Indicators of Diet Quality, Nutrition, and Health for Americans by Program Participation Status, 2011–2016: WIC Report

Appendix C. Indicators of Health and Nutrition Status

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Appendix C. Indicators of Health and Nutrition Status

Table C.1. Body Mass Index-for-Age Categories for Young Children WIC Participants and Nonparticipants by Age and Gender

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
All Young Children 2–4 Years Old								
Both genders								
Sample size	1,724	–	627	–	586	–	504	–
Underweight	2.8	(0.41)	2.2	(0.62)	2.7	(0.67)	3.1	(0.81)
Normal weight	73.5	(1.11)	69.4	(1.94)	76.7 **	(1.79)	73.7	(2.04)
Overweight	14.3	(0.88)	15.5	(1.53)	12.1	(1.40)	14.9	(1.66)
Obese	9.4	(0.74)	12.9	(1.43)	8.5 *	(1.18)	8.2 *	(1.29)
Boys								
Sample size	850	–	310	–	287	–	248	–
Underweight	2.2	(0.53)	3.0	(1.02)	1.3	(0.71)	2.4	(1.00)
Normal weight	72.2	(1.61)	65.3	(2.84)	77.1 **	(2.58)	72.9	(2.97)
Overweight	15.9	(1.31)	19.4	(2.35)	13.7	(2.12)	15.1	(2.38)
Obese	9.7	(1.06)	12.3	(1.97)	7.8	(1.64)	9.6	(1.97)
Girls								
Sample size	874	–	317	–	299	–	256	–
Underweight	3.4	(0.64)	1.3	(0.70)	4.2 *	(1.15)	3.9	(1.29)
Normal weight	74.9	(1.53)	73.8	(2.64)	76.2	(2.49)	74.6	(2.80)
Overweight	12.6	(1.18)	11.5	(1.93)	10.5	(1.81)	14.7	(2.32)
Obese	9.2	(1.02)	13.5	(2.07)	9.1	(1.70)	6.8 *	(1.64)
2-Year-Olds								
Both genders								
Sample size	701	–	282	–	222	–	193	–
Underweight	2.5	(0.64)	2.1	(0.98)	4.3	(1.44)	1.4	(0.97)
Normal weight	76.7	(1.75)	75.5	(2.81)	75.3	(3.17)	78.7	(3.27)
Overweight	13.9	(1.44)	16.1	(2.41)	14.5	(2.59)	11.5	(2.55)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Obese	6.9	(1.04)	6.2	(1.52)	5.9	(1.70)	8.4	(2.23)
Boys								
Sample size	327	–	126	–	108	–	90	–
Underweight	2.3	(0.92)	3.7	(1.81)	1.5	(1.30)	2.0	(1.65)
Normal weight	74.2	(2.66)	71.6	(4.36)	75.4	(4.62)	75.5	(5.11)
Overweight	17.5	(2.31)	21.8	(3.99)	19.0	(4.21)	12.5	(3.92)
Obese	5.9	(1.44)	3.0	(1.65)	4.1	(2.12)	10.1	(3.57)
Girls								
Sample size	374	–	156	–	114	–	103	–
