

Trace Elements: Iodine

Iodine, a trace element found in soil, is an essential component of the thyroid hormones involved in regulating the body's metabolic processes. Iodized salt and seafood are the major dietary sources of iodine. In the United States, salt is iodized with potassium iodide at 100 parts per million (76 milligram [mg] of iodine per kilogram [kg] of salt). Iodized salt is chosen by about 50–60 percent of the U.S. population ([Institute of Medicine 2001](#)). Still, most ingested salt comes from processed food (approximately 70 percent), which is typically not iodized in either the United States or in Canada ([The Public Health Committee of the American Thyroid Association 2006](#)).

For the thyroid to synthesize thyroid hormones, iodine is essential. Iodine deficiency disorders include mental retardation, hypothyroidism, goiter, cretinism, and varying degrees of other growth and developmental abnormalities. Iodine deficiency is the most preventable cause of mental retardation in the world ([World Health Organization 2007](#)). Thyroid enlargement (goiter) is usually the earliest clinical feature of iodine deficiency. Thyroid hormone is particularly important in the development of the central nervous system during the fetal and early postnatal periods. In areas where iodized salt is common, iodine deficiency is rare.

The median intake of iodine from food in the United States is approximately 240 to 300 micrograms (μg) per day for men and 190 to 210 $\mu\text{g}/\text{day}$ for women, largely owing to the iodization of salt ([Institute of Medicine 2001](#)). Iodine deficiency develops when iodide intake is less than 20 $\mu\text{g}/\text{day}$ ([Beers 2006](#)). Most dietary iodine absorbed in the body eventually appears in the urine; thus, urinary iodine excretion is recommended for assessing recent dietary iodine intake worldwide ([World Health Organization 2007](#)).

Excess iodine intake may also result in goiter, as well as in hyper- or hypothyroidism. High iodine intake has also been associated with increased risk for thyroid papillary cancer ([Institute of Medicine 2001](#)). For most people, iodine intake from usual foods and supplements is unlikely to exceed the tolerable upper intake level (1,100 $\mu\text{g}/\text{day}$).

The Institute of Medicine recommends iodine intake at 150 μg per day for nonpregnant adults, 220 μg per day for pregnant women and 290 μg per day during lactation ([Institute of Medicine 2001](#)).



World Health Organization (WHO) categories for median urinary iodine concentrations in school-age children and adults (excluding pregnant and lactating women) are widely used to define iodine intake and nutrition status for populations (World Health Organization 2007) (Table 4.a). An additional adequacy criterion is that not more than 20 percent of samples from children and non-pregnant women are below 50 nanograms per milliliter (ng/mL) of iodine.

Table 4.a Epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentrations of school-age children (≥ 6 years)*

Median Urinary Iodine (ng/mL)	Iodine Intake	Iodine Status
< 20	Insufficient	Severe iodine deficiency
20–49	Insufficient	Moderate iodine deficiency
50–99	Insufficient	Mild iodine deficiency
100–199	Adequate	Adequate iodine nutrition
200–299	Above requirements	Likely to provide adequate intake for pregnant/lactating women but may pose a slight risk of more than adequate intake in the overall population
> 300	Excessive	Risk for adverse health consequences (e.g., iodine-induced hyperthyroidism, autoimmune thyroid diseases)

*Applies to adults but not to pregnant and lactating women

Note that these categories are useful for classifying population risk but are not categories to define individual risk for adverse health outcomes. The large day-to-day variations in urine iodine excretion, even among individuals with stable iodine intake, tend to offset one another when the sample includes an adequately large number (50–100 people per site) of representative individuals (Borak 2005).

For pregnant women, median urinary iodine concentrations of 150–249 ng/mL represent adequate iodine intake (World Health Organization 2007).

The Public Health Committee of the American Thyroid Association (2006) has recommended that until additional physiologic data are available to determine the appropriate requirements during pregnancy and lactation, iodine supplementation (150 $\mu\text{g}/\text{day}$) is appropriate for these two life stages in the United States and in

Canada. This decision was based on data for pregnant women from NHANES III and NHANES 2001–2002: median urinary iodine concentrations were lower than recommended during NHANES III (141 ng/mL) and within the recommended range during NHANES 2001–2002 (173 ng/mL), but 95 percent confidence intervals ranged from 75 to 229 ng/mL (Caldwell 2005).

