	62.8 (59.8 – 67.0)	113 (106 – 121)	519
20–39 years	60.8 (56.7 – 65.1)	34.0 (30.4 – 37.3)	61.0 (56.4 – 66.1)	103 (88.8 – 128)	172
40–59 years	63.2 (55.2 – 72.3)	38.4 (33.6 – 40.7)	58.4 (52.1 – 68.1)	111 (102 – 120)	140
60 years and older	72.5 (67.0 – 78.5)	41.9 (34.7 – 48.1)	71.2 (67.3 – 76.6)	127 (108 – 154)	207

Table 2.29.a.1. Plasma gamma-linolenic acid (18:3n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	46.9 (45.0 – 49.0)	17.1 (13.7 – 19.1)	20.2 (19.0 – 22.0)	49.0 (46.4 – 51.5)	100 (94.2 – 106)	117 (107 – 127)	1,795
Age group							
20–39 years	41.7 (39.4 – 44.1)	15.0 (12.6 – 17.7)	19.3 (15.1 – 21.2)	41.9 (38.7 – 46.5)	85.1 (79.1 – 105)	99.8 (86.2 – 140)	603
40–59 years	51.0 (48.4 – 53.8)	18.4 (15.0 – 19.4)	20.4 (18.3 – 24.0)	53.3 (50.1 – 56.4)	108 (96.5 – 118)	121 (113 – 129)	513
60 years and older	49.6 (45.9 – 53.6)	18.3 (14.4 – 20.3)	22.0 (20.3 – 23.6)	51.2 (46.1 – 57.0)	102 (97.4 – 119)	115 (104 – 142)	679
Gender							
Males	48.0 (45.5 – 50.6)	17.1 (13.1 – 20.3)	22.0 (18.7 – 23.5)	50.0 (48.0 – 52.4)	99.2 (90.5 – 120)	120 (105 – 129)	855
Females	46.0 (43.7 – 48.4)	16.8 (12.8 – 19.1)	19.5 (17.0 – 21.6)	47.2 (44.0 – 50.6)	100 (92.8 – 106)	110 (106 – 128)	940
Race/ethnicity							
Mexican Americans	41.8 (38.1 – 45.8)	12.6† (6.25 – 15.0)	15.1 (9.90 – 18.6)	43.1 (38.4 – 49.9)	94.0 (89.7 – 115)	116† (96.3 – 132)	375
Non-Hispanic Blacks	42.5 (40.4 – 44.7)	16.5† (14.9 – 18.3)	20.6 (15.8 – 23.1)	42.8 (40.0 – 46.4)	84.1 (76.7 – 112)	105† (86.7 – 138)	309
Non-Hispanic Whites	48.8 (46.1 – 51.6)	19.2 (13.9 – 21.3)	22.1 (19.7 – 23.8)	50.5 (47.5 – 53.2)	101 (93.4 – 108)	117 (105 – 128)	981

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.29.a. Plasma gamma-linolenic acid (18:3n-6): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

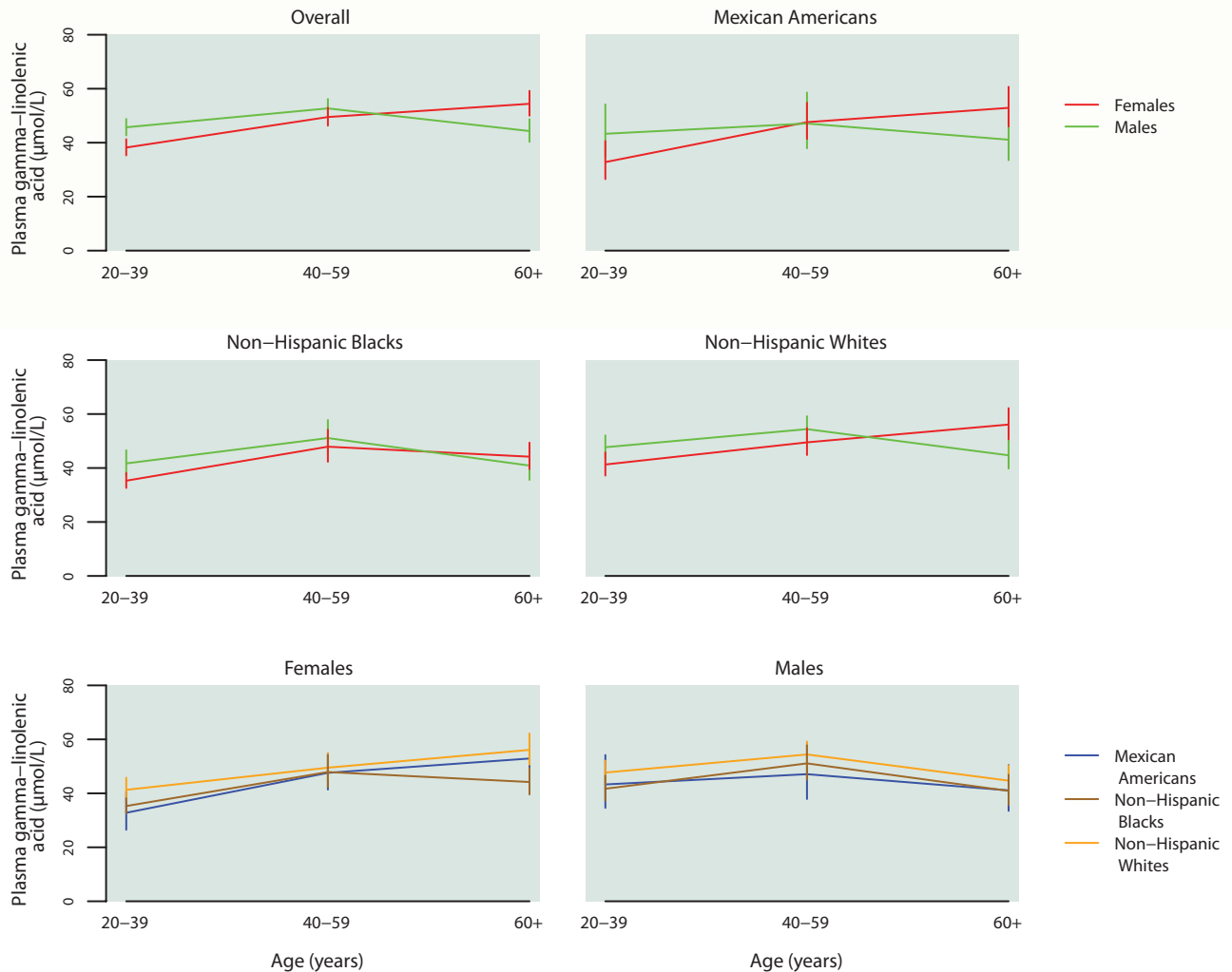


Table 2.29.a.2. Plasma gamma-linolenic acid (18:3n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	46.9 (45.0 – 49.0)	24.4 (22.9 – 25.8)	49.0 (46.4 – 51.5)	85.7 (82.1 – 90.3)	1,795
20–39 years	41.7 (39.4 – 44.1)	22.5 (20.6 – 24.1)	41.9 (38.7 – 46.5)	75.2 (69.9 – 80.9)	603
40–59 years	51.0 (48.4 – 53.8)	25.7 (23.4 – 29.5)	53.3 (50.1 – 56.4)	90.5 (87.1 – 94.7)	513
60 years and older	49.6 (45.9 – 53.6)	26.7 (23.9 – 29.1)	51.2 (46.1 – 57.0)	90.8 (82.8 – 101)	679
Males					
Total, 20 years and older	48.0 (45.5 – 50.6)	25.6 (23.8 – 27.0)	50.0 (48.0 – 52.4)	85.7 (81.2 – 94.4)	855
20–39 years	45.7 (42.7 – 48.8)	25.1 (21.7 – 26.9)	48.8 (44.3 – 52.1)	79.5 (68.4 – 90.5)	277
40–59 years	52.7 (49.5 – 56.2)	26.3 (23.9 – 30.8)	55.7 (51.5 – 59.2)	91.9 (85.6 – 110)	246
60 years and older	44.3 (40.3 – 48.7)	24.7 (19.5 – 27.7)	44.5 (42.4 – 48.4)	79.8 (70.5 – 101)	332
Females					
Total, 20 years and older	46.0 (43.7 – 48.4)	23.0 (21.5 – 24.8)	47.2 (44.0 – 50.6)	85.1 (80.4 – 89.8)	940
20–39 years	38.2 (35.3 – 41.3)	21.5 (16.6 – 23.1)	37.3 (34.7 – 41.3)	73.0 (62.6 – 79.0)	326
40–59 years	49.5 (46.3 – 53.0)	24.5 (20.1 – 27.8)	51.7 (48.2 – 55.8)	89.7 (81.9 – 101)	267
60 years and older	54.4 (50.0 – 59.2)	29.1 (26.2 – 30.6)	57.9 (50.7 – 64.5)	97.2 (88.0 – 105)	347

Table 2.29.a.3. Plasma gamma-linolenic acid (18:3n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	41.8 (38.1 – 45.8)	19.5 (15.2 – 22.8)	43.1 (38.4 – 49.9)	83.5 (77.3 – 89.8)	375
20–39 years	38.5 (33.2 – 44.5)	18.1 (13.0 – 20.2)	40.4 (32.6 – 51.1)	71.2 (67.0 – 87.0)	132
40–59 years	47.4 (42.9 – 52.3)	24.2† (17.3 – 27.6)	48.3 (39.6 – 55.1)	94.9† (81.5 – 123)	93
60 years and older	46.9 (40.9 – 53.7)	24.0 (13.3 – 29.1)	48.7 (41.9 – 61.0)	86.0 (79.1 – 89.7)	150
Males					
Total, 20 years and older	44.2 (38.1 – 51.2)	20.6 (14.5 – 26.3)	45.9 (38.4 – 54.8)	87.3 (74.0 – 91.6)	188
20–39 years	43.3 (34.6 – 54.2)	20.1† (7.22 – 25.2)	46.7 (32.8 – 60.0)	81.3† (67.1 – 107)	67
40–59 years	47.1 (37.9 – 58.6)	25.8† (9.42 – 31.7)	44.7 (38.0 – 55.2)	94.2† (70.9 – 155)	48
60 years and older	41.1 (33.5 – 50.5)	21.3† (11.1 – 25.6)	42.9 (26.9 – 60.8)	71.0† (57.5 – 131)	73
Females					
Total, 20 years and older	39.0 (34.4 – 44.1)	16.5 (10.6 – 21.9)	40.1 (33.0 – 50.6)	82.4 (72.2 – 90.6)	187
20–39 years	32.8 (26.5 – 40.6)	14.7† (6.25 – 19.3)	34.6 (29.0 – 41.4)	61.6† (50.6 – 89.6)	65
40–59 years	47.6 (41.4 – 54.8)	21.0† (15.0 – 27.4)	51.3 (35.0 – 61.6)	94.9† (81.2 – 108)	45
60 years and older	52.9 (46.0 – 60.7)	26.6† (9.56 – 39.1)	55.3 (50.3 – 62.2)	88.9† (86.4 – 98.2)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.29.a.4. Plasma gamma-linolenic acid (18:3n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	42.5 (40.4 – 44.7)	23.7 (22.0 – 25.1)	42.8 (40.0 – 46.4)	73.7 (68.3 – 80.0)	309
20–39 years	38.0 (35.1 – 41.2)	22.1 (18.2 – 24.1)	37.1 (32.7 – 41.8)	67.3 (61.8 – 76.2)	125
40–59 years	49.2 (45.5 – 53.2)	27.0† (19.9 – 33.0)	50.1 (48.6 – 53.3)	82.2† (73.0 – 111)	98
60 years and older	42.9 (40.1 – 45.9)	25.3† (11.9 – 30.0)	45.8 (39.8 – 48.6)	68.5† (66.3 – 74.0)	86
Males					
Total, 20 years and older	44.7 (41.2 – 48.4)	24.8 (22.5 – 27.5)	44.2 (38.7 – 51.2)	75.4 (72.8 – 88.6)	142
20–39 years	41.7 (37.3 – 46.6)	23.4† (14.7 – 26.3)	42.5 (32.5 – 52.0)	73.1† (60.3 – 181)	57
40–59 years	51.1 (45.1 – 57.8)	27.9† (23.2 – 34.8)	48.8 (39.2 – 58.8)	88.5† (73.1 – 121)	42
60 years and older	40.9 (35.6 – 46.9)	23.6† (20.0 – 26.3)	39.8 (33.3 – 51.3)	69.4† (57.4 – 83.1)	43
Females					
Total, 20 years and older	40.9 (38.9 – 43.0)	22.4 (18.9 – 25.2)	41.7 (37.8 – 46.2)	69.3 (65.9 – 78.6)	167
20–39 years	35.3 (32.6 – 38.2)	21.2† (15.5 – 24.3)	36.7 (29.9 – 39.1)	60.0† (50.6 – 82.2)	68
40–59 years	47.9 (42.3 – 54.2)	21.8† (17.8 – 33.3)	50.8 (46.4 – 54.0)	78.1† (68.2 – 109)	56
60 years and older	44.2 (39.6 – 49.4)	25.4† (11.9 – 31.0)	46.8 (36.5 – 54.0)	68.3† (61.7 – 78.4)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.29.a.5. Plasma gamma-linolenic acid (18:3n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	48.8 (46.1 – 51.6)	25.6 (23.9 – 27.8)	50.5 (47.5 – 53.2)	86.9 (82.2 – 93.2)	981
20–39 years	44.1 (40.9 – 47.6)	24.0 (21.8 – 26.7)	45.3 (39.0 – 50.9)	76.3 (69.5 – 84.7)	294
40–59 years	51.9 (48.1 – 56.0)	26.6 (22.8 – 32.2)	54.2 (50.0 – 58.7)	90.3 (86.4 – 94.7)	278
60 years and older	50.6 (46.1 – 55.5)	26.8 (22.8 – 29.6)	52.4 (46.2 – 58.7)	92.5 (83.2 – 104)	409
Males					
Total, 20 years and older	49.6 (46.0 – 53.4)	26.3 (23.9 – 29.6)	51.4 (49.0 – 53.5)	86.1 (79.7 – 101)	464
20–39 years	47.7 (43.6 – 52.1)	26.3 (22.5 – 29.5)	49.8 (46.8 – 52.9)	80.5 (67.7 – 115)	124
40–59 years	54.4 (50.0 – 59.2)	28.5 (24.0 – 33.3)	56.9 (51.7 – 60.7)	92.4 (85.5 – 117)	138
60 years and older	44.7 (39.8 – 50.3)	24.6 (16.3 – 28.7)	44.6 (41.8 – 49.7)	80.9 (67.4 – 119)	202
Females					
Total, 20 years and older	48.1 (45.4 – 50.9)	24.6 (22.4 – 27.7)	49.1 (45.1 – 53.5)	87.3 (82.1 – 92.2)	517
20–39 years	41.3 (37.2 – 45.8)	23.0 (20.1 – 25.2)	39.6 (35.8 – 45.4)	75.5 (64.7 – 81.7)	170
40–59 years	49.5 (44.8 – 54.8)	25.4 (19.2 – 31.5)	50.5 (46.2 – 56.1)	88.9 (77.0 – 103)	140
60 years and older	56.1 (50.6 – 62.2)	29.6 (22.8 – 33.5)	60.6 (52.8 – 66.0)	97.4 (88.3 – 107)	207