Underweight	2.6	(0.89)	0.5	(0.64)	7.3 *	(2.61)	0.9	(0.98)
Normal weight	79.3	(2.25)	79.7	(3.52)	75.1	(4.32)	82.0	(4.05)
Overweight	10.1	(1.67)	10.2	(2.64)	9.7	(2.96)	10.4	(3.22)
Obese	7.9	(1.50)	9.6	(2.58)	7.9	(2.69)	6.7	(2.63)
3-Year-Olds								
Both genders								
Sample size	522	–	186	–	171	–	162	–
Underweight	2.2	(0.65)	1.7	(0.96)	1.1	(0.80)	3.0	(1.35)
Normal weight	74.7	(1.94)	60.2	(3.67)	85.3 ***	(2.76)	75.5 **	(3.46)
Overweight	14.5	(1.57)	18.3	(2.90)	8.3 **	(2.14)	16.7	(3.01)
Obese	8.7	(1.25)	19.9	(3.00)	5.3 ***	(1.76)	4.7 ***	(1.72)
Boys								
Sample size	271	–	97	–	93	–	79	–
Underweight	1.0	(0.62)	1.1	(1.09)	1.2	(1.14)	0.9	(1.06)
Normal weight	71.8	(2.81)	56.5	(5.25)	85.2 ***	(3.76)	71.1	(5.24)
Overweight	16.9	(2.34)	21.9	(4.39)	9.2 *	(3.06)	19.9	(4.61)
Obese	10.3	(1.90)	20.5	(4.28)	4.4 ***	(2.17)	8.2 *	(3.17)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Girls								
Sample size	251	–	89	–	78	–	83	–
Underweight	3.4	(1.16)	2.3	(1.60)	1.0	(1.13)	5.3	(2.53)
Normal weight	77.6	(2.66)	64.0	(5.12)	85.5 ***	(4.04)	80.1 *	(4.49)
Overweight	12.0	(2.07)	14.5	(3.75)	7.3	(2.98)	13.4	(3.84)
Obese	6.9	(1.62)	19.2	(4.20)	6.3 *	(2.78)	1.1 ***	(1.17)
4-Year-Olds								
Both genders								
Sample size	501	–	159	–	193	–	149	–
Underweight	3.7	(0.84)	2.7	(1.27)	2.7	(1.15)	4.9	(1.79)
Normal weight	69.2	(2.07)	72.7	(3.55)	69.3	(3.38)	67.0	(3.86)
Overweight	14.4	(1.58)	12.1	(2.60)	13.7	(2.52)	16.5	(3.06)
Obese	12.7	(1.50)	12.5	(2.66)	14.2	(2.57)	11.6	(2.65)
Boys								
Sample size	252	–	87	–	86	–	79	–
Underweight	3.3	(1.14)	4.3	(2.21)	1.3	(1.22)	4.3	(2.30)
Normal weight	70.7	(2.89)	67.9	(5.10)	70.7	(4.97)	72.3	(5.07)
Overweight	13.2	(2.15)	14.3	(3.83)	13.0	(3.66)	12.8	(3.78)
Obese	12.8	(2.12)	13.5	(3.73)	15.1	(3.90)	10.7	(3.50)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Girls								
Sample size	249	–	72	–	107	–	70	–
Underweight	4.0	(1.25)	1.0	(1.20)	4.3	(1.97)	5.6	(2.76)
Normal weight	67.6	(2.98)	77.8	(4.94)	67.9	(4.56)	61.4 *	(5.86)
Overweight	15.7	(2.31)	9.7	(3.51)	14.5	(3.43)	20.4	(4.85)
Obese	12.6	(2.11)	11.5	(3.79)	13.4	(3.32)	12.6	(4.00)