For more information about iodine, see the Institute of Medicine's Dietary Reference Intake report (Institute of Medicine 2001) as well as information from the American Society for Nutrition (<http://jn.nutrition.org/nutinfo/>).

Since 1971, NHANES has measured urinary iodine. The NHANES III survey (1988–1994) showed a sizable decrease in urinary iodine concentrations compared with concentrations measured during NHANES I (1971–1974) (Hollowell 1998). This decline may have been due to the dairy industry's effort in the mid-1980s to reduce the iodine residue in milk from feed supplements and iodophor sanitizing agents (Pennington 1996). Decreased concentrations of iodine in fruit-flavored breakfast cereals—the industry's response to a ban on erythrosine (an iodine-containing food dye)—could also have contributed to the decline in urinary

iodine concentrations (Pennington 1996). Since 2000, urinary iodine has been measured in the continuous NHANES survey. CDC uses a new method, involving inductively coupled plasma mass spectrometry (ICP-MS), to make these measurements (Caldwell 2003). This method has been compared with the established Sandell-Kolthoff spectrophotometric method used in NHANES III (Pino 1998). The two methods strongly correlate ($r^2 = 0.98$), and the average difference between them is not statistically significant (Caldwell 2003). When CDC laboratory scientists used this new method to measure urinary iodine concentrations in NHANES 2000 (U.S. Centers for Disease Control and Prevention 2000) and NHANES 2001–2002 (Caldwell 2005), they found that the U.S. median urinary iodine concentration had stabilized since the initial drop that had occurred from NHANES I to NHANES III. This finding confirms the stability of the U.S. iodine intake and continued adequate iodine nutrition for the country generally.



Chemist performs maintenance on instrumentation used to measure urinary iodine.

Selected Observations and Highlights

The following example observations and figures are taken from the uncorrected tables of 2001–2002 data contained in this report. Statements about categorical differences between demographic groups noted below are based on non-overlapping confidence limits from univariate analysis without adjusting for demographic variables (i.e., age, sex, race/ethnicity) or other determinants of these urine concentrations (i.e., 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 E.

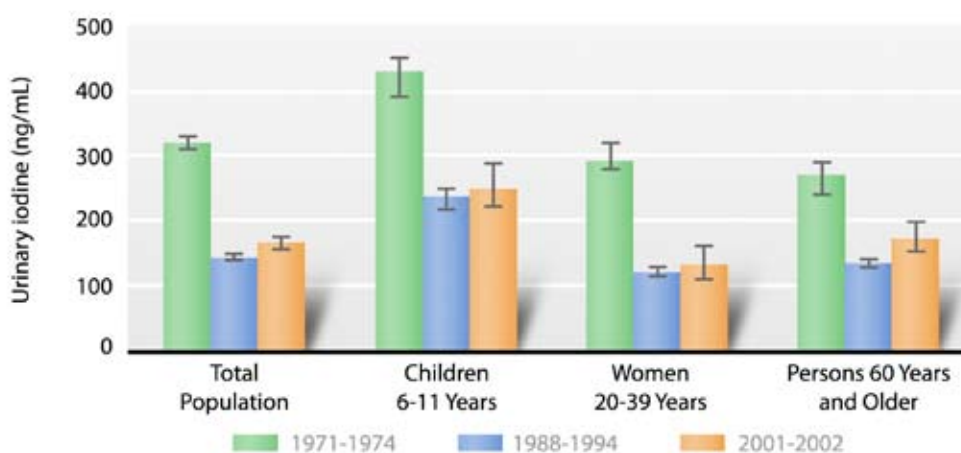
General Observations

- Children (aged 6–11 years) have higher urinary iodine concentrations than people in any other age group.
- Females have lower urinary iodine concentrations than males.

Highlights

After a sharp decline that occurred from 1971–1988, from 1988–2002 median concentrations of urinary iodine appear to have stabilized in various population subgroups (Fig 4.a). This finding has been shown previously (Caldwell 2005).

