Original Investigation

Prevalence of Childhood and Adult Obesity in the United States, 2011-2012

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IMPORTANCE More than one-third of adults and 17% of youth in the United States are obese, although the prevalence remained stable between 2003-2004 and 2009-2010.

OBJECTIVE To provide the most recent national estimates of childhood obesity, analyze trends in childhood obesity between 2003 and 2012, and provide detailed obesity trend analyses among adults.

DESIGN, SETTING, AND PARTICIPANTS Weight and height or recumbent length were measured in 9120 participants in the 2011-2012 nationally representative National Health and Nutrition Examination Survey.

MAIN OUTCOMES AND MEASURES In infants and toddlers from birth to 2 years, high weight for recumbent length was defined as weight for length at or above the 95th percentile of the sex-specific Centers for Disease Control and Prevention (CDC) growth charts. In children and adolescents aged 2 to 19 years, obesity was defined as a body mass index (BMI) at or above the 95th percentile of the sex-specific CDC BMI-for-age growth charts. In adults, obesity was defined as a BMI greater than or equal to 30. Analyses of trends in high weight for recumbent length or obesity prevalence were conducted overall and separately by age across 5 periods (2003-2004, 2005-2006, 2007-2008, 2009-2010, and 2011-2012).

RESULTS In 2011-2012, 8.1% (95% CI, 5.8%-11.1%) of infants and toddlers had high weight for recumbent length, and 16.9% (95% CI, 14.9%-19.2%) of 2- to 19-year-olds and 34.9% (95% CI, 32.0%-37.9%) of adults (age-adjusted) aged 20 years or older were obese. Overall, there was no significant change from 2003-2004 through 2011-2012 in high weight for recumbent length among infants and toddlers, obesity in 2- to 19-year-olds, or obesity in adults. Tests for an interaction between survey period and age found an interaction in children (P = .03) and women (P = .02). There was a significant decrease in obesity among 2- to 5-year-old children (from 13.9% to 8.4%; P = .03) and a significant increase in obesity among women aged 60 years and older (from 31.5% to 38.1%; P = .006).

CONCLUSIONS AND RELEVANCE Overall, there have been no significant changes in obesity prevalence in youth or adults between 2003-2004 and 2011-2012. Obesity prevalence remains high and thus it is important to continue surveillance.

JAMA. 2014;311(8):806-814. doi:10.1001/jama.2014.732

Supplemental content at jama.com

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Obesity and childhood obesity, in particular, are the focus of many public health efforts in the United States.[1,2] New regulations have been implemented by the US Department of Agriculture for food packages in the Special Supplemental Nutrition Program for Women, Infants and Children,[3] the Centers for Disease Control and Prevention (