Table 2.30.a.1. Plasma eicosadienoic acid (20:2n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	21.2 (20.7 – 21.8)	11.2 (10.5 – 11.6)	12.4 (11.9 – 12.8)	20.9 (20.3 – 21.6)	36.9 (35.1 – 39.9)	42.2 (39.9 – 47.3)	1,805	
Age group								
20–39 years	20.2 (19.5 – 20.9)	10.4 (9.44 – 11.0)	11.3 (10.7 – 12.0)	19.4 (18.6 – 20.3)	38.5 (35.8 – 43.2)	43.9 (40.7 – 50.1)	607	
40–59 years	21.5 (20.6 – 22.3)	11.7 (10.3 – 12.2)	12.8 (11.8 – 13.7)	21.2 (20.3 – 22.4)	35.4 (33.9 – 40.3)	42.0 (38.1 – 47.5)	515	
60 years and older	22.8 (22.1 – 23.5)	12.9 (10.6 – 14.0)	14.3 (13.1 – 15.3)	23.1 (22.3 – 23.6)	35.4 (33.7 – 37.4)	38.6 (36.6 – 46.6)	683	
Gender								
Males	20.4 (19.7 – 21.2)	11.4 (10.6 – 11.9)	12.6 (11.8 – 13.0)	20.2 (19.3 – 21.1)	32.9 (31.3 – 37.1)	40.0 (35.1 – 44.9)	865	
Females	22.0 (21.3 – 22.7)	11.0 (10.4 – 11.4)	12.2 (11.4 – 13.0)	21.7 (21.0 – 22.3)	38.5 (36.4 – 43.8)	46.5 (40.9 – 49.6)	940	
Race/ethnicity								
Mexican Americans	25.2 (23.5 – 27.1)	11.4† (8.60 – 13.3)	13.3 (11.3 – 14.4)	24.9 (22.8 – 26.6)	49.5 (43.2 – 69.3)	55.0† (49.5 – 121)	375	
Non-Hispanic Blacks	19.2 (18.3 – 20.1)	10.8† (9.00 – 11.2)	11.4 (10.5 – 12.5)	19.0 (18.1 – 19.7)	33.5 (28.4 – 40.5)	36.3† (34.6 – 51.6)	310	
Non-Hispanic Whites	20.9 (20.3 – 21.5)	11.2 (9.83 – 11.8)	12.3 (11.7 – 12.9)	20.7 (20.1 – 21.4)	35.0 (33.5 – 38.1)	40.7 (36.9 – 46.5)	990	

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.30.a. Plasma eicosadienoic acid (20:2n-6): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

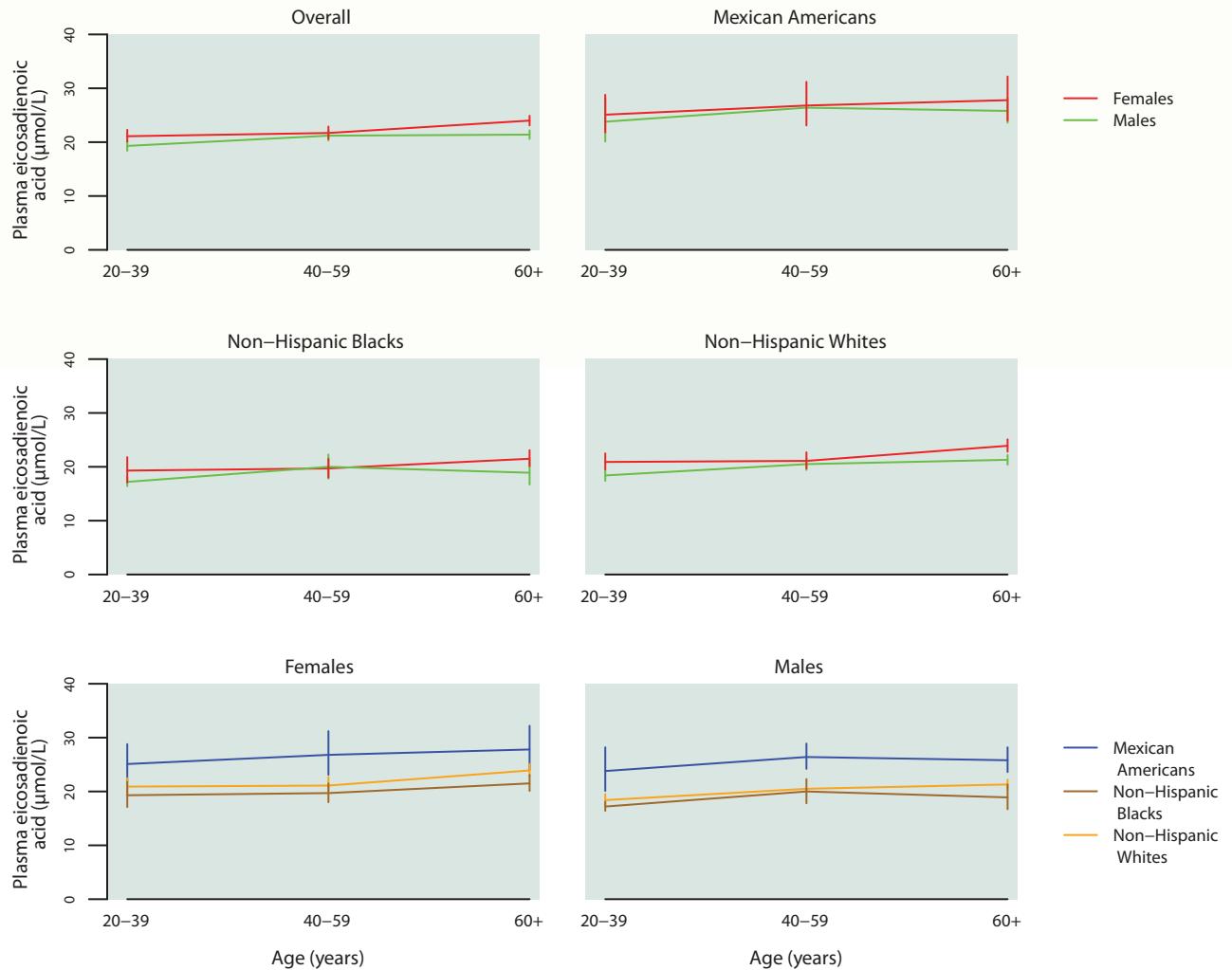


Table 2.30.a.2. Plasma eicosadienoic acid (20:2n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	21.2 (20.7 – 21.8)	14.1 (13.5 – 14.6)	20.9 (20.3 – 21.6)	32.0 (30.8 – 33.8)	1,805
20–39 years	20.2 (19.5 – 20.9)	13.0 (12.0 – 13.7)	19.4 (18.6 – 20.3)	33.1 (30.9 – 36.6)	607
40–59 years	21.5 (20.6 – 22.3)	14.5 (13.2 – 15.3)	21.2 (20.3 – 22.4)	30.8 (30.0 – 33.7)	515
60 years and older	22.8 (22.1 – 23.5)	16.2 (15.2 – 16.8)	23.1 (22.3 – 23.6)	32.2 (31.0 – 33.4)	683
Males					
Total, 20 years and older	20.4 (19.7 – 21.2)	13.9 (13.0 – 14.7)	20.2 (19.3 – 21.1)	29.6 (28.1 – 31.3)	865
20–39 years	19.3 (18.4 – 20.2)	13.1 (11.6 – 13.9)	19.2 (18.1 – 19.9)	28.3 (26.4 – 31.4)	282
40–59 years	21.2 (20.3 – 22.2)	14.5 (12.9 – 15.3)	20.9 (19.6 – 22.8)	30.3 (28.1 – 32.4)	248
60 years and older	21.4 (20.6 – 22.2)	15.3 (13.2 – 16.6)	21.0 (20.3 – 21.9)	29.5 (28.1 – 33.4)	335
Females					
Total, 20 years and older	22.0 (21.3 – 22.7)	14.4 (13.7 – 14.8)	21.7 (21.0 – 22.3)	34.2 (32.5 – 36.2)	940
20–39 years	21.1 (20.1 – 22.3)	12.9 (12.2 – 13.8)	20.0 (19.0 – 21.2)	36.3 (34.3 – 39.4)	325
40–59 years	21.7 (20.6 – 22.9)	14.6 (12.2 – 15.7)	21.4 (20.5 – 22.2)	31.5 (29.9 – 37.8)	267
60 years and older	24.0 (23.1 – 24.9)	16.7 (15.6 – 17.7)	24.0 (23.1 – 25.4)	33.5 (32.4 – 35.7)	348

Table 2.30.a.3. Plasma eicosadienoic acid (20:2n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	25.2 (23.5 – 27.1)	15.7 (13.4 – 17.2)	24.9 (22.8 – 26.6)	42.1 (35.6 – 51.2)	375
20–39 years	24.3 (21.7 – 27.3)	14.1 (12.6 – 16.7)	23.5 (20.5 – 27.8)	43.9 (33.7 – 55.6)	131
40–59 years	26.6 (24.6 – 28.8)	17.7† (12.3 – 20.2)	25.5 (24.5 – 26.5)	42.3† (35.8 – 73.3)	93
60 years and older	26.8 (25.4 – 28.3)	19.9 (18.1 – 20.4)	26.4 (24.7 – 27.6)	37.0 (35.1 – 49.3)	151
Males					
Total, 20 years and older	24.7 (22.2 – 27.5)	14.9 (13.0 – 17.2)	24.7 (22.4 – 26.6)	39.9 (31.9 – 63.7)	189
20–39 years	23.8 (20.1 – 28.2)	13.7† (12.1 – 15.9)	23.9 (19.8 – 28.8)	36.5† (28.8 – 56.4)	67
40–59 years	26.4 (24.2 – 28.9)	17.6† (12.5 – 20.6)	25.2 (23.8 – 26.9)	41.6† (34.7 – 73.3)	48
60 years and older	25.8 (23.6 – 28.2)	18.7† (10.7 – 20.5)	25.6 (22.1 – 27.9)	37.0† (31.3 – 69.2)	74
Females					
Total, 20 years and older	25.9 (24.0 – 28.0)	16.7 (11.4 – 17.4)	25.1 (22.2 – 27.7)	45.8 (37.6 – 55.9)	186
20–39 years	25.1 (21.8 – 28.8)	14.5† (10.8 – 17.2)	22.7 (20.1 – 27.0)	48.8† (37.2 – 56.6)	64
40–59 years	26.8 (23.1 – 31.2)	18.3† (8.60 – 20.6)	25.7 (23.0 – 28.3)	42.2† (32.9 – 58.3)	45
60 years and older	27.8 (24.0 – 32.2)	20.2† (17.8 – 20.8)	26.9 (22.9 – 34.5)	36.1† (34.7 – 51.5)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.30.a.4. Plasma eicosadienoic acid (20:2n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	19.2 (18.3 – 20.1)	12.8 (11.3 – 13.7)	19.0 (18.1 – 19.7)	27.8 (25.4 – 33.8)	310
20–39 years	18.3 (17.0 – 19.7)	12.2 (10.9 – 13.1)	17.9 (16.3 – 19.1)	26.4 (24.5 – 36.1)	126
40–59 years	19.8 (18.6 – 21.1)	13.3† (10.5 – 14.9)	19.2 (17.8 – 21.1)	28.1† (26.1 – 34.9)	98
60 years and older	20.5 (19.6 – 21.3)	14.2† (12.6 – 15.4)	21.1 (19.7 – 22.4)	27.5† (25.3 – 28.2)	86
Males					
Total, 20 years and older	18.4 (17.3 – 19.5)	12.3 (10.9 – 13.3)	17.9 (16.5 – 19.2)	26.4 (24.3 – 31.6)	143
20–39 years	17.2 (16.4 – 18.1)	11.3† (9.43 – 13.2)	16.4 (16.0 – 18.2)	25.1† (22.0 – 48.7)	58
40–59 years	20.0 (17.8 – 22.3)	13.8† (10.2 – 15.5)	18.2 (16.8 – 20.4)	31.9† (26.2 – 52.2)	42
60 years and older	18.9 (16.7 – 21.3)	12.4† (8.53 – 14.5)	19.6 (17.1 – 21.5)	25.6† (23.5 – 35.0)	43
Females					
Total, 20 years and older	19.8 (18.3 – 21.5)	12.9 (11.2 – 14.7)	19.4 (18.3 – 21.6)	28.2 (24.8 – 40.6)	167
20–39 years	19.3 (17.1 – 21.8)	12.5† (11.2 – 14.1)	18.5 (16.8 – 20.1)	32.1† (24.5 – 47.8)	68
40–59 years	19.7 (18.0 – 21.5)	12.9† (8.30 – 15.4)	19.3 (17.5 – 22.1)	27.0† (23.6 – 96.5)	56
60 years and older	21.5 (20.1 – 23.1)	15.9† (13.1 – 17.7)	21.9 (19.9 – 23.2)	27.7† (24.3 – 40.5)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.30.a.5. Plasma eicosadienoic acid (20:2n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	20.9 (20.3 – 21.5)	14.0 (13.1 – 14.7)	20.7 (20.1 – 21.4)	31.0 (29.8 – 33.3)	990
20–39 years	19.7 (18.9 – 20.5)	12.8 (11.7 – 13.6)	19.3 (18.1 – 20.0)	33.1 (29.5 – 37.1)	298
40–59 years	20.8 (19.7 – 21.9)	13.9 (12.7 – 15.1)	20.8 (19.8 – 21.8)	30.2 (28.0 – 32.2)	280
60 years and older	22.7 (21.9 – 23.5)	16.0 (14.5 – 16.8)	23.0 (22.0 – 23.8)	31.9 (29.9 – 33.5)	412
Males					
Total, 20 years and older	20.0 (19.3 – 20.7)	13.7 (12.8 – 14.8)	19.9 (18.9 – 20.8)	28.2 (27.1 – 30.4)	472
20–39 years	18.4 (17.4 – 19.5)	12.7 (10.9 – 13.9)	18.3 (17.3 – 19.4)	25.7 (23.3 – 29.6)	128
40–59 years	20.5 (19.4 – 21.6)	14.1 (12.8 – 15.1)	20.4 (18.7 – 22.5)	28.2 (27.3 – 30.6)	140
60 years and older	21.3 (20.4 – 22.2)	15.4 (12.9 – 16.7)	21.0 (20.1 – 22.1)	29.4 (28.0 – 33.4)	204
Females					
Total, 20 years and older	21.8 (20.9 – 22.7)	14.3 (13.2 – 14.8)	21.5 (20.9 – 22.2)	33.8 (31.8 – 36.2)	518
20–39 years	20.9 (19.5 – 22.5)	12.8 (12.0 – 13.7)	20.0 (18.5 – 21.4)	36.9 (34.1 – 40.4)	170
40–59 years	21.1 (19.7 – 22.7)	13.8 (11.8 – 15.4)	21.1 (20.2 – 22.0)	30.9 (28.2 – 36.5)	140
60 years and older	23.9 (22.8 – 25.1)	16.5 (15.0 – 18.1)	24.1 (23.0 – 25.5)	33.2 (32.2 – 35.2)	208

Table 2.31.a.1. Plasma homo-gamma-linolenic acid (20:3n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	73.2 (67.9 – 79.6)	87.5 (84.6 – 89.9)	151 (145 – 156)	262 (254 – 274)	289 (281 – 320)	1,806		
Age group								
20–39 years	71.5 (57.7 – 78.3)	84.9 (75.9 – 91.3)	139 (135 – 146)	251 (239 – 276)	281 (262 – 317)	609		
40–59 years	72.0 (67.7 – 86.3)	88.3 (83.1 – 94.0)	156 (147 – 164)	265 (258 – 286)	312 (284 – 337)	514		
60 years and older	77.0 (62.8 – 84.0)	86.6 (77.7 – 92.8)	158 (148 – 167)	262 (254 – 285)	288 (275 – 357)	683		
Gender								
Males	72.8 (62.2 – 76.4)	86.1 (76.4 – 90.0)	144 (135 – 153)	252 (237 – 277)	281 (260 – 373)	864		
Females	72.9 (67.9 – 84.9)	88.5 (84.7 – 93.0)	156 (150 – 163)	272 (261 – 287)	304 (287 – 321)	942		
Race/ethnicity								
Mexican Americans	82.2† (58.9 – 89.6)	92.0 (77.8 – 101)	167 (153 – 180)	297 (260 – 363)	330† (295 – 716)	375		
Non-Hispanic Blacks	70.0† (52.8 – 75.7)	76.7 (70.3 – 85.5)	131 (127 – 136)	203 (196 – 230)	223† (206 – 276)	310		
Non-Hispanic Whites	76.0 (67.7 – 84.6)	88.9 (84.9 – 92.9)	152 (144 – 157)	261 (250 – 281)	287 (275 – 324)	991		