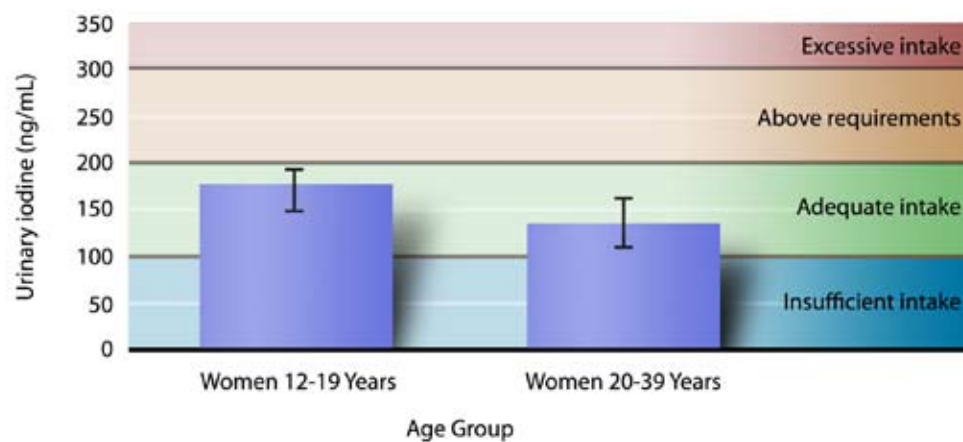
Figure 4.a



Median concentrations (95 percent confidence intervals) of urinary iodine in the U.S. population, aged 6 years and older, and in population subgroups, National Health and Nutrition Examination Survey, 1971–2002. Data shown for NHANES 1971–1974 and 1988–1994 are not part of the tables displayed in this report but were analyzed separately to generate this figure.

On the basis of median urinary iodine concentrations, the iodine intake of women of childbearing age appears adequate (Fig 4.b). Appropriate consideration should be given, however, to the higher intake recommendation for pregnant women (World Health Organization 2007).

Figure 4.b



Median concentrations (95 percent confidence intervals) of urinary iodine among women of childbearing age, National Health and Nutrition Examination Survey, 2001–2002.

Table 4.1.a. Urinary iodine: Total population

Geometric mean and selected percentiles of urine concentrations (in ng/mL) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	162 (152-172)	44.0 (41.0-49.0)	167 (158-176)	503 (466-543)	2837
6–11 years	235 (208-266)	78.0 (61.0-89.0)	249 (221-289)	682 (571-737)	374
12–19 years	192 (178-207)	58.0 (42.0-68.0)	206 (189-214)	594 (511-693)	831
20–39 years	148 (132-166)	49.0 (34.0-58.0)	153 (136-175)	429 (356-482)	627
40–59 years	140 (121-162)	37.0 (25.0-45.0)	142 (118-169)	478 (403-577)	496
60 years and older	177 (156-200)	57.0 (49.0-65.0)	173 (152-199)	524 (440-633)	509
Males					
Total, 6 years and older	192 (178-208)	64.0 (54.0-73.0)	197 (179-209)	542 (478-619)	1333
6–11 years	250 (213-294)	86.0 (55.0-126)	266 (223-316)	682 (498-864)	185
12–19 years	238 (214-265)	75.0 (67.0-104)	234 (210-271)	639 (545-896)	386
20–39 years	176 (155-200)	63.0 (48.0-89.0)	178 (143-213)	425 (345-479)	271
40–59 years	169 (147-194)	44.0 (35.0-71.0)	172 (149-207)	496 (391-596)	255
60 years and older	211 (172-258)	75.0 (40.0-102)	202 (163-249)	615 (417-904)	236
Females					
Total, 6 years and older	137 (127-148)	37.0 (31.0-43.0)	140 (127-157)	458 (421-516)	1504
6–11 years	220 (182-267)	64.0 (44.0-88.0)	239 (185-293)	638 (524-738)	189
12–19 years	154 (137-173)	40.0 (28.0-62.0)	174 (148-193)	454 (368-587)	445
20–39 years	127 (105-153)	34.0 (23.0-53.0)	133 (108-162)	425 (314-507)	356
40–59 years	115 (93.2-141)	28.0 (22.0-36.0)	111 (78.0-146)	456 (292-695)	241
60 years and older	155 (135-177)	51.0 (44.0-62.0)	156 (117-189)	440 (349-550)	273