Notes: "All young children" includes children with missing WIC participation or income. Body mass index (BMI)-for-age categories are defined as follows: underweight if BMI-for-age is < the 5th percentile in the Centers for Disease Control and Prevention BMI-for-age growth chart; healthy weight if BMI-for-age is ≥ the 5th and < the 85th percentiles; overweight if BMI-for-age is ≥ the 85th and < the 95th percentiles; and obese if BMI-for-age is ≥ the 95th percentile. Estimates are weighted to account for differential probabilities of selection, nonresponse to survey instruments, and differences between the final sample and the U.S. civilian noninstitutionalized population to ensure different age distributions of NSLP participants and nonparticipants are accounted for. Significant differences in estimates are noted by * $p < .05$, ** $p < .01$, or *** $p < .001$. Differences were tested using two-sample t-tests comparing WIC participants with income-eligible nonparticipants or higher income nonparticipants. WIC participants consist of children in households that at the time of data collection reported receiving WIC benefits.
– Denotes not applicable
Source: National Health And Nutrition Examination Survey (NHANES) 2011–2016 body measures data. Sample includes NHANES children aged 2–4 years with complete day 1 dietary recall, weight, and height data.

Table C.2. Hemoglobin Status for Young Children WIC Participants and Nonparticipants by Age and Gender

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
All Young Children 1–4 Years Old								
Both genders								
Sample size	2,314	–	902	–	729	–	671	–
Normal	95.9	(0.50)	95.6	(0.83)	96.6	(0.83)	95.7	(1.04)
Low	4.1	(0.50)	4.4	(0.83)	3.4	(0.83)	4.3	(1.04)
Boys								
Sample size	1,158	–	452	–	355	–	343	–
Normal	95.6	(0.72)	96.7	(0.98)	97.1	(1.08)	93.4	(1.71)
Low	4.4	(0.72)	3.3	(0.98)	2.9	(1.08)	6.6	(1.71)
Girls								
Sample size	1,156	–	450	–	374	–	328	–
Normal	96.3	(0.70)	94.5	(1.35)	96.1	(1.26)	98.1 *	(1.13)
Low	3.7	(0.70)	5.5	(1.35)	3.9	(1.26)	1.9 *	(1.13)
1-Year-Olds								
Both genders								
Sample size	590	–	450	–	374	–	328	–
Normal	92.8	(1.36)	94.5	(1.35)	96.1	(1.26)	98.1 *	(1.13)
Low	7.2	(1.36)	5.5	(1.35)	3.9	(1.26)	1.9 *	(1.13)
Boys								
Sample size	308	–	142	–	68	–	95	–
Normal	92.6	(1.88)	97.0	(1.79)	96.8	(2.64)	86.6 *	(4.68)
Low	7.4	(1.88)	3.0	(1.79)	3.2	(2.64)	13.4 *	(4.68)
Girls								
Sample size	282	–	133	–	75	–	72	–
Normal	93.1	(1.98)	91.4	(3.02)	94.6	(3.49)	94.8	(3.86)
Low	6.9	(1.98)	8.6	(3.02)	5.4	(3.49)	5.2	(3.86)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
2-Year-Olds								
Both genders								
Sample size	701	–	282	–	222	–	193	–
Normal	97.0	(0.78)	97.6	(1.04)	96.4	(1.44)	96.6	(1.84)
Low	3.0	(0.78)	2.4	(1.04)	3.6	(1.44)	3.4	(1.84)
Boys								
Sample size	327	–	126	–	108	–	90	–
Normal	96.8	(1.17)	98.5	(1.25)	97.6	(1.72)	93.3	(3.60)
Low	3.2	(1.17)	1.5	(1.25)	2.4	(1.72)	6.7	(3.60)
Girls								
Sample size	374	–	156	–	114	–	103	–
Normal	97.3	(1.01)	96.7	(1.69)	95.2	(2.32)	100.0	(0.00)
Low	2.7	(1.01)	3.3	(1.69)	4.8	(2.32)	0.0	(0.00)
3-Year-Olds								
Both genders								
Sample size	522	–	186	–	171	–	162	–
Normal	97.3	(0.83)	94.0	(2.00)	96.8	(1.55)	100.0 **	(0.00)
Low	2.7	(0.83)	6.0	(2.00)	3.2	(1.55)	0.0 **	(0.00)
Boys								
Sample size	271	–	97	–	93	–	79	–
Normal	96.8	(1.24)	92.6	(2.96)	96.9	(2.07)	100.0 *	(0.00)
Low	3.2	(1.24)	7.4	(2.96)	3.1	(2.07)	0.0 *	(0.00)
Girls								
Sample size	251	–	89	–	78	–	83	–
Normal	97.8	(1.10)	95.4	(2.69)	96.8	(2.31)	100.0	(0.00)
Low	2.2	(1.10)	4.6	(2.69)	3.2	(2.31)	0.0	(0.00)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
4-Year-Olds								
Both genders								
Sample size	501	–	159	–	193	–	149	–
Normal	96.4	(0.98)	96.6	(1.69)	97.4	(1.34)	95.4	(2.20)
Low	3.6	(0.98)	3.4	(1.69)	2.6	(1.34)	4.6	(2.20)
Boys								
Sample size	252	–	87	–	86	–	79	–
Normal	96.1	(1.43)	98.8	(1.31)	96.9	(2.13)	93.5	(3.60)
Low	3.9	(1.43)	1.2	(1.31)	3.1	(2.13)	6.5	(3.60)
Girls								
Sample size	249	–	72	–	107	–	70	–
Normal	96.8	(1.33)	94.2	(3.17)	97.9	(1.60)	97.4	(2.47)
Low	3.2	(1.33)	5.8	(3.17)	2.1	(1.60)	2.6	(2.47)