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.31.a. Plasma homo- γ -linolenic acid (20:3n-6): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

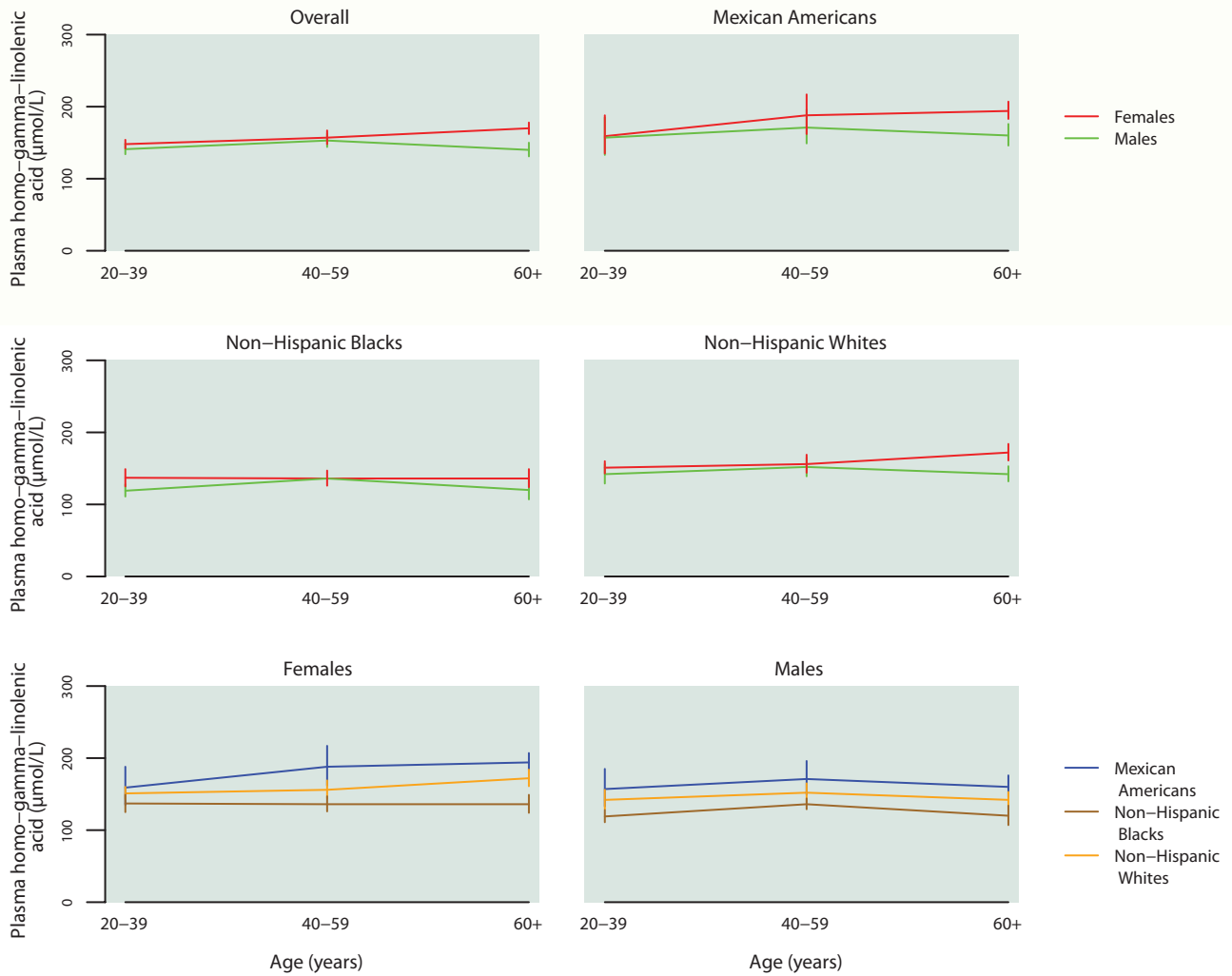


Table 2.31.a.2. Plasma homo-gamma-linolenic acid (20:3n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	151 (147 – 156)	98.4 (95.2 – 102)	151 (145 – 156)	232 (221 – 245)	1,806
20–39 years	145 (140 – 149)	95.6 (92.4 – 99.4)	139 (135 – 146)	223 (213 – 239)	609
40–59 years	155 (147 – 163)	102 (94.2 – 107)	156 (147 – 164)	240 (222 – 258)	514
60 years and older	156 (148 – 164)	100 (94.3 – 104)	158 (148 – 167)	236 (222 – 250)	683
Males					
Total, 20 years and older	145 (139 – 153)	96.7 (93.1 – 100)	144 (135 – 153)	222 (210 – 246)	864
20–39 years	141 (134 – 149)	95.2 (88.2 – 97.7)	137 (131 – 145)	219 (201 – 247)	282
40–59 years	153 (144 – 163)	101 (93.8 – 107)	155 (141 – 161)	232 (217 – 272)	247
60 years and older	140 (131 – 150)	92.2 (84.0 – 97.9)	141 (133 – 153)	203 (185 – 244)	335
Females					
Total, 20 years and older	157 (152 – 162)	102 (96.6 – 105)	156 (150 – 163)	241 (227 – 258)	942
20–39 years	148 (142 – 154)	97.3 (91.9 – 103)	142 (135 – 156)	226 (209 – 270)	327
40–59 years	157 (148 – 167)	104 (93.3 – 107)	157 (151 – 166)	241 (214 – 264)	267
60 years and older	170 (162 – 178)	107 (98.4 – 115)	175 (159 – 185)	258 (236 – 274)	348

Table 2.31.a.3. Plasma homo-gamma-linolenic acid (20:3n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	166 (154 – 179)	103 (90.3 – 109)	167 (153 – 180)	258 (245 – 293)	375
20–39 years	158 (140 – 177)	96.7 (82.8 – 104)	158 (131 – 189)	254 (239 – 295)	131
40–59 years	178 (166 – 192)	110† (81.4 – 129)	178 (168 – 186)	289† (241 – 360)	93
60 years and older	177 (169 – 185)	119 (108 – 130)	185 (169 – 199)	245 (237 – 261)	151
Males					
Total, 20 years and older	161 (143 – 181)	103 (85.0 – 114)	161 (138 – 192)	246 (222 – 296)	189
20–39 years	157 (133 – 185)	102† (65.4 – 113)	148 (121 – 204)	248† (215 – 329)	67
40–59 years	171 (149 – 196)	111† (84.1 – 132)	168 (148 – 194)	244† (213 – 361)	48
60 years and older	160 (146 – 176)	113† (49.9 – 123)	165 (143 – 181)	228† (188 – 288)	74
Females					
Total, 20 years and older	172 (155 – 190)	93.0 (65.6 – 109)	175 (159 – 201)	272 (240 – 716)	186
20–39 years	159 (135 – 188)	89.4† (55.8 – 103)	160 (127 – 200)	269† (225 – 716)	64
40–59 years	188 (162 – 217)	106† (65.9 – 149)	190 (171 – 214)	303† (244 – 372)	45
60 years and older	194 (183 – 207)	128† (117 – 135)	204 (193 – 214)	258† (238 – 328)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.31.a.4. Plasma homo-gamma-linolenic acid (20:3n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	131 (128 – 135)	91.5 (81.3 – 96.1)	131 (127 – 136)	187 (181 – 200)	310
20–39 years	129 (122 – 136)	88.0 (72.5 – 96.0)	128 (117 – 139)	186 (172 – 206)	126
40–59 years	136 (130 – 143)	98.8† (63.0 – 109)	134 (128 – 141)	198† (182 – 235)	98
60 years and older	130 (123 – 136)	85.9† (75.4 – 92.8)	134 (117 – 147)	183† (173 – 215)	86
Males					
Total, 20 years and older	125 (119 – 131)	82.5 (73.7 – 94.9)	121 (112 – 130)	188 (173 – 203)	143
20–39 years	119 (111 – 128)	77.7† (53.1 – 94.7)	115 (106 – 130)	174† (168 – 196)	58
40–59 years	136 (129 – 144)	99.7† (71.4 – 105)	128 (118 – 147)	197† (174 – 261)	42
60 years and older	120 (107 – 134)	76.3† (45.9 – 90.2)	118 (105 – 141)	184† (156 – 213)	43
Females					
Total, 20 years and older	136 (129 – 144)	93.0 (85.4 – 103)	135 (124 – 150)	186 (180 – 206)	167
20–39 years	137 (125 – 149)	92.6† (77.6 – 104)	134 (116 – 159)	193† (174 – 272)	68
40–59 years	136 (126 – 147)	94.2† (49.0 – 116)	135 (128 – 145)	189† (156 – 298)	56
60 years and older	136 (124 – 149)	92.6† (70.7 – 102)	144 (115 – 160)	182† (171 – 216)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.31.a.5. Plasma homo-gamma-linolenic acid (20:3n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	152 (146 – 159)	99.3 (94.2 – 103)	152 (144 – 157)	233 (218 – 250)	991
20–39 years	147 (140 – 154)	97.2 (91.2 – 103)	140 (135 – 148)	226 (215 – 245)	300
40–59 years	154 (143 – 165)	101 (92.9 – 107)	156 (143 – 166)	232 (213 – 261)	279
60 years and older	158 (149 – 167)	100 (91.9 – 107)	160 (148 – 172)	242 (226 – 256)	412
Males					
Total, 20 years and older	146 (137 – 155)	97.0 (90.8 – 101)	144 (134 – 155)	222 (206 – 254)	471
20–39 years	142 (129 – 156)	95.2 (73.6 – 101)	136 (126 – 147)	222 (187 – 279)	128
40–59 years	152 (139 – 165)	100 (90.4 – 107)	155 (134 – 165)	227 (210 – 284)	139
60 years and older	142 (132 – 153)	93.6 (86.9 – 99.4)	141 (133 – 154)	206 (184 – 250)	204
Females					
Total, 20 years and older	159 (152 – 165)	104 (97.0 – 106)	157 (150 – 168)	242 (224 – 261)	520
20–39 years	151 (143 – 160)	99.5 (93.5 – 109)	141 (135 – 160)	232 (210 – 285)	172
40–59 years	156 (144 – 169)	103 (86.2 – 107)	156 (149 – 168)	240 (210 – 264)	140
60 years and older	172 (161 – 184)	107 (88.1 – 124)	177 (161 – 191)	260 (245 – 271)	208

Table 2.32.a.1. Plasma arachidonic acid (20:4n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	445 (418–463)	484 (456–500)	789 (772–805)	1,180 (1,150–1,230)	1,320 (1,240–1,420)	1,807		
Age group								
20–39 years	429 (386–455)	479 (445–504)	737 (713–761)	1,110 (1,050–1,230)	1,230 (1,140–1,380)	610		
40–59 years	445 (372–470)	480 (450–496)	808 (785–829)	1,220 (1,160–1,360)	1,380 (1,260–1,560)	514		
60 years and older	448 (421–480)	502 (460–535)	841 (814–868)	1,200 (1,180–1,260)	1,430 (1,310–1,490)	683		
Gender								
Males	452 (424–473)	480 (455–495)	780 (756–806)	1,150 (1,090–1,220)	1,230 (1,160–1,460)	864		
Females	429 (386–465)	490 (436–520)	792 (769–821)	1,220 (1,180–1,300)	1,370 (1,320–1,460)	943		
Race/ethnicity								
Mexican Americans	419† (376–432)	440 (396–487)	726 (675–768)	1,110 (1,040–1,310)	1,290† (1,140–1,460)	376		
Non-Hispanic Blacks	526† (226–572)	576 (493–611)	883 (831–941)	1,330 (1,260–1,580)	1,520† (1,360–1,770)	310		
Non-Hispanic Whites	445 (419–463)	485 (446–511)	785 (767–807)	1,160 (1,120–1,220)	1,260 (1,190–1,480)	991		

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.32.a. Plasma arachidonic acid (20:4n-6): Concentrations by age group
 Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

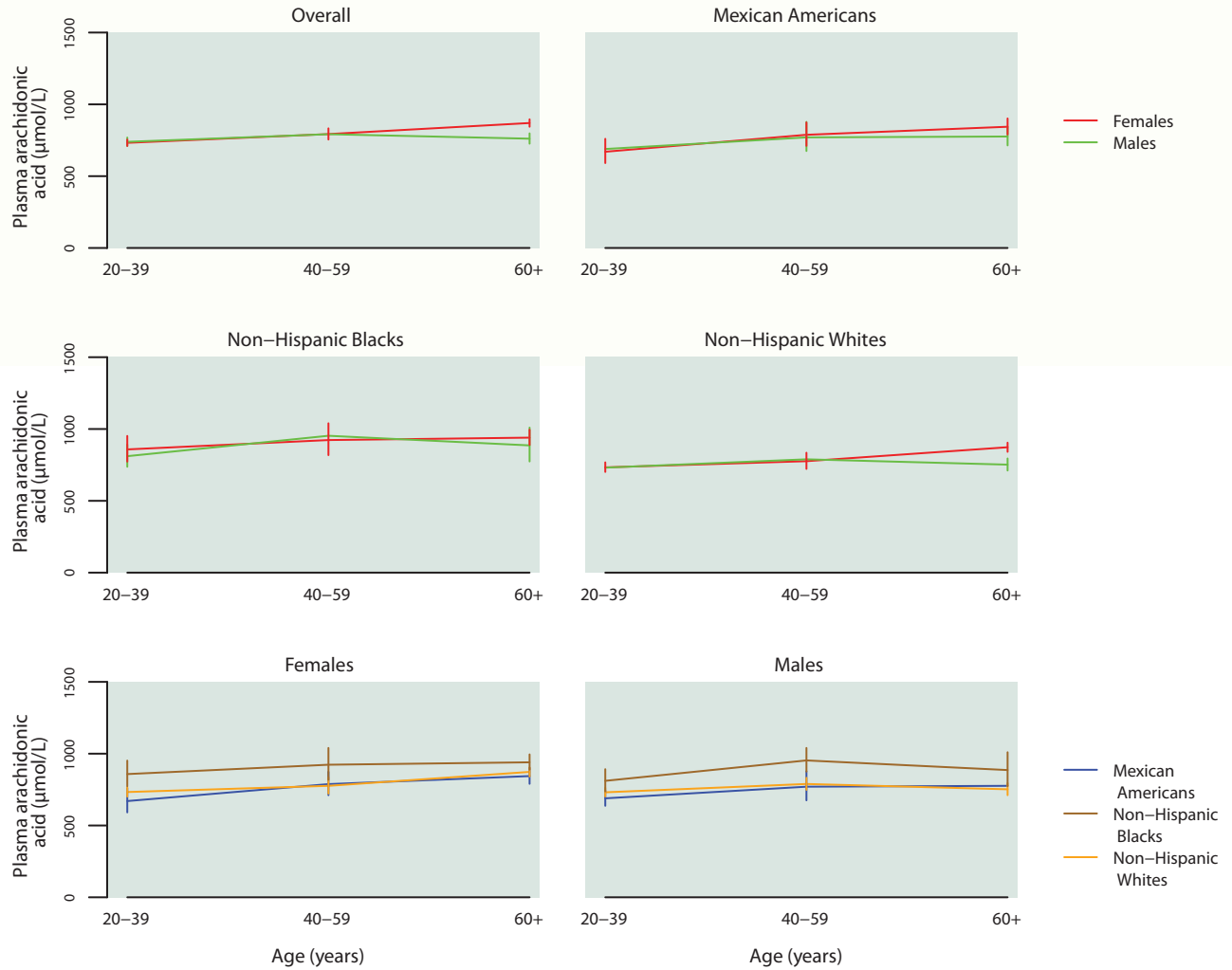


Table 2.32.a.2. Plasma arachidonic acid (20:4n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	776 (761 – 791)	538 (516 – 560)	789 (772 – 805)	1,070 (1,040 – 1,110)	1,807
20–39 years	735 (716 – 755)	529 (510 – 542)	737 (713 – 761)	1,000 (959 – 1,080)	610
40–59 years	793 (772 – 814)	534 (488 – 569)	808 (785 – 829)	1,090 (1,050 – 1,140)	514
60 years and older	819 (798 – 841)	562 (533 – 591)	841 (814 – 868)	1,120 (1,090 – 1,140)	683
Males					
Total, 20 years and older	764 (744 – 785)	534 (502 – 547)	780 (756 – 806)	1,040 (1,000 – 1,090)	864
20–39 years	739 (710 – 769)	533 (505 – 542)	736 (713 – 766)	999 (945 – 1,100)	282
40–59 years	792 (761 – 825)	529 (487 – 566)	823 (795 – 842)	1,070 (1,020 – 1,150)	247
60 years and older	761 (726 – 798)	532 (453 – 570)	796 (740 – 839)	1,030 (986 – 1,100)	335
Females					
Total, 20 years and older	787 (769 – 806)	549 (517 – 575)	792 (769 – 821)	1,100 (1,050 – 1,160)	943
20–39 years	732 (710 – 755)	523 (497 – 552)	738 (705 – 766)	1,010 (956 – 1,120)	328
40–59 years	793 (755 – 833)	534 (464 – 597)	787 (753 – 864)	1,130 (1,020 – 1,230)	267
60 years and older	870 (844 – 896)	620 (551 – 654)	878 (854 – 904)	1,150 (1,120 – 1,200)	348