Table 4.1.b. Urinary iodine: Mexican Americans

Geometric mean and selected percentiles of urine concentrations (in ng/mL) for Mexican Americans in the U.S. population, age 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	176 (163-189)	56.0 (45.0-60.0)	186 (167-205)	487 (442-518)	720
6–11 years	241 (210-277)	95.0 (62.0-150)	231 (193-297)	621 (487-699)	112
12–19 years	179 (161-198)	56.0 (40.0-72.0)	190 (160-213)	524 (392-583)	266
20–39 years	168 (142-198)	50.0 (40.0-66.0)	173 (141-218)	442 (375-534)	166
40–59 years	156 (124-197)	31.0† (14.0-74.0)	169 (146-215)	472† (380-700)	90
60 years and older	152 (131-176)	56.0† (36.0-75.0)	156 (115-203)	427† (303-477)	86
Males					
Total, 6 years and older	201 (173-233)	60.0 (43.0-79.0)	203 (172-236)	524 (442-792)	325
6–11 years	246 (190-318)	76.0† (42.0-138)	246 (174-374)	677† (469-926)	53
12–19 years	190 (163-221)	58.0 (33.0-100)	198 (153-226)	511 (344-583)	113
20–39 years	195 (146-261)	58.0† (28.0-79.0)	197 (137-255)	495† (374-1170)	75
40–59 years	191 (134-274)	37.0† (15.0-146)	193 (154-311)	453† (346-713)	48
60 years and older	209 (165-265)	82.0† (13.0-161)	203 (154-345)	455† (324-1210)	36
Females					
Total, 6 years and older	151 (136-168)	45.0 (31.0-60.0)	169 (137-202)	441 (370-480)	395
6–11 years	237 (193-290)	107† (79.0-150)	218 (179-297)	510† (370-656)	59
12–19 years	167 (143-194)	46.0 (32.0-62.0)	189 (146-213)	506 (351-676)	153
20–39 years	140 (109-179)	40.0† (22.0-69.0)	167 (97.0-247)	331† (294-480)	91
40–59 years	123 (85.4-178)	22.0† (7.00-58.0)	125 (86.0-178)	433† (186-532)	42
60 years and older	120 (94.1-154)	51.0† (28.0-61.0)	111 (82.0-158)	299† (158-521)	50

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

Table 4.1.c. Urinary iodine: Non-Hispanic blacks

Geometric mean and selected percentiles of urine concentrations (in ng/mL) for non-Hispanic blacks in the U.S. population, age 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	156 (137-178)	54.0 (45.0-65.0)	143 (124-173)	478 (402-608)	670
6–11 years	247 (201-302)	97.0 (67.0-138)	257 (175-311)	600 (467-954)	121
12–19 years	183 (151-221)	62.0 (43.0-78.0)	172 (156-200)	555 (384-695)	248
20–39 years	145 (117-181)	58.0 (31.0-95.0)	134 (106-169)	398 (306-478)	121
40–59 years	136 (99.7-185)	44.0† (31.0-57.0)	120 (82.0-197)	627† (275-923)	106
60 years and older	127 (91.6-176)	40.0† (18.0-64.0)	112 (94.0-129)	268† (213-525)	74
Males					
Total, 6 years and older	161 (143-181)	55.0 (39.0-68.0)	156 (134-173)	540 (414-681)	325
6–11 years	259 (201-334)	90.0† (53.0-149)	240 (175-318)	932† (496-1100)	61
12–19 years	201 (162-249)	65.0 (50.0-101)	186 (161-214)	624 (381-873)	120
20–39 years	161 (127-204)	69.0† (23.0-126)	149 (127-183)	459† (242-745)	57
40–59 years	120 (83.6-171)	31.0† (11.0-65.0)	113 (76.0-180)	594† (180-1010)	55
60 years and older	120 (79.4-183)	45.0† (25.0-99.0)	119 (56.0-232)	320† (156-525)	32
Females					
Total, 6 years and older	153 (128-182)	53.0 (41.0-60.0)	135 (108-174)	449 (352-608)	345
6–11 years	234 (177-309)	97.0† (73.0-138)	257 (143-334)	531† (424-744)	60
12–19 years	167 (134-207)	38.0 (32.0-68.0)	168 (146-186)	487 (366-670)	128
20–39 years	135 (103-176)	53.0† (47.0-86.0)	121 (92.0-176)	340† (201-471)	64
40–59 years	152 (104-223)	50.0† (36.0-65.0)	124 (65.0-352)	702† (350-994)	51
60 years and older	132 (69.1-252)	30.0† (16.0-73.0)	104 (66.0-200)	255† (208-1780)	42