Notes: "All young children" includes children with missing WIC participation or income. For children 6–59 months old, hemoglobin levels are defined according to the World Health Organization guidelines as: normal if ≥ 110 grams per liter (g/L), and low if < 110 g/L. Estimates are weighted to account for differential probabilities of selection, nonresponse to survey instruments, and differences between the final sample and the U.S. civilian noninstitutionalized population to ensure different age distributions of NSLP participants and nonparticipants are accounted for. Significant differences in estimates are noted by * p < .05, ** p < .01, or *** p < .001. Differences were tested using two-sample t-tests comparing WIC participants with income-eligible nonparticipants or higher income nonparticipants. WIC participants consist of children in households that at the time of data collection reported receiving WIC benefits.
– Denotes not applicable
Source: National Health And Nutrition Examination Survey (NHANES) 2011–2016 body measures data. Sample includes NHANES children aged 1–4 years with complete day 1 dietary recall data and blood biomarker data.

Table C.3. Vitamin D Status for Young Children WIC Participants and Nonparticipants by Age and Gender

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
All Young Children 1–4 Years Old								
Both genders								
Sample size	1,597	–	662	–	478	–	450	–
Adequate	93.1	(0.81)	92.8	(1.26)	91.0	(1.64)	95.4	(1.38)
Insufficient	6.3	(0.78)	6.2	(1.16)	8.3	(1.58)	4.6	(1.38)
Associated with deficiency	0.6	(0.24)	1.0	(0.52)	0.7	(0.45)	0.0 *	(0.00)
Boys								
Sample size	789	–	334	–	225	–	225	–
Adequate	94.0	(1.06)	90.7	(1.97)	91.7	(2.29)	98.9 ***	(0.99)
Insufficient	5.4	(1.01)	8.7	(1.92)	7.3	(2.18)	1.1 ***	(0.99)
Associated with deficiency	0.6	(0.34)	0.7	(0.53)	1.0	(0.76)	0.0	(0.00)
Girls								
Sample size	808	–	328	–	253	–	225	–
Adequate	92.1	(1.24)	95.0	(1.53)	90.2	(2.33)	91.7	(2.63)
Insufficient	7.3	(1.20)	3.6	(1.26)	9.4 *	(2.30)	8.3	(2.63)
Associated with deficiency	0.6	(0.35)	1.4	(0.90)	0.4	(0.47)	0.0	(0.00)
1-Year-Olds								
Both genders								
Sample size	394	–	193	–	83	–	115	–
Adequate	96.3	(1.30)	95.7	(1.92)	94.1	(3.30)	97.3	(2.80)
Insufficient	3.7	(1.30)	4.3	(1.92)	5.9	(3.30)	2.7	(2.80)
Associated with deficiency	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)
Boys								
Sample size	200	–	101	–	33	–	64	–
Adequate	97.0	(1.56)	96.4	(2.41)	91.0	(5.74)	100.0	(0.00)
Insufficient	3.0	(1.56)	3.6	(2.41)	9.0	(5.74)	0.0	(0.00)
Associated with deficiency	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Girls								
Sample size	194	–	92	–	50	–	51	–
Adequate	95.5	(2.10)	95.1	(3.00)	97.3	(3.12)	94.5	(5.72)
Insufficient	4.5	(2.10)	4.9	(3.00)	2.7	(3.12)	5.5	(5.72)
Associated with deficiency	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)
2-Year-Olds								
Both genders								
Sample size	477	–	206	–	148	–	121	–
Adequate	93.1	(1.47)	91.5	(2.36)	92.4	(2.74)	97.1	(2.18)
Insufficient	6.5	(1.43)	7.4	(2.22)	7.6	(2.74)	2.9	(2.18)
Associated with deficiency	0.5	(0.39)	1.1	(0.89)	0.0	(0.00)	0.0	(0.00)
Boys								
Sample size	220	–	95	–	66	–	58	–
Adequate	91.5	(2.35)	89.9	(3.71)	89.8	(4.57)	97.7	(2.87)
Insufficient	7.9	(2.28)	8.8	(3.48)	10.2	(4.57)	2.3	(2.87)
Associated with deficiency	0.5	(0.62)	1.3	(1.41)	0.0	(0.00)	0.0	(0.00)
Girls								
Sample size	257	–	111	–	82	–	63	–
Adequate	94.7	(1.74)	93.2	(2.89)	95.1	(2.95)	96.4	(3.31)
Insufficient	4.9	(1.69)	5.9	(2.71)	4.9	(2.95)	3.6	(3.31)
Associated with deficiency	0.4	(0.47)	0.9	(1.08)	0.0	(0.00)	0.0	(0.00)
3-Year-Olds								
Both genders								
Sample size	371	–	144	–	115	–	110	–
Adequate	90.7	(1.91)	93.0	(2.49)	87.5	(3.77)	91.5	(3.30)
Insufficient	8.5	(1.83)	6.3	(2.39)	10.8	(3.54)	8.5	(3.30)
Associated with deficiency	0.8	(0.57)	0.7	(0.80)	1.6	(1.38)	0.0	(0.00)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Boys								
Sample size	190	–	76	–	62	–	50	–
Adequate	93.0	(2.34)	87.1	(4.69)	91.5	(4.26)	99.3 *	(1.75)
Insufficient	5.5	(2.10)	11.6	(4.48)	5.3	(3.41)	0.7 *	(1.75)
Associated with deficiency	1.5	(1.11)	1.3	(1.57)	3.2	(2.69)	0.0	(0.00)
Girls								
Sample size	181	–	68	–	53	–	60	–
Adequate	88.3	(3.04)	99.1	(1.42)	83.4 *	(6.29)	83.3 *	(6.50)
Insufficient	11.7	(3.04)	0.9	(1.42)	16.6 *	(6.29)	16.7 *	(6.50)
Associated with deficiency	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)	0.0	(0.00)
4-Year-Olds								
Both genders								
Sample size	355	–	119	–	132	–	104	–
Adequate	92.5	(1.73)	90.9	(3.11)	89.9	(3.18)	95.8	(2.66)
Insufficient	6.5	(1.62)	6.8	(2.65)	8.9	(3.01)	4.2	(2.66)
Associated with deficiency	1.1	(0.68)	2.3	(1.68)	1.1	(1.13)	0.0	(0.00)
Boys								
Sample size	179	–	62	–	64	–	53	–
Adequate	94.7	(2.06)	89.4	(4.49)	94.5	(3.60)	98.8	(2.01)
Insufficient	5.0	(2.01)	10.6	(4.49)	4.8	(3.38)	1.2	(2.01)
Associated with deficiency	0.3	(0.47)	0.0	(0.00)	0.7	(1.30)	0.0	(0.00)