Table 2.32.a.3. Plasma arachidonic acid (20:4n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	722 (678 – 768)	499 (439 – 536)	726 (675 – 768)	1,030 (975 – 1,080)	376
20–39 years	681 (631 – 735)	483 (413 – 526)	687 (628 – 745)	993 (892 – 1,070)	132
40–59 years	778 (718 – 844)	510† (420 – 602)	774 (749 – 835)	1,120† (948 – 1,350)	93
60 years and older	811 (777 – 846)	567 (496 – 592)	826 (769 – 874)	1,170 (1,050 – 1,330)	151
Males					
Total, 20 years and older	719 (669 – 773)	502 (426 – 535)	745 (674 – 788)	1,030 (937 – 1,090)	189
20–39 years	689 (637 – 746)	503† (380 – 540)	707 (609 – 758)	983† (851 – 1,110)	67
40–59 years	770 (675 – 878)	489† (377 – 606)	800 (748 – 843)	1,040† (881 – 1,460)	48
60 years and older	776 (714 – 842)	527† (376 – 590)	811 (643 – 924)	1,090† (1,000 – 1,360)	74
Females					
Total, 20 years and older	724 (659 – 796)	479 (352 – 582)	716 (653 – 782)	1,020 (945 – 1,310)	187
20–39 years	670 (591 – 760)	436† (352 – 539)	676 (626 – 723)	987† (856 – 1,310)	65
40–59 years	788 (711 – 874)	567† (447 – 616)	756 (652 – 885)	1,250† (964 – 1,430)	45
60 years and older	844 (790 – 902)	586† (580 – 600)	835 (810 – 873)	1,220† (987 – 1,940)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.32.a.4. Plasma arachidonic acid (20:4n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	884 (839 – 932)	630 (588 – 670)	883 (831 – 941)	1,220 (1,160 – 1,330)	310
20–39 years	836 (776 – 901)	602 (542 – 635)	839 (769 – 887)	1,210 (1,040 – 1,380)	126
40–59 years	936 (858 – 1,020)	681† (513 – 711)	942 (827 – 1,040)	1,230† (1,170 – 1,760)	98
60 years and older	919 (859 – 983)	714† (534 – 744)	933 (830 – 1,030)	1,200† (1,160 – 1,330)	86
Males					
Total, 20 years and older	870 (817 – 925)	591 (512 – 659)	859 (811 – 976)	1,200 (1,130 – 1,330)	143
20–39 years	811 (737 – 892)	580† (479 – 616)	812 (692 – 891)	1,120† (1,020 – 1,660)	58
40–59 years	953 (875 – 1,040)	666† (501 – 727)	984 (780 – 1,070)	1,230† (1,110 – 2,240)	42
60 years and older	886 (774 – 1,010)	535† (226 – 722)	940 (833 – 1,050)	1,180† (1,130 – 1,440)	43
Females					
Total, 20 years and older	895 (829 – 967)	648 (588 – 704)	884 (823 – 958)	1,230 (1,130 – 1,470)	167
20–39 years	858 (773 – 952)	616† (570 – 661)	857 (746 – 955)	1,230† (1,010 – 1,390)	68
40–59 years	923 (818 – 1,040)	679† (468 – 714)	912 (824 – 1,020)	1,230† (1,100 – 2,020)	56
60 years and older	940 (889 – 995)	740† (715 – 762)	916 (809 – 1,040)	1,220† (1,130 – 1,490)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.32.a.5. Plasma arachidonic acid (20:4n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	773 (752 – 795)	539 (497 – 569)	785 (767 – 807)	1,050 (1,010 – 1,100)	991
20–39 years	733 (711 – 755)	533 (490 – 569)	736 (706 – 766)	971 (929 – 1,060)	300
40–59 years	782 (749 – 817)	531 (465 – 579)	800 (777 – 830)	1,040 (1,010 – 1,120)	279
60 years and older	815 (788 – 843)	562 (504 – 604)	839 (811 – 870)	1,110 (1,070 – 1,140)	412
Males					
Total, 20 years and older	760 (733 – 788)	534 (488 – 558)	783 (752 – 810)	1,000 (981 – 1,050)	471
20–39 years	731 (702 – 762)	527 (480 – 562)	735 (698 – 771)	957 (899 – 1,160)	128
40–59 years	789 (748 – 832)	539 (476 – 569)	823 (786 – 863)	1,030 (997 – 1,160)	139
60 years and older	752 (711 – 795)	524 (444 – 573)	769 (715 – 833)	998 (962 – 1,110)	204
Females					
Total, 20 years and older	785 (761 – 811)	552 (500 – 583)	786 (769 – 816)	1,080 (1,040 – 1,160)	520
20–39 years	733 (701 – 768)	532 (432 – 583)	738 (699 – 768)	997 (920 – 1,150)	172
40–59 years	776 (722 – 835)	530 (403 – 598)	780 (726 – 858)	1,060 (991 – 1,240)	140
60 years and older	873 (841 – 905)	610 (541 – 665)	889 (857 – 916)	1,150 (1,120 – 1,200)	208

Table 2.33.a.1. Plasma eicosapentaenoic acid (20:5n-3): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	42.1 (39.5 – 45.0)	14.8 (11.8 – 16.1)	17.1 (15.7 – 18.6)	40.9 (37.6 – 43.8)	113 (103 – 138)	151 (136 – 176)	1,806
Age group							
20–39 years	35.9 (33.8 – 38.1)	13.5 (9.10 – 14.9)	15.8 (13.6 – 16.8)	34.2 (32.0 – 36.2)	106 (84.3 – 137)	134 (110 – 193)	609
40–59 years	45.5 (41.8 – 49.5)	17.1 (14.6 – 17.4)	19.0 (17.1 – 20.8)	45.0 (41.0 – 48.3)	114 (102 – 153)	156 (134 – 200)	515
60 years and older	48.5 (43.3 – 54.4)	15.3 (7.79 – 19.9)	20.0 (11.8 – 23.1)	49.4 (43.5 – 53.8)	132 (111 – 162)	175 (139 – 207)	682
Gender							
Males	43.1 (39.8 – 46.6)	15.7 (11.2 – 16.9)	17.1 (15.5 – 20.1)	41.4 (37.6 – 45.1)	121 (103 – 150)	156 (136 – 199)	863
Females	41.3 (38.7 – 44.1)	14.1 (11.2 – 15.7)	16.9 (15.2 – 18.3)	40.1 (37.5 – 43.1)	111 (99.9 – 143)	146 (118 – 177)	943
Race/ethnicity							
Mexican Americans	31.0 (28.7 – 33.5)	8.80† (6.03 – 10.9)	10.9 (7.53 – 15.3)	31.4 (28.4 – 35.4)	77.1 (69.0 – 86.4)	86.5† (79.1 – 98.9)	375
Non-Hispanic Blacks	38.8 (34.7 – 43.4)	14.9† (10.8 – 16.1)	16.7 (14.4 – 18.8)	36.1 (33.0 – 41.6)	113 (95.3 – 169)	141† (114 – 247)	310
Non-Hispanic Whites	43.5 (39.8 – 47.7)	15.8 (11.6 – 17.3)	18.1 (14.9 – 20.8)	42.6 (38.1 – 46.0)	112 (101 – 142)	152 (133 – 177)	991

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.33.a. Plasma eicosapentaenoic acid (20:5n-3): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

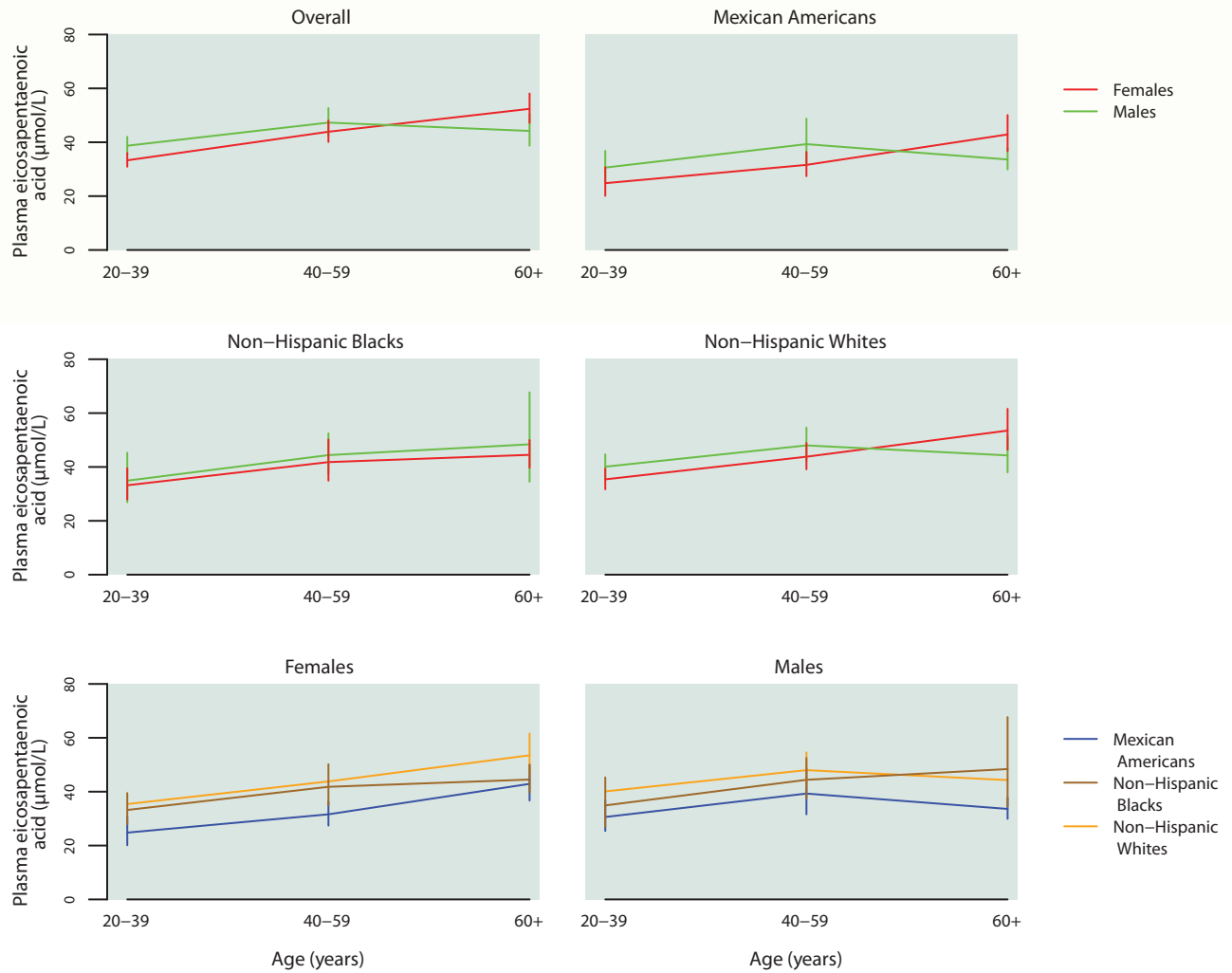


Table 2.33.a.2. Plasma eicosapentaenoic acid (20:5n-3): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	42.1 (39.5 – 45.0)	20.8 (18.9 – 22.2)	40.9 (37.6 – 43.8)	89.9 (80.0 – 99.9)	1,806
20–39 years	35.9 (33.8 – 38.1)	18.2 (16.7 – 20.2)	34.2 (32.0 – 36.2)	74.5 (64.8 – 94.2)	609
40–59 years	45.5 (41.8 – 49.5)	22.8 (19.4 – 26.2)	45.0 (41.0 – 48.3)	92.8 (81.5 – 103)	515
60 years and older	48.5 (43.3 – 54.4)	24.4 (15.6 – 29.1)	49.4 (43.5 – 53.8)	100 (90.6 – 116)	682
Males					
Total, 20 years and older	43.1 (39.8 – 46.6)	21.0 (18.5 – 23.0)	41.4 (37.6 – 45.1)	92.8 (81.4 – 104)	863
20–39 years	38.7 (35.6 – 42.0)	18.7 (16.8 – 20.6)	36.1 (34.3 – 40.5)	86.1 (70.8 – 108)	281
40–59 years	47.3 (42.5 – 52.7)	23.4 (20.8 – 26.6)	45.7 (40.0 – 48.9)	97.4 (82.2 – 136)	248
60 years and older	44.2 (38.7 – 50.5)	22.1 (10.4 – 27.5)	44.6 (38.7 – 51.3)	88.7 (74.8 – 109)	334
Females					
Total, 20 years and older	41.3 (38.7 – 44.1)	20.4 (18.5 – 22.2)	40.1 (37.5 – 43.1)	86.3 (76.6 – 101)	943
20–39 years	33.3 (30.9 – 36.0)	17.4 (15.8 – 19.8)	31.4 (30.1 – 34.1)	64.6 (56.5 – 80.8)	328
40–59 years	43.9 (40.1 – 48.1)	21.9 (17.2 – 27.5)	43.4 (40.3 – 47.8)	84.6 (76.6 – 100)	267
60 years and older	52.4 (47.2 – 58.1)	25.2 (21.5 – 29.7)	51.7 (49.2 – 57.1)	105 (94.5 – 134)	348