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

Table 4.1.d. Urinary iodine: Non-Hispanic whites

Geometric mean and selected percentiles of urine concentrations (in ng/mL) for non-Hispanic whites in the U.S. population, age 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	163 (150-176)	44.0 (40.0-49.0)	169 (158-179)	511 (468-569)	1222
6–11 years	229 (195-270)	61.0† (44.0-92.0)	266 (206-327)	682† (516-738)	111
12–19 years	205 (182-231)	59.0 (41.0-81.0)	214 (192-240)	619 (537-769)	248
20–39 years	148 (125-176)	47.0 (27.0-63.0)	157 (133-185)	421 (324-507)	280
40–59 years	139 (115-168)	35.0 (23.0-45.0)	138 (107-169)	480 (387-659)	258
60 years and older	185 (161-211)	56.0 (48.0-68.0)	186 (163-200)	552 (435-670)	325
Males					
Total, 6 years and older	199 (180-221)	64.0 (51.0-78.0)	204 (187-219)	548 (470-653)	575
6–11 years	247 (192-319)	92.0† (37.0-139)	271 (206-320)	682† (389-864)	57
12–19 years	279 (246-316)	97.0 (67.0-150)	280 (223-344)	696 (586-1020)	116
20–39 years	179 (149-215)	63.0 (44.0-95.0)	181 (136-247)	407 (323-468)	112
40–59 years	174 (146-206)	43.0 (35.0-75.0)	172 (141-212)	477 (389-659)	132
60 years and older	224 (178-282)	80.0 (40.0-107)	212 (168-271)	633 (417-1040)	158
Females					
Total, 6 years and older	135 (122-149)	35.0 (28.0-43.0)	140 (122-157)	473 (419-569)	647
6–11 years	211 (153-291)	58.0† (24.0-124)	225 (129-399)	689† (451-895)	54
12–19 years	153 (126-185)	40.0 (21.0-62.0)	175 (127-194)	454 (323-740)	132
20–39 years	126 (95.4-166)	28.0 (20.0-53.0)	133 (96.0-169)	425 (303-576)	168
40–59 years	110 (83.1-144)	28.0 (22.0-36.0)	96.0 (67.0-152)	480 (265-873)	126
60 years and older	159 (140-181)	52.0 (43.0-65.0)	158 (121-194)	444 (365-634)	167

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

Table 4.1.e. Urinary iodine: Total population (creatinine corrected)

Geometric mean and selected percentiles of urine concentrations (in µg/g creatinine) for the total U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	163 (153-173)	64.5 (59.5-68.3)	151 (141-165)	437 (406-470)	2835
6–11 years	273 (246-304)	116 (101-131)	257 (219-321)	699 (608-817)	374
12–19 years	149 (137-161)	66.7 (59.9-70.2)	138 (129-146)	364 (297-479)	830
20–39 years	135 (127-143)	56.7 (51.2-63.7)	128 (116-136)	346 (307-431)	627
40–59 years	151 (130-175)	59.5 (52.5-66.3)	141 (119-176)	407 (300-478)	496
60 years and older	216 (192-244)	87.2 (75.8-97.2)	200 (176-230)	518 (452-629)	508
Males					
Total, 6 years and older	156 (143-171)	59.6 (53.1-69.1)	145 (136-161)	415 (368-501)	1333
6–11 years	292 (263-325)	123 (92.0-148)	321 (260-359)	774 (533-963)	185
12–19 years	162 (144-182)	63.8 (58.1-72.5)	151 (136-181)	412 (303-578)	386
20–39 years	131 (122-141)	57.9 (49.7-65.6)	119 (107-136)	341 (273-470)	271
40–59 years	133 (112-158)	52.5 (43.9-60.2)	134 (103-162)	315 (269-423)	255
60 years and older	200 (168-238)	74.8 (57.6-94.9)	190 (145-238)	474 (362-704)	236
Females					
Total, 6 years and older	170 (161-179)	67.6 (63.1-70.5)	158 (146-169)	449 (426-508)	1502
6–11 years	254 (213-303)	109 (95.1-119)	220 (195-298)	631 (481-978)	189
12–19 years	136 (124-149)	66.8 (59.7-71.2)	128 (111-137)	337 (265-434)	444
20–39 years	139 (127-153)	56.1 (48.6-68.2)	133 (116-144)	359 (299-449)	356
40–59 years	171 (148-198)	65.4 (56.0-78.4)	155 (133-186)	436 (392-576)	241
60 years and older	230 (199-265)	96.9 (81.8-113)	207 (179-251)	571 (446-667)	272