Subgroup	All Young Children		WIC Participants		Income-Eligible Nonparticipants		Higher Income Nonparticipants	
	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error	Percent	Standard Error
Girls								
Sample size	176	–	57	–	68	–	51	–
Adequate	90.1	(2.82)	92.4	(4.29)	85.1	(5.30)	92.7	(5.02)
Insufficient	7.9	(2.55)	2.9	(2.71)	13.2	(5.05)	7.3	(5.02)
Associated with deficiency	1.9	(1.30)	4.7	(3.43)	1.6	(1.87)	0.0	(0.00)

Notes: "All young children" includes children with missing WIC participation or income. Serum 25-hydroxyvitamin D levels are defined according to the Institute of Medicine guidelines as: adequate if ≥ 50 and < 125 nanomoles per liter (nmol/L), insufficient if ≥ 30 to < 50 nmol/L, and associated with deficiency if < 30 nmol/L. Estimates are weighted to account for differential probabilities of selection, nonresponse to survey instruments, and differences between the final sample and the U.S. civilian noninstitutionalized population to ensure different age distributions of NSLP participants and nonparticipants are accounted for. Significant differences in estimates are noted by * $p < .05$, ** $p < .01$, or *** $p < .001$. Differences were tested using two-sample t-tests comparing WIC participants with income-eligible nonparticipants or higher income nonparticipants. WIC participants consist of children in households that at the time of data collection reported receiving WIC benefits.
– Denotes not applicable
Source: National Health And Nutrition Examination Survey (NHANES) 2011–2016 body measures data. Sample includes NHANES children aged 1–4 years with complete day 1 dietary recall data and blood biomarker data.