Table 2.33.a.3. Plasma eicosapentaenoic acid (20:5n-3): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	31.0 (28.7 – 33.5)	15.8 (11.1 – 18.4)	31.4 (28.4 – 35.4)	63.8 (58.1 – 70.0)	375
20–39 years	28.0 (24.9 – 31.4)	15.4 (8.96 – 18.3)	28.3 (21.7 – 35.1)	59.1 (50.9 – 68.1)	132
40–59 years	35.5 (30.7 – 41.0)	17.0† (12.2 – 19.0)	35.9 (31.0 – 40.8)	76.2† (56.8 – 91.5)	93
60 years and older	38.2 (35.8 – 40.7)	17.9 (12.9 – 21.6)	40.5 (34.3 – 43.5)	72.9 (61.1 – 95.6)	150
Males					
Total, 20 years and older	33.1 (29.9 – 36.8)	16.4 (15.5 – 18.4)	34.3 (29.0 – 37.9)	68.9 (60.4 – 77.9)	188
20–39 years	30.6 (25.4 – 36.8)	16.1† (9.95 – 18.9)	29.4 (22.2 – 40.7)	63.9† (50.2 – 78.0)	67
40–59 years	39.3 (31.6 – 48.8)	16.2† (11.8 – 22.3)	37.6 (30.0 – 51.3)	82.2† (66.1 – 180)	48
60 years and older	33.6 (29.9 – 37.8)	16.0† (12.8 – 18.3)	34.4 (24.2 – 43.5)	56.5† (48.9 – 161)	73
Females					
Total, 20 years and older	28.6 (24.9 – 32.8)	13.8 (7.13 – 18.3)	29.1 (23.4 – 35.1)	60.2 (49.1 – 76.5)	187
20–39 years	24.8 (20.1 – 30.7)	10.8† (6.03 – 18.2)	23.5 (19.9 – 31.6)	53.1† (39.3 – 90.1)	65
40–59 years	31.6 (27.4 – 36.4)	17.1† (8.81 – 19.8)	31.3 (26.8 – 37.9)	55.9† (46.3 – 84.0)	45
60 years and older	42.9 (36.7 – 50.1)	22.2† (8.91 – 26.3)	43.3 (38.1 – 49.3)	85.0† (63.7 – 147)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.33.a.4. Plasma eicosapentaenoic acid (20:5n-3): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	38.8 (34.7 – 43.4)	19.9 (17.5 – 21.2)	36.1 (33.0 – 41.6)	80.3 (64.8 – 121)	310
20–39 years	33.9 (28.3 – 40.8)	17.9 (15.0 – 20.1)	32.6 (25.1 – 40.6)	64.8 (53.4 – 253)	126
40–59 years	42.9 (37.2 – 49.6)	20.8† (16.4 – 24.8)	39.9 (35.3 – 44.2)	96.3† (72.1 – 147)	98
60 years and older	46.0 (39.2 – 53.9)	27.2† (19.4 – 30.4)	44.5 (36.2 – 51.1)	88.6† (64.3 – 209)	86
Males					
Total, 20 years and older	39.9 (34.4 – 46.2)	18.9 (15.3 – 22.2)	35.5 (32.4 – 41.6)	106 (70.6 – 134)	143
20–39 years	34.9 (26.9 – 45.3)	16.6† (12.9 – 19.5)	33.3 (24.6 – 43.0)	64.8† (51.9 – 150)	58
40–59 years	44.4 (37.5 – 52.5)	21.0† (17.3 – 26.5)	36.0 (30.8 – 50.1)	117† (79.5 – 206)	42
60 years and older	48.4 (34.5 – 67.7)	26.1† (7.52 – 32.4)	44.4 (35.0 – 59.2)	102† (61.1 – 209)	43
Females					
Total, 20 years and older	38.0 (34.0 – 42.4)	20.1 (18.5 – 21.4)	36.2 (30.4 – 43.9)	71.2 (61.3 – 105)	167
20–39 years	33.2 (27.9 – 39.5)	18.6† (13.2 – 20.4)	29.7 (25.6 – 35.7)	64.3† (44.7 – 253)	68
40–59 years	41.8 (34.9 – 50.2)	19.8† (12.6 – 25.5)	41.3 (35.8 – 46.4)	71.2† (64.0 – 193)	56
60 years and older	44.5 (39.7 – 50.0)	25.5† (20.0 – 30.5)	44.1 (35.2 – 51.1)	75.9† (62.8 – 104)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.33.a.5. Plasma eicosapentaenoic acid (20:5n-3): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	43.5 (39.8 – 47.7)	21.9 (18.6 – 24.7)	42.6 (38.1 – 46.0)	90.5 (78.4 – 102)	991
20–39 years	37.5 (34.3 – 41.0)	20.4 (16.3 – 21.9)	35.3 (32.0 – 38.3)	74.7 (63.8 – 110)	299
40–59 years	45.8 (41.5 – 50.6)	23.9 (18.8 – 27.7)	45.2 (40.5 – 48.7)	89.0 (78.7 – 101)	280
60 years and older	49.0 (42.5 – 56.5)	23.5 (11.7 – 29.6)	49.9 (44.2 – 54.8)	101 (91.7 – 117)	412
Males					
Total, 20 years and older	44.3 (40.1 – 48.9)	21.9 (17.3 – 25.8)	43.1 (37.6 – 47.6)	89.8 (78.2 – 105)	471
20–39 years	40.1 (35.9 – 44.7)	20.6 (16.9 – 22.7)	37.8 (34.8 – 42.9)	89.0 (67.8 – 119)	127
40–59 years	48.0 (42.2 – 54.6)	25.1 (20.7 – 27.5)	47.3 (40.0 – 50.2)	92.4 (80.9 – 140)	140
60 years and older	44.3 (38.0 – 51.6)	21.8 (10.3 – 28.6)	44.8 (37.6 – 52.3)	87.2 (75.6 – 105)	204
Females					
Total, 20 years and older	42.9 (39.0 – 47.2)	21.8 (18.3 – 24.6)	42.0 (37.9 – 45.6)	91.3 (76.7 – 104)	520
20–39 years	35.4 (31.7 – 39.4)	18.2 (15.8 – 21.9)	31.9 (30.2 – 37.0)	68.2 (54.3 – 112)	172
40–59 years	43.8 (39.1 – 48.9)	22.3 (12.3 – 30.0)	43.3 (37.8 – 48.4)	81.0 (74.2 – 100)	140
60 years and older	53.5 (46.4 – 61.6)	24.6 (18.7 – 30.9)	53.5 (49.3 – 59.7)	110 (96.5 – 138)	208

Table 2.34.a.1. Plasma docosatetraenoic acid (22:4n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

Age group	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	25.0 (24.4 – 25.6)		12.1 (10.4 – 13.1)	14.4 (13.3 – 14.9)	24.7 (24.1 – 25.6)	43.0 (41.6 – 44.7)	47.7 (45.4 – 53.5)	1,808
Age group								
20–39 years	24.4 (23.4 – 25.4)		12.2 (10.4 – 13.8)	14.3 (13.1 – 15.0)	23.9 (23.1 – 24.9)	41.1 (38.8 – 46.0)	47.1 (42.8 – 58.0)	610
40–59 years	25.5 (24.5 – 26.4)		11.2 (9.62 – 12.9)	14.3 (12.0 – 15.4)	25.0 (24.3 – 26.6)	44.5 (42.1 – 46.2)	50.0 (45.0 – 63.4)	515
60 years and older	25.3 (24.6 – 26.0)		12.6 (9.34 – 14.4)	14.8 (12.9 – 15.8)	25.7 (24.5 – 26.6)	42.2 (39.6 – 45.3)	47.1 (44.7 – 49.5)	683
Gender								
Males	25.3 (24.4 – 26.2)		11.8 (9.72 – 13.1)	14.5 (13.5 – 14.9)	25.0 (24.3 – 26.1)	42.4 (41.0 – 44.9)	46.8 (44.6 – 58.2)	865
Females	24.7 (24.0 – 25.5)		12.2 (9.93 – 13.9)	14.3 (13.0 – 15.1)	24.5 (23.6 – 25.6)	43.7 (41.4 – 45.9)	48.0 (44.8 – 56.3)	943
Race/ethnicity								
Mexican Americans	27.5 (25.6 – 29.5)		13.1† (11.2 – 15.6)	15.8 (12.9 – 16.6)	27.4 (25.1 – 29.6)	47.3 (45.9 – 53.3)	58.5† (48.0 – 66.9)	376
Non-Hispanic Blacks	26.0 (25.1 – 26.8)		13.4† (9.11 – 15.0)	15.0 (13.2 – 16.7)	25.8 (24.3 – 26.8)	45.0 (42.0 – 46.7)	50.4† (46.1 – 72.9)	310
Non-Hispanic Whites	24.8 (23.9 – 25.6)		12.1 (10.0 – 13.5)	14.5 (13.0 – 15.1)	24.6 (23.9 – 25.6)	41.9 (39.6 – 44.7)	47.2 (44.5 – 56.1)	992

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.34.a. Plasma docosatetraenoic acid (22:4n-6): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

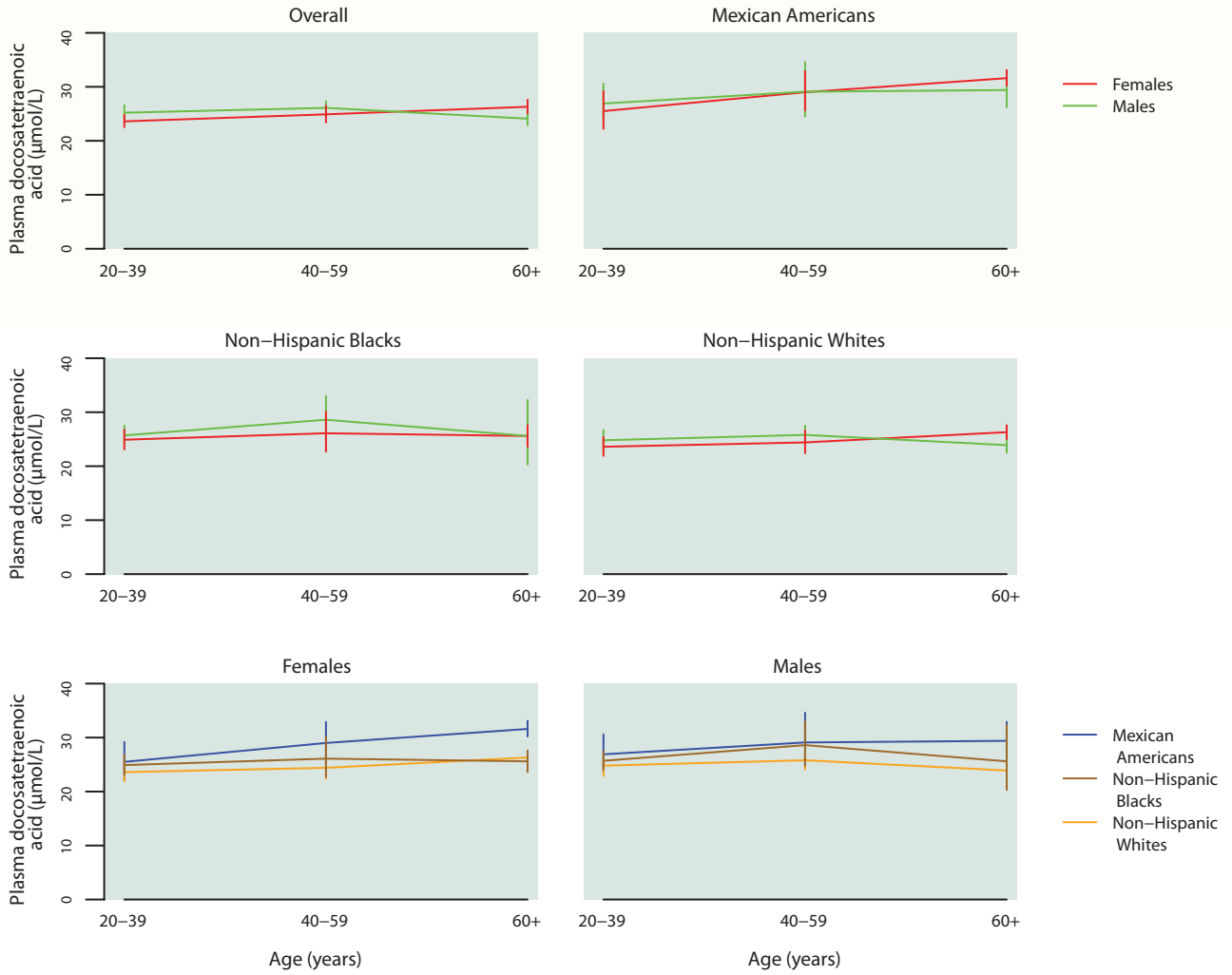


Table 2.34.a.2. Plasma docosatetraenoic acid (22:4n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	25.0 (24.4 – 25.6)	16.8 (15.7 – 17.4)	24.7 (24.1 – 25.6)	37.7 (36.7 – 39.4)	1,808
20–39 years	24.4 (23.4 – 25.4)	16.7 (15.0 – 17.5)	23.9 (23.1 – 24.9)	37.1 (34.7 – 39.1)	610
40–59 years	25.5 (24.5 – 26.4)	17.0 (14.8 – 18.0)	25.0 (24.3 – 26.6)	39.4 (37.4 – 41.6)	515
60 years and older	25.3 (24.6 – 26.0)	16.7 (16.0 – 17.5)	25.7 (24.5 – 26.6)	37.0 (36.3 – 38.3)	683
Males					
Total, 20 years and older	25.3 (24.4 – 26.2)	16.9 (15.8 – 18.0)	25.0 (24.3 – 26.1)	38.2 (36.5 – 40.0)	865
20–39 years	25.2 (23.8 – 26.6)	17.1 (14.8 – 18.7)	24.5 (23.6 – 26.1)	38.3 (35.5 – 40.8)	282
40–59 years	26.1 (24.9 – 27.3)	17.3 (14.7 – 19.5)	25.9 (24.5 – 27.9)	39.8 (36.8 – 43.7)	248
60 years and older	24.1 (22.9 – 25.3)	16.0 (14.8 – 16.8)	24.3 (22.5 – 26.5)	35.9 (34.2 – 37.6)	335
Females					
Total, 20 years and older	24.7 (24.0 – 25.5)	16.5 (15.4 – 17.4)	24.5 (23.6 – 25.6)	37.5 (36.0 – 40.6)	943
20–39 years	23.6 (22.5 – 24.8)	15.8 (14.4 – 17.1)	23.1 (21.3 – 24.7)	35.9 (32.7 – 38.8)	328
40–59 years	24.9 (23.4 – 26.5)	15.6 (14.5 – 17.5)	24.6 (23.4 – 26.4)	38.3 (35.3 – 43.3)	267
60 years and older	26.3 (25.1 – 27.6)	17.6 (16.4 – 18.5)	26.2 (24.9 – 27.8)	38.3 (36.3 – 43.9)	348