Table 4.1.f. Urinary iodine: Mexican Americans (creatinine corrected)

Geometric mean and selected percentiles of urine concentrations (in µg/g creatinine) for Mexican Americans in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	164 (152-176)	65.4 (61.8-74.5)	154 (140-178)	424 (344-467)	720
6–11 years	298 (253-350)	135 (104-162)	304 (239-344)	726 (469-939)	112
12–19 years	144 (132-157)	65.2 (53.5-82.7)	132 (119-149)	314 (255-445)	266
20–39 years	146 (127-168)	63.0 (54.9-70.8)	143 (109-175)	328 (248-492)	166
40–59 years	142 (124-164)	62.0† (40.1-83.0)	140 (117-186)	325† (241-479)	90
60 years and older	200 (170-234)	74.3† (61.9-112)	195 (156-245)	452† (391-765)	86
Males					
Total, 6 years and older	157 (137-181)	62.2 (53.8-74.4)	150 (125-182)	428 (308-522)	325
6–11 years	300 (227-395)	141† (93.0-193)	304 (209-375)	766† (459-1090)	53
12–19 years	133 (116-151)	61.1 (49.3-81.4)	123 (108-146)	282 (182-493)	113
20–39 years	144 (115-181)	57.3† (49.4-69.3)	143 (102-182)	328† (202-613)	75
40–59 years	130 (98.3-172)	58.9† (9.93-108)	129 (103-214)	294† (241-405)	48
60 years and older	193 (130-287)	84.0† (60.9-117)	180 (110-342)	452† (245-765)	36
Females					
Total, 6 years and older	172 (154-192)	74.1 (63.2-83.7)	159 (139-184)	428 (339-534)	395
6–11 years	296 (233-375)	130† (90.6-163)	304 (198-373)	726† (428-1070)	59
12–19 years	157 (136-182)	73.9 (60.8-82.9)	141 (119-168)	364 (255-778)	153
20–39 years	147 (123-176)	65.4† (42.9-89.7)	145 (108-190)	316† (210-466)	91
40–59 years	159 (115-218)	70.0† (40.1-119)	143 (95.1-233)	408† (230-705)	42
60 years and older	204 (158-265)	66.3† (58.5-122)	195 (143-257)	437† (331-1110)	50

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

Table 4.1.g. Urinary iodine: Non-Hispanic blacks (creatinine corrected)