Table 2.34.a.3. Plasma docosatetraenoic acid (22:4n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	27.5 (25.6 – 29.5)	17.9 (15.5 – 19.6)	27.4 (25.1 – 29.6)	43.1 (40.6 – 46.6)	376
20–39 years	26.3 (24.0 – 28.8)	16.4 (12.1 – 19.5)	26.1 (21.9 – 29.9)	41.1 (36.6 – 47.8)	132
40–59 years	29.1 (26.8 – 31.6)	18.2† (13.2 – 20.2)	28.4 (26.2 – 31.2)	45.6† (42.2 – 59.9)	93
60 years and older	30.5 (29.3 – 31.8)	20.6 (17.6 – 22.4)	30.2 (28.3 – 32.1)	43.6 (40.4 – 48.5)	151
Males					
Total, 20 years and older	27.7 (25.0 – 30.8)	18.4 (13.6 – 20.3)	27.3 (24.4 – 31.1)	41.5 (39.1 – 48.7)	189
20–39 years	26.9 (23.6 – 30.6)	18.5† (12.6 – 20.7)	26.2 (22.5 – 29.9)	40.4† (36.1 – 58.6)	67
40–59 years	29.1 (24.5 – 34.6)	17.9† (13.8 – 21.3)	28.3 (25.3 – 33.8)	44.6† (37.0 – 63.5)	48
60 years and older	29.4 (26.2 – 32.9)	18.8† (17.0 – 21.2)	28.5 (24.6 – 34.1)	45.0† (37.4 – 67.2)	74
Females					
Total, 20 years and older	27.2 (24.6 – 30.1)	16.9 (11.4 – 19.7)	27.6 (23.8 – 30.3)	43.5 (40.3 – 50.5)	187
20–39 years	25.5 (22.2 – 29.2)	15.6† (11.2 – 18.0)	25.1 (20.0 – 32.3)	42.9† (34.4 – 58.4)	65
40–59 years	29.0 (25.6 – 32.9)	18.5† (13.2 – 21.6)	27.2 (23.7 – 31.6)	45.8† (42.0 – 61.3)	45
60 years and older	31.6 (30.2 – 33.1)	20.8† (17.8 – 25.8)	31.1 (29.8 – 33.2)	41.7† (36.9 – 66.9)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.34.a.4. Plasma docosatetraenoic acid (22:4n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	26.0 (25.1 – 26.8)	17.4 (15.5 – 18.7)	25.8 (24.3 – 26.8)	38.6 (37.0 – 41.1)	310
20–39 years	25.3 (24.1 – 26.4)	17.5 (14.8 – 18.9)	24.0 (22.6 – 26.3)	37.8 (34.6 – 44.2)	126
40–59 years	27.2 (25.0 – 29.5)	17.4† (14.3 – 19.8)	26.7 (24.7 – 28.2)	41.1† (38.8 – 46.3)	98
60 years and older	25.6 (22.9 – 28.6)	16.8† (9.11 – 20.5)	25.8 (24.0 – 29.4)	35.7† (33.3 – 40.3)	86
Males					
Total, 20 years and older	26.7 (24.6 – 28.9)	17.5 (13.0 – 19.5)	25.8 (23.0 – 29.1)	41.6 (38.0 – 46.0)	143
20–39 years	25.7 (24.1 – 27.5)	17.5† (11.3 – 19.7)	23.8 (21.7 – 27.5)	39.9† (34.0 – 75.9)	58
40–59 years	28.6 (24.8 – 33.0)	18.0† (12.7 – 20.7)	26.9 (23.7 – 30.4)	41.9† (36.6 – 96.8)	42
60 years and older	25.6 (20.3 – 32.3)	15.3† (9.11 – 23.9)	26.0 (24.1 – 31.6)	37.0† (32.0 – 47.5)	43
Females					
Total, 20 years and older	25.4 (24.0 – 27.0)	17.3 (15.1 – 18.7)	25.6 (23.6 – 27.2)	36.4 (34.4 – 40.4)	167
20–39 years	24.9 (23.1 – 26.8)	17.5† (13.4 – 19.2)	24.5 (22.3 – 27.7)	35.9† (30.8 – 46.3)	68
40–59 years	26.1 (22.7 – 30.1)	15.6† (13.4 – 20.0)	26.6 (22.7 – 27.9)	39.1† (31.1 – 118)	56
60 years and older	25.6 (23.6 – 27.6)	17.5† (13.4 – 21.3)	25.1 (23.5 – 27.4)	35.5† (32.5 – 36.6)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.34.a.5. Plasma docosatetraenoic acid (22:4n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	24.8 (23.9 – 25.6)	16.8 (15.6 – 17.5)	24.6 (23.9 – 25.6)	36.8 (35.3 – 37.9)	992
20–39 years	24.1 (22.8 – 25.6)	16.4 (14.6 – 17.6)	23.8 (22.9 – 24.9)	35.5 (32.1 – 39.6)	300
40–59 years	25.0 (23.5 – 26.6)	17.2 (14.5 – 18.6)	24.7 (23.6 – 26.5)	36.8 (34.8 – 41.3)	280
60 years and older	25.2 (24.3 – 26.0)	16.6 (15.6 – 17.4)	25.6 (24.1 – 27.0)	36.9 (36.3 – 38.2)	412
Males					
Total, 20 years and older	24.9 (23.8 – 26.1)	16.9 (15.0 – 18.1)	24.7 (24.0 – 26.1)	36.7 (35.1 – 38.3)	472
20–39 years	24.8 (22.9 – 26.7)	17.0 (12.5 – 18.9)	24.3 (23.3 – 26.1)	36.3 (33.0 – 39.7)	128
40–59 years	25.8 (24.1 – 27.5)	17.8 (10.9 – 19.8)	25.2 (24.4 – 27.9)	36.9 (35.2 – 44.0)	140
60 years and older	23.9 (22.5 – 25.4)	15.9 (14.5 – 16.8)	24.1 (22.1 – 26.6)	34.9 (33.5 – 37.2)	204
Females					
Total, 20 years and older	24.6 (23.7 – 25.6)	16.6 (15.4 – 17.4)	24.4 (23.5 – 25.6)	36.9 (34.4 – 41.0)	520
20–39 years	23.6 (21.9 – 25.4)	15.8 (14.3 – 17.2)	23.0 (21.0 – 25.1)	34.6 (31.9 – 45.6)	172
40–59 years	24.4 (22.4 – 26.6)	15.9 (13.7 – 18.0)	24.3 (22.5 – 25.9)	35.5 (32.9 – 44.5)	140
60 years and older	26.3 (25.0 – 27.6)	17.3 (16.5 – 18.0)	26.2 (24.7 – 28.1)	38.7 (36.3 – 44.4)	208

Table 2.35.a.1. Plasma docosapentaenoic-3 acid (22:5n-3): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)		Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th			
Total, 20 years and older	22.1 (17.2 – 23.8)	24.5 (22.8 – 25.8)	41.4 (40.0 – 42.8)	72.7 (69.7 – 76.7)	82.9 (78.5 – 92.2)	1,808		
Age group								
20–39 years	20.0 (15.1 – 22.7)	23.2 (20.9 – 24.4)	38.0 (36.8 – 39.3)	63.0 (58.0 – 73.3)	73.0 (65.5 – 95.1)	610		
40–59 years	22.2 (13.5 – 24.3)	24.9 (20.6 – 26.9)	43.2 (40.6 – 46.0)	77.0 (72.6 – 81.0)	84.9 (79.4 – 105)	515		
60 years and older	24.5 (11.7 – 26.7)	26.5 (23.6 – 28.5)	45.7 (42.8 – 49.1)	74.0 (70.7 – 81.9)	82.0 (76.6 – 97.8)	683		
Gender								
Males	24.2 (15.0 – 25.6)	26.2 (24.7 – 27.1)	42.5 (40.6 – 44.1)	72.7 (68.1 – 81.6)	87.2 (78.7 – 97.2)	865		
Females	20.5 (13.6 – 22.8)	23.1 (20.7 – 24.5)	40.6 (38.8 – 42.0)	72.7 (67.8 – 78.6)	80.4 (75.5 – 89.8)	943		
Race/ethnicity								
Mexican Americans	16.9† (12.1 – 22.3)	22.4 (14.1 – 25.0)	40.0 (36.4 – 44.1)	71.5 (67.8 – 79.3)	80.9† (72.5 – 112)	376		
Non-Hispanic Blacks	20.1† (17.5 – 21.5)	22.3 (20.6 – 23.8)	38.1 (36.2 – 40.0)	64.5 (62.0 – 80.1)	85.0† (67.0 – 108)	310		
Non-Hispanic Whites	22.8 (15.6 – 24.2)	24.7 (22.5 – 26.7)	42.2 (40.4 – 43.8)	71.7 (67.9 – 78.5)	81.2 (75.5 – 92.7)	992		

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.35.a. Plasma docosapentaenoic–3 acid (22:5n–3): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

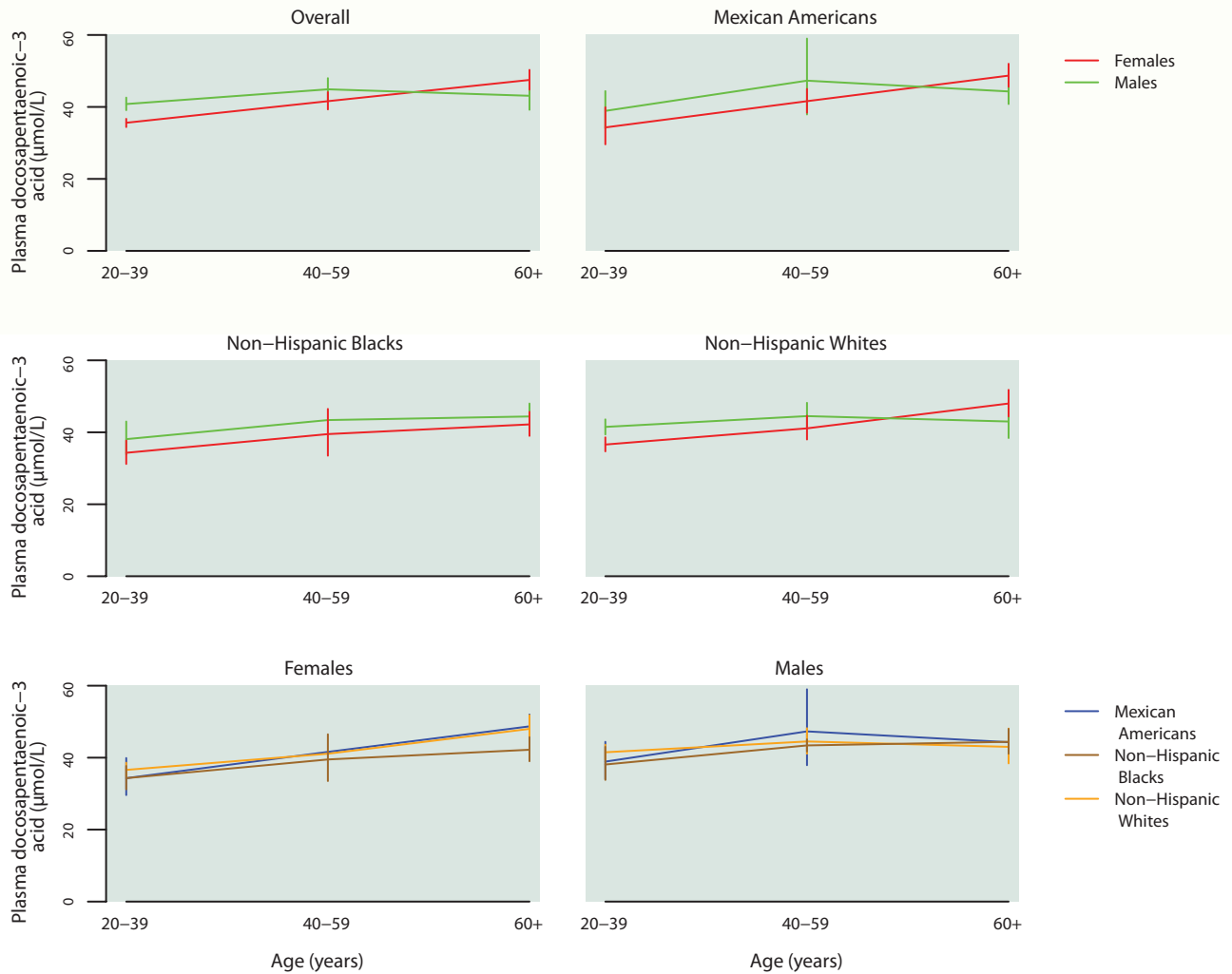


Table 2.35.a.2. Plasma docosapentaenoic-3 acid (22:5n-3): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	41.6 (40.2 – 43.1)	27.4 (26.2 – 28.4)	41.4 (40.0 – 42.8)	62.3 (60.4 – 65.4)	1,808
20–39 years	38.1 (37.1 – 39.0)	26.1 (24.8 – 26.7)	38.0 (36.8 – 39.3)	54.8 (52.4 – 59.9)	610
40–59 years	43.1 (41.1 – 45.3)	27.6 (26.0 – 29.8)	43.2 (40.6 – 46.0)	65.2 (61.6 – 69.7)	515
60 years and older	45.5 (42.3 – 48.8)	29.6 (25.8 – 33.7)	45.7 (42.8 – 49.1)	67.6 (63.0 – 72.4)	683
Males					
Total, 20 years and older	42.8 (41.0 – 44.8)	28.8 (26.9 – 30.4)	42.5 (40.6 – 44.1)	63.7 (60.0 – 68.0)	865
20–39 years	40.8 (39.1 – 42.6)	27.3 (25.6 – 29.1)	40.5 (38.5 – 42.9)	59.1 (54.0 – 66.2)	282
40–59 years	44.9 (41.9 – 48.0)	30.2 (28.4 – 31.6)	44.2 (40.7 – 47.8)	68.0 (63.3 – 77.9)	248
60 years and older	43.1 (39.2 – 47.4)	28.7 (23.4 – 33.1)	42.9 (40.9 – 47.2)	60.3 (58.1 – 66.1)	335
Females					
Total, 20 years and older	40.5 (39.1 – 42.0)	26.2 (24.8 – 27.4)	40.6 (38.8 – 42.0)	61.4 (59.9 – 65.0)	943
20–39 years	35.6 (34.4 – 36.7)	23.9 (22.8 – 25.7)	35.8 (34.2 – 37.7)	50.4 (48.4 – 56.6)	328
40–59 years	41.6 (39.3 – 44.1)	26.1 (23.1 – 27.7)	41.9 (39.3 – 44.7)	61.2 (58.6 – 71.2)	267
60 years and older	47.5 (44.8 – 50.3)	30.0 (26.8 – 34.2)	48.0 (44.5 – 50.6)	70.1 (67.7 – 74.5)	348

Table 2.35.a.3. Plasma docosapentaenoic-3 acid (22:5n-3): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	39.9 (37.2 – 42.9)	25.9 (20.2 – 29.5)	40.0 (36.4 – 44.1)	61.2 (57.8 – 67.9)	376
20–39 years	36.9 (33.4 – 40.7)	24.4 (15.2 – 27.2)	36.8 (34.2 – 39.9)	54.9 (50.1 – 75.1)	132
40–59 years	44.5 (39.4 – 50.3)	27.8† (25.5 – 30.9)	44.9 (39.4 – 48.2)	69.4† (58.3 – 127)	93
60 years and older	46.5 (45.2 – 47.9)	30.5 (25.7 – 35.6)	46.6 (44.5 – 50.8)	67.4 (57.5 – 80.9)	151
Males					
Total, 20 years and older	41.6 (37.6 – 46.0)	26.8 (22.1 – 30.9)	40.5 (36.3 – 46.4)	67.4 (59.1 – 74.5)	189
20–39 years	38.9 (34.0 – 44.4)	25.4† (15.2 – 30.7)	37.2 (35.5 – 40.8)	60.5† (52.3 – 73.1)	67
40–59 years	47.3 (37.9 – 59.0)	29.4† (26.2 – 31.9)	46.6 (33.3 – 60.1)	76.8† (55.8 – 127)	48
60 years and older	44.3 (40.8 – 48.0)	27.9† (20.5 – 32.2)	46.4 (40.6 – 50.0)	63.3† (55.2 – 83.1)	74
Females					
Total, 20 years and older	38.0 (34.6 – 41.6)	24.3 (13.1 – 29.6)	39.2 (34.1 – 44.9)	57.5 (52.2 – 60.8)	187
20–39 years	34.3 (29.6 – 39.9)	20.0† (12.1 – 28.3)	35.3 (30.6 – 41.1)	50.6† (47.1 – 85.4)	65
40–59 years	41.6 (38.4 – 45.0)	25.9† (17.2 – 32.5)	41.5 (36.9 – 47.2)	60.2† (55.9 – 74.8)	45
60 years and older	48.7 (45.6 – 52.0)	31.5† (27.6 – 39.2)	50.2 (44.4 – 52.9)	69.2† (57.4 – 90.2)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.35.a.4. Plasma docosapentaenoic-3 acid (22:5n-3): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	38.9 (36.8 – 41.0)	25.6 (24.6 – 26.5)	38.1 (36.2 – 40.0)	59.3 (55.1 – 62.4)	310
20–39 years	36.0 (32.7 – 39.5)	24.3 (21.5 – 25.8)	35.2 (32.0 – 38.1)	54.6 (48.6 – 63.5)	126
40–59 years	41.1 (37.4 – 45.2)	26.6† (24.3 – 28.0)	40.0 (35.2 – 44.2)	60.3† (57.2 – 84.5)	98
60 years and older	43.0 (40.4 – 45.8)	30.5† (21.3 – 34.2)	43.0 (39.5 – 47.7)	60.6† (54.6 – 63.6)	86
Males					
Total, 20 years and older	40.8 (38.5 – 43.2)	26.1 (24.7 – 29.2)	38.7 (37.7 – 41.4)	60.2 (58.8 – 69.2)	143
20–39 years	38.1 (33.8 – 43.0)	25.3† (20.3 – 28.5)	37.7 (32.3 – 39.9)	59.8† (44.2 – 131)	58
40–59 years	43.4 (41.7 – 45.1)	28.4† (24.7 – 30.5)	40.3 (38.6 – 42.1)	68.5† (57.2 – 108)	42
60 years and older	44.4 (41.1 – 48.0)	31.7† (17.8 – 36.7)	44.9 (40.9 – 50.5)	60.5† (58.2 – 64.6)	43
Females					
Total, 20 years and older	37.4 (35.0 – 40.1)	24.4 (22.4 – 26.2)	36.8 (34.3 – 40.1)	54.4 (51.8 – 62.5)	167
20–39 years	34.3 (31.2 – 37.7)	21.9† (18.8 – 25.8)	33.5 (28.9 – 38.8)	53.0† (45.4 – 64.5)	68
40–59 years	39.5 (33.5 – 46.5)	23.9† (20.6 – 27.1)	39.3 (33.9 – 44.8)	58.0† (48.6 – 148)	56
60 years and older	42.2 (39.0 – 45.7)	29.5† (25.6 – 34.3)	41.7 (37.8 – 47.7)	56.6† (52.5 – 70.1)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.35.a.5. Plasma docosapentaenoic-3 acid (22:5n-3): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	42.1 (40.1 – 44.1)	27.7 (26.1 – 29.0)	42.2 (40.4 – 43.8)	62.8 (60.0 – 67.4)	992
20–39 years	38.8 (37.5 – 40.2)	26.7 (24.8 – 28.1)	38.8 (36.8 – 41.0)	54.7 (52.1 – 61.5)	300
40–59 years	42.8 (40.1 – 45.7)	27.6 (24.8 – 30.1)	43.3 (39.7 – 47.0)	63.6 (60.8 – 68.0)	280
60 years and older	45.6 (41.8 – 49.8)	29.5 (25.0 – 33.7)	45.8 (42.5 – 50.1)	68.0 (64.1 – 73.0)	412
Males					
Total, 20 years and older	43.1 (40.7 – 45.6)	29.2 (26.9 – 31.2)	43.1 (40.6 – 45.3)	63.0 (59.6 – 66.9)	472
20–39 years	41.5 (39.4 – 43.6)	27.5 (26.4 – 29.3)	42.3 (39.1 – 44.4)	56.4 (53.0 – 72.1)	128
40–59 years	44.5 (41.1 – 48.2)	30.8 (27.1 – 32.2)	44.2 (39.7 – 48.3)	66.1 (61.6 – 75.0)	140
60 years and older	43.0 (38.4 – 48.1)	29.5 (14.9 – 33.9)	42.7 (39.7 – 47.5)	60.2 (57.3 – 70.0)	204
Females					
Total, 20 years and older	41.2 (39.3 – 43.1)	26.5 (24.5 – 28.2)	41.3 (38.8 – 43.0)	62.4 (59.2 – 71.1)	520
20–39 years	36.6 (34.7 – 38.6)	24.8 (22.8 – 28.3)	36.8 (34.2 – 38.5)	50.0 (46.5 – 61.2)	172
40–59 years	41.1 (38.0 – 44.6)	26.0 (22.3 – 27.7)	42.0 (38.8 – 46.6)	60.1 (57.1 – 73.0)	140
60 years and older	48.0 (44.4 – 51.8)	29.5 (24.8 – 34.5)	48.4 (44.1 – 52.6)	72.4 (68.4 – 75.1)	208

Table 2.36.a.1. Plasma docosapentaenoic-6 acid (22:5n-6): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean		Selected percentiles (95% conf. interval)					Sample size
	(95% conf. interval)		2.5th	5th	50th	95th	97.5th	
Total, 20 years and older	19.6 (18.9 – 20.4)		8.56 (7.60 – 9.46)	9.80 (9.30 – 10.5)	19.3 (18.6 – 20.1)	39.0 (36.1 – 42.4)	46.5 (42.9 – 52.2)	1,808
Age group								
20–39 years	19.5 (18.6 – 20.5)		9.15 (8.17 – 9.51)	9.88 (9.25 – 11.1)	18.8 (17.9 – 20.0)	41.4 (35.5 – 46.3)	47.8 (45.1 – 54.4)	610
40–59 years	19.4 (18.4 – 20.4)		8.37 (4.40 – 9.67)	9.80 (7.79 – 11.1)	19.0 (18.3 – 20.5)	36.0 (34.5 – 39.1)	41.6 (37.2 – 50.8)	515
60 years and older	20.3 (19.5 – 21.2)		8.00 (5.88 – 8.84)	9.63 (8.26 – 10.8)	20.5 (19.5 – 21.5)	41.4 (37.9 – 48.4)	52.1 (46.8 – 58.0)	683
Gender								
Males	18.6 (17.7 – 19.7)		8.11 (6.96 – 9.23)	9.66 (8.83 – 10.4)	18.6 (17.8 – 19.3)	34.6 (32.2 – 40.5)	42.8 (38.6 – 45.2)	865
Females	20.6 (19.8 – 21.4)		8.92 (7.74 – 9.55)	9.95 (9.30 – 11.2)	20.5 (19.2 – 21.7)	41.9 (38.5 – 47.8)	50.6 (46.4 – 59.0)	943
Race/ethnicity								
Mexican Americans	23.5 (21.0 – 26.2)		10.4† (6.86 – 11.5)	11.6 (8.94 – 13.5)	22.8 (19.7 – 27.1)	47.6 (44.2 – 56.0)	53.6† (48.5 – 60.2)	376
Non-Hispanic Blacks	21.3 (20.3 – 22.4)		9.27† (5.89 – 10.3)	10.2 (9.35 – 11.6)	20.8 (19.7 – 22.4)	43.0 (40.4 – 50.4)	50.6† (45.0 – 63.2)	310
Non-Hispanic Whites	19.1 (18.3 – 19.9)		8.15 (7.49 – 9.20)	9.67 (8.52 – 10.6)	18.9 (18.3 – 19.8)	36.0 (34.0 – 40.9)	45.2 (40.7 – 51.4)	992

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.36.a. Plasma docosapentaenoic–6 acid (22:5n–6): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

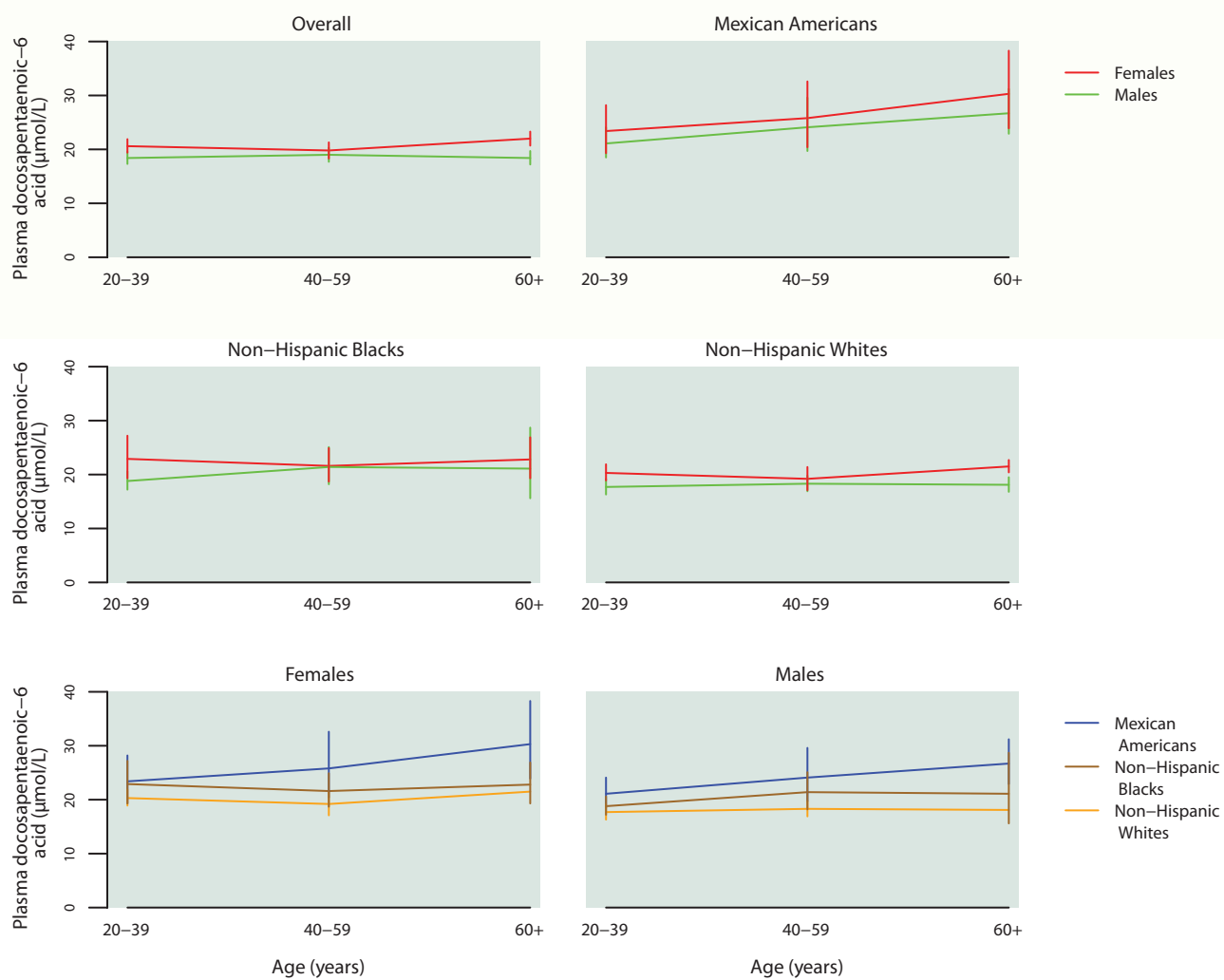


Table 2.36.a.2. Plasma docosapentaenoic-6 acid (22:5n-6): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	19.6 (18.9 – 20.4)	11.8 (11.4 – 12.3)	19.3 (18.6 – 20.1)	32.5 (31.4 – 33.9)	1,808
20–39 years	19.5 (18.6 – 20.5)	11.8 (11.2 – 12.9)	18.8 (17.9 – 20.0)	32.4 (31.3 – 34.8)	610
40–59 years	19.4 (18.4 – 20.4)	11.5 (11.2 – 12.1)	19.0 (18.3 – 20.5)	31.8 (29.8 – 34.2)	515
60 years and older	20.3 (19.5 – 21.2)	12.2 (10.6 – 12.8)	20.5 (19.5 – 21.5)	33.2 (31.2 – 38.6)	683
Males					
Total, 20 years and older	18.6 (17.7 – 19.7)	11.7 (11.0 – 12.3)	18.6 (17.8 – 19.3)	29.8 (28.8 – 32.1)	865
20–39 years	18.4 (17.3 – 19.6)	12.1 (10.8 – 13.1)	18.0 (17.1 – 18.7)	29.6 (27.2 – 33.4)	282
40–59 years	19.0 (17.7 – 20.3)	11.8 (10.6 – 12.4)	19.0 (17.6 – 20.7)	29.4 (28.1 – 33.3)	248
60 years and older	18.4 (17.2 – 19.7)	10.4 (9.64 – 11.7)	18.7 (17.7 – 20.0)	31.2 (27.9 – 35.6)	335
Females					
Total, 20 years and older	20.6 (19.8 – 21.4)	12.0 (11.3 – 12.7)	20.5 (19.2 – 21.7)	34.5 (33.0 – 36.6)	943
20–39 years	20.6 (19.4 – 21.9)	11.6 (9.88 – 13.0)	20.5 (18.7 – 22.2)	35.0 (32.4 – 41.2)	328
40–59 years	19.8 (18.3 – 21.3)	11.3 (10.7 – 12.1)	19.1 (17.8 – 21.7)	34.3 (31.1 – 36.4)	267
60 years and older	22.0 (20.7 – 23.3)	13.7 (12.4 – 14.4)	22.0 (20.7 – 23.1)	35.5 (31.4 – 48.5)	348

Table 2.36.a.3. Plasma docosapentaenoic-6 acid (22:5n-6): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	23.5 (21.0 – 26.2)	14.1 (11.5 – 15.0)	22.8 (19.7 – 27.1)	42.8 (38.9 – 46.1)	376
20–39 years	22.0 (19.6 – 24.8)	13.2 (9.09 – 14.9)	21.0 (18.0 – 25.7)	40.8 (33.5 – 45.8)	132
40–59 years	24.9 (21.6 – 28.7)	14.2† (8.50 – 16.5)	24.7 (20.6 – 29.6)	43.8† (38.4 – 52.6)	93
60 years and older	28.5 (24.4 – 33.3)	17.8 (15.1 – 19.7)	28.2 (23.4 – 33.9)	45.1 (36.8 – 71.9)	151
Males					
Total, 20 years and older	22.4 (19.8 – 25.4)	13.7 (10.4 – 15.7)	21.2 (19.1 – 26.0)	38.7 (34.0 – 44.6)	189
20–39 years	21.1 (18.5 – 24.1)	13.3† (9.51 – 15.4)	19.8 (17.6 – 23.2)	33.4† (29.0 – 51.2)	67
40–59 years	24.1 (19.7 – 29.6)	13.8† (6.48 – 17.7)	24.5 (18.1 – 33.3)	42.5† (31.7 – 52.7)	48
60 years and older	26.7 (22.9 – 31.2)	16.4† (12.7 – 19.2)	26.1 (20.7 – 33.2)	41.8† (35.3 – 56.1)	74
Females					
Total, 20 years and older	24.8 (21.5 – 28.7)	14.1 (9.21 – 15.0)	24.5 (20.1 – 31.4)	44.7 (41.4 – 53.8)	187
20–39 years	23.4 (19.3 – 28.2)	12.0† (8.52 – 14.8)	22.1 (15.0 – 32.1)	45.5† (35.2 – 104)	65
40–59 years	25.8 (20.4 – 32.6)	14.4† (10.5 – 16.8)	24.6 (18.0 – 35.8)	43.5† (37.4 – 70.9)	45
60 years and older	30.3 (23.9 – 38.3)	19.5† (14.3 – 21.0)	28.8 (22.4 – 41.5)	48.8† (37.9 – 71.9)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.36.a.4. Plasma docosapentaenoic-6 acid (22:5n-6): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	21.3 (20.3 – 22.4)	12.4 (10.4 – 13.5)	20.8 (19.7 – 22.4)	35.3 (33.3 – 41.5)	310
20–39 years	21.0 (19.2 – 22.8)	12.8 (11.7 – 13.4)	19.9 (18.3 – 23.5)	34.8 (31.5 – 50.8)	126
40–59 years	21.5 (19.4 – 23.7)	12.1† (9.42 – 13.5)	21.7 (19.7 – 22.6)	34.9† (30.5 – 44.0)	98
60 years and older	22.1 (18.4 – 26.6)	12.8† (5.89 – 14.9)	22.9 (17.6 – 28.4)	37.7† (32.6 – 45.7)	86
Males					
Total, 20 years and older	20.0 (18.1 – 22.2)	11.7 (9.26 – 13.2)	19.8 (18.3 – 21.6)	34.8 (30.9 – 43.6)	143
20–39 years	18.8 (17.2 – 20.6)	11.4† (5.94 – 13.4)	18.9 (15.9 – 19.9)	32.8† (27.6 – 47.8)	58
40–59 years	21.4 (18.2 – 25.1)	12.2† (9.72 – 13.8)	21.7 (18.1 – 23.2)	32.9† (27.0 – 89.5)	42
60 years and older	21.1 (15.6 – 28.7)	9.26† (5.89 – 15.5)	21.5 (16.0 – 31.7)	39.9† (32.2 – 50.3)	43
Females					
Total, 20 years and older	22.4 (20.3 – 24.7)	13.0 (10.3 – 14.6)	22.0 (19.5 – 25.3)	35.3 (33.0 – 45.2)	167
20–39 years	22.9 (19.3 – 27.2)	14.0† (9.93 – 16.1)	22.2 (18.4 – 27.0)	35.3† (31.8 – 100)	68
40–59 years	21.6 (18.7 – 24.9)	11.1† (8.75 – 13.5)	21.3 (18.9 – 26.4)	35.1† (28.2 – 99.4)	56
60 years and older	22.8 (19.3 – 26.9)	13.0† (7.21 – 15.0)	23.2 (17.4 – 29.7)	33.7† (32.4 – 47.7)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.36.a.5. Plasma docosapentaenoic-6 acid (22:5n-6): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	19.1 (18.3 – 19.9)	11.7 (11.0 – 12.3)	18.9 (18.3 – 19.8)	31.1 (29.4 – 32.6)	992
20–39 years	19.0 (17.9 – 20.2)	11.6 (9.68 – 12.9)	18.5 (17.3 – 20.3)	31.3 (29.1 – 33.0)	300
40–59 years	18.7 (17.3 – 20.3)	11.4 (10.1 – 12.6)	18.6 (17.6 – 19.6)	29.6 (27.6 – 33.3)	280
60 years and older	19.9 (19.2 – 20.6)	11.9 (10.4 – 12.8)	20.1 (19.3 – 21.3)	31.9 (30.5 – 35.2)	412
Males					
Total, 20 years and older	18.0 (17.0 – 19.1)	11.4 (10.1 – 12.3)	18.3 (17.6 – 19.0)	28.3 (26.7 – 30.8)	472
20–39 years	17.7 (16.3 – 19.2)	11.5 (8.97 – 13.1)	17.5 (16.8 – 18.5)	27.4 (22.5 – 39.7)	128
40–59 years	18.3 (16.9 – 19.8)	11.6 (8.23 – 13.7)	18.8 (16.9 – 20.2)	28.7 (25.9 – 31.6)	140
60 years and older	18.1 (16.8 – 19.5)	10.4 (9.64 – 11.7)	18.6 (16.9 – 20.4)	29.9 (26.7 – 33.1)	204
Females					
Total, 20 years and older	20.2 (19.3 – 21.1)	12.1 (11.2 – 12.8)	20.2 (18.6 – 21.6)	32.9 (31.3 – 35.6)	520
20–39 years	20.3 (18.9 – 21.9)	11.5 (9.55 – 13.2)	20.5 (18.0 – 22.5)	32.6 (30.9 – 42.8)	172
40–59 years	19.2 (17.1 – 21.4)	11.4 (10.0 – 12.5)	18.4 (16.8 – 21.9)	32.3 (27.4 – 37.2)	140
60 years and older	21.5 (20.4 – 22.7)	13.5 (12.0 – 14.1)	21.6 (20.5 – 22.9)	33.6 (30.5 – 49.5)	208