Geometric mean and selected percentiles of urine concentrations (in µg/g creatinine) for non-Hispanic blacks in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	113 (103-124)	45.7 (41.3-51.0)	103 (92.5-115)	321 (257-381)	669
6–11 years	209 (161-273)	89.7 (75.5-110)	206 (121-293)	510 (393-775)	121
12–19 years	110 (93.7-128)	45.9 (36.8-58.8)	95.5 (87.7-114)	303 (208-406)	247
20–39 years	94.6 (86.0-104)	42.8 (37.1-55.4)	88.3 (82.4-104)	190 (172-247)	121
40–59 years	101 (82.3-124)	37.9† (23.6-55.9)	98.7 (69.1-130)	339† (218-441)	106
60 years and older	122 (93.7-160)	51.3† (38.8-59.3)	102 (93.5-117)	339† (175-394)	74
Males					
Total, 6 years and older	102 (87.9-119)	37.9 (29.0-48.1)	95.6 (79.1-118)	305 (260-356)	325
6–11 years	208 (148-292)	84.0† (75.0-107)	204 (109-321)	510† (356-802)	61
12–19 years	111 (89.6-138)	44.9 (33.7-60.7)	99.1 (80.0-119)	332 (201-479)	120
20–39 years	90.0 (78.5-103)	37.6† (27.9-53.9)	83.8 (63.3-109)	300† (153-362)	57
40–59 years	74.7 (54.5-102)	26.9† (7.53-54.1)	73.6 (41.3-148)	188† (116-280)	55
60 years and older	105 (85.8-129)	50.6† (35.5-67.1)	97.1 (69.5-134)	211† (126-359)	32
Females					
Total, 6 years and older	123 (111-135)	51.9 (46.3-57.8)	108 (98.7-117)	329 (239-414)	344
6–11 years	211 (152-293)	101† (33.7-124)	214 (120-328)	478† (297-915)	60
12–19 years	108 (94.4-124)	45.9 (36.4-62.9)	94.3 (87.7-106)	257 (189-468)	127
20–39 years	98.2 (82.4-117)	48.6† (37.1-67.5)	90.4 (75.0-115)	184† (157-235)	64
40–59 years	133 (99.2-178)	48.3† (44.6-65.4)	117 (79.3-162)	441† (303-699)	51
60 years and older	136 (83.5-222)	51.3† (38.8-71.8)	107 (94.7-115)	270† (120-9060)	42

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

Table 4.1.h. Urinary iodine: Non-Hispanic whites (creatinine corrected)

Geometric mean and selected percentiles of urine concentrations (in µg/g creatinine) for non-Hispanic whites in the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 2001–2002.

	Geometric mean (95% conf. interval)	Selected percentiles (95% conf. interval)			Sample size
		10th	50th	90th	
Males and Females					
Total, 6 years and older	175 (163-188)	69.2 (64.5-72.4)	164 (151-177)	452 (420-517)	1221
6–11 years	290 (256-328)	121† (98.2-148)	298 (214-366)	738† (570-857)	111
12–19 years	159 (145-175)	70.2 (62.5-75.3)	143 (129-175)	353 (297-578)	248
20–39 years	145 (133-157)	64.5 (52.9-69.7)	133 (121-144)	386 (322-451)	280
40–59 years	159 (133-191)	62.0 (55.9-69.8)	147 (123-191)	416 (315-562)	258
60 years and older	232 (203-265)	102 (84.3-116)	211 (188-249)	567 (455-667)	324
Males					
Total, 6 years and older	167 (149-187)	66.5 (55.6-76.5)	156 (142-175)	432 (371-532)	575
6–11 years	320 (268-383)	134† (98.2-157)	359 (237-379)	785† (404-1200)	57
12–19 years	182 (160-206)	67.4 (57.8-89.1)	180 (143-229)	559 (297-710)	116
20–39 years	139 (122-158)	66.9 (49.7-78.7)	126 (107-145)	352 (228-514)	112
40–59 years	140 (115-171)	54.7 (43.9-64.8)	137 (99.2-179)	369 (276-439)	132
60 years and older	215 (175-264)	81.1 (54.1-116)	197 (159-263)	514 (366-830)	158
Females					
Total, 6 years and older	182 (172-193)	69.6 (65.3-74.3)	169 (158-183)	468 (431-569)	646
6–11 years	260 (201-336)	106† (85.9-132)	215 (167-368)	631† (449-978)	54
12–19 years	140 (121-162)	69.2 (59.7-73.5)	131 (103-148)	328 (264-434)	132
20–39 years	150 (130-172)	62.7 (47.2-69.7)	138 (122-161)	397 (322-451)	168
40–59 years	182 (150-221)	69.6 (60.7-84.5)	177 (122-231)	437 (387-730)	126
60 years and older	246 (209-289)	109 (89.4-132)	212 (192-278)	571 (446-700)	166

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

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