Table 2.37.a.1. Plasma docosahexaenoic acid (22:6n-3): Concentrations

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)					Sample size
	2.5th	5th	50th	95th	97.5th		
Total, 20 years and older	125 (118 – 133)	54.9 (52.4 – 57.8)	61.1 (56.2 – 65.2)	121 (114 – 128)	277 (248 – 310)	323 (302 – 372)	1,808
Age group							
20–39 years	115 (108 – 122)	54.3 (45.5 – 57.3)	58.1 (53.6 – 62.5)	111 (102 – 119)	254 (228 – 316)	316 (275 – 484)	610
40–59 years	125 (115 – 136)	54.1 (50.2 – 58.3)	60.6 (53.8 – 65.6)	121 (111 – 136)	272 (237 – 303)	305 (290 – 400)	515
60 years and older	145 (135 – 156)	64.5 (54.8 – 70.4)	73.5 (56.2 – 81.9)	142 (132 – 154)	305 (268 – 358)	373 (330 – 398)	683
Gender							
Males	117 (110 – 125)	53.9 (49.3 – 55.7)	57.9 (54.0 – 62.4)	114 (107 – 123)	253 (229 – 299)	303 (277 – 368)	865
Females	133 (125 – 141)	57.8 (48.3 – 63.0)	65.2 (56.1 – 72.0)	127 (121 – 135)	293 (258 – 323)	337 (315 – 385)	943
Race/ethnicity							
Mexican Americans	111 (105 – 119)	54.4† (46.4 – 58.0)	58.8 (55.2 – 60.2)	111 (99.8 – 123)	211 (191 – 251)	250† (218 – 342)	376
Non-Hispanic Blacks	140 (124 – 157)	64.9† (47.5 – 72.4)	72.5 (59.4 – 80.3)	133 (118 – 152)	304 (254 – 425)	348† (321 – 416)	310
Non-Hispanic Whites	122 (113 – 130)	54.7 (51.3 – 56.2)	59.5 (55.0 – 64.6)	117 (110 – 127)	259 (241 – 294)	315 (283 – 375)	992

† Estimate is subject to greater uncertainty due to small cell size.

Figure 2.37.a. Plasma docosahexaenoic acid (22:6n-3): Concentrations by age group

Geometric mean (95% confidence interval), National Health and Nutrition Examination Survey, 2003–2004

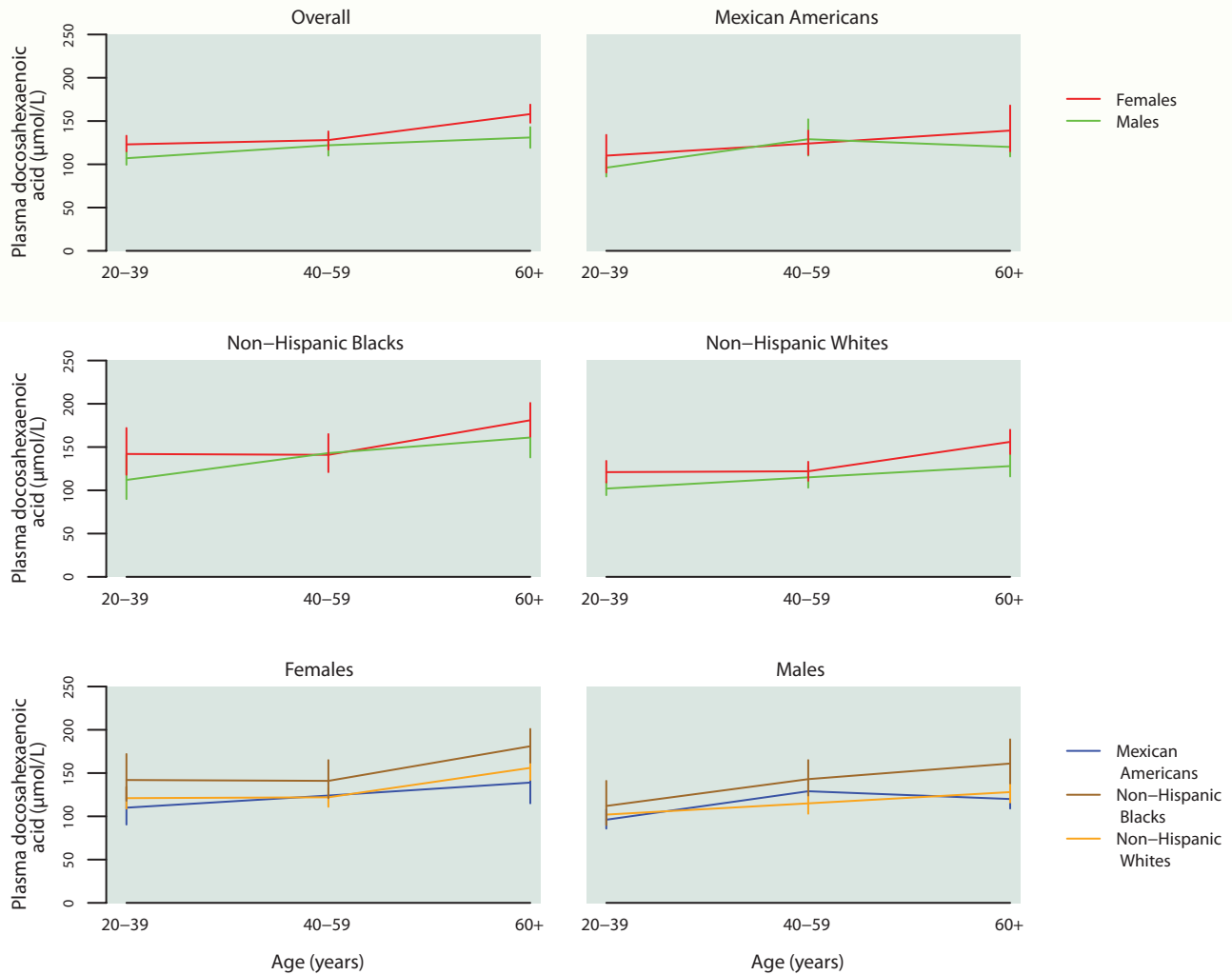


Table 2.37.a.2. Plasma docosahexaenoic acid (22:6n-3): Total population

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for the fasted U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	125 (118 – 133)	71.7 (67.1 – 74.9)	121 (114 – 128)	227 (208 – 244)	1,808
20–39 years	115 (108 – 122)	67.0 (62.3 – 71.6)	111 (102 – 119)	204 (187 – 234)	610
40–59 years	125 (115 – 136)	70.1 (62.3 – 77.7)	121 (111 – 136)	217 (201 – 244)	515
60 years and older	145 (135 – 156)	84.2 (73.5 – 94.3)	142 (132 – 154)	247 (234 – 268)	683
Males					
Total, 20 years and older	117 (110 – 125)	67.9 (62.5 – 71.7)	114 (107 – 123)	206 (189 – 235)	865
20–39 years	107 (99.5 – 115)	62.3 (57.6 – 68.1)	102 (93.2 – 113)	186 (170 – 209)	282
40–59 years	122 (110 – 135)	68.7 (61.4 – 74.4)	118 (106 – 135)	219 (189 – 296)	248
60 years and older	131 (119 – 143)	77.8 (53.6 – 92.8)	125 (117 – 142)	219 (194 – 256)	335
Females					
Total, 20 years and older	133 (125 – 141)	75.6 (68.7 – 80.0)	127 (121 – 135)	238 (223 – 256)	943
20–39 years	123 (115 – 133)	72.4 (61.8 – 78.6)	117 (110 – 127)	220 (194 – 283)	328
40–59 years	128 (117 – 138)	72.3 (59.3 – 79.4)	124 (112 – 143)	210 (201 – 256)	267
60 years and older	158 (148 – 169)	91.4 (82.5 – 99.1)	154 (144 – 168)	272 (249 – 307)	348

Table 2.37.a.3. Plasma docosahexaenoic acid (22:6n-3): Mexican Americans

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted Mexican Americans in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	111 (105 – 119)	67.1 (57.8 – 73.0)	111 (99.8 – 123)	185 (165 – 199)	376
20–39 years	102 (91.1 – 114)	60.0 (55.3 – 67.6)	100 (80.6 – 122)	161 (150 – 204)	132
40–59 years	127 (117 – 137)	84.9† (56.6 – 94.3)	125 (112 – 139)	189† (163 – 266)	93
60 years and older	129 (118 – 142)	81.2 (61.1 – 92.2)	131 (114 – 144)	202 (185 – 246)	151
Males					
Total, 20 years and older	107 (99.7 – 114)	64.8 (55.1 – 69.2)	104 (95.3 – 124)	165 (158 – 188)	189
20–39 years	96.1 (85.8 – 108)	59.4† (52.4 – 67.1)	99.4 (78.2 – 119)	147† (136 – 158)	67
40–59 years	129 (110 – 152)	83.3† (66.8 – 93.9)	127 (101 – 153)	194† (155 – 355)	48
60 years and older	120 (109 – 132)	69.0† (46.1 – 90.1)	121 (105 – 143)	190† (159 – 272)	74
Females					
Total, 20 years and older	118 (105 – 131)	68.8 (52.3 – 83.3)	116 (102 – 133)	191 (166 – 250)	187
20–39 years	110 (90.5 – 134)	60.4† (54.0 – 73.7)	109 (75.7 – 150)	191† (158 – 325)	65
40–59 years	124 (111 – 139)	87.9† (52.3 – 99.1)	119 (110 – 139)	173† (150 – 268)	45
60 years and older	139 (115 – 168)	88.9† (77.0 – 107)	133 (109 – 164)	229† (183 – 334)	77

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.37.a.4. Plasma docosahexaenoic acid (22:6n-3): Non-Hispanic blacks

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic blacks in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	140 (124 – 157)	83.4 (72.4 – 90.8)	133 (118 – 152)	251 (207 – 333)	310
20–39 years	128 (107 – 153)	77.2 (66.4 – 89.0)	119 (103 – 140)	237 (177 – 367)	126
40–59 years	142 (127 – 159)	84.1† (69.9 – 95.8)	133 (119 – 157)	234† (204 – 374)	98
60 years and older	173 (155 – 193)	117† (56.2 – 135)	173 (149 – 197)	258† (216 – 368)	86
Males					
Total, 20 years and older	129 (114 – 147)	72.4 (60.4 – 82.2)	124 (110 – 145)	233 (198 – 361)	143
20–39 years	112 (89.9 – 141)	67.9† (52.5 – 76.1)	107 (84.5 – 140)	193† (143 – 367)	58
40–59 years	143 (124 – 165)	77.8† (62.1 – 89.4)	131 (113 – 171)	283† (217 – 404)	42
60 years and older	161 (138 – 189)	113† (47.5 – 127)	159 (144 – 175)	251† (195 – 368)	43
Females					
Total, 20 years and older	148 (129 – 171)	96.2 (80.8 – 104)	136 (120 – 176)	254 (203 – 442)	167
20–39 years	142 (118 – 172)	93.1† (80.7 – 98.8)	127 (106 – 186)	254† (191 – 340)	68
40–59 years	141 (121 – 165)	90.3† (47.6 – 110)	132 (119 – 163)	208† (184 – 442)	56
60 years and older	181 (162 – 201)	121† (63.8 – 136)	182 (149 – 213)	258† (222 – 351)	43

† Estimate is subject to greater uncertainty due to small cell size.

Table 2.37.a.5. Plasma docosahexaenoic acid (22:6n-3): Non-Hispanic whites

Geometric mean and selected percentiles of plasma concentrations (in $\mu\text{mol/L}$) for fasted non-Hispanic whites in the U.S. population aged 20 years and older, National Health and Nutrition Examination Survey, 2003–2004.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 20 years and older	122 (113 – 130)	69.8 (64.4 – 74.5)	117 (110 – 127)	215 (202 – 235)	992
20–39 years	111 (102 – 121)	65.2 (58.4 – 72.4)	110 (97.8 – 118)	201 (170 – 258)	300
40–59 years	118 (108 – 130)	65.9 (55.3 – 75.7)	114 (106 – 128)	206 (181 – 252)	280
60 years and older	142 (131 – 155)	84.2 (67.8 – 95.3)	136 (125 – 154)	244 (233 – 266)	412
Males					
Total, 20 years and older	113 (105 – 122)	65.3 (59.6 – 71.8)	112 (102 – 121)	198 (178 – 229)	472
20–39 years	102 (94.4 – 110)	60.8 (54.8 – 68.1)	96.1 (84.4 – 113)	180 (157 – 212)	128
40–59 years	115 (103 – 128)	64.9 (53.7 – 73.5)	113 (97.8 – 127)	194 (167 – 303)	140
60 years and older	128 (116 – 142)	77.0 (49.3 – 93.0)	121 (113 – 141)	213 (188 – 254)	204
Females					
Total, 20 years and older	130 (120 – 140)	74.4 (65.3 – 79.0)	124 (116 – 133)	229 (209 – 259)	520
20–39 years	121 (109 – 134)	72.4 (54.3 – 79.2)	114 (104 – 127)	204 (178 – 315)	172
40–59 years	122 (111 – 133)	68.0 (52.5 – 78.9)	120 (106 – 139)	207 (188 – 244)	140
60 years and older	156 (142 – 170)	89.5 (81.0 – 97.4)	150 (132 – 174)	274 (243 – 330)	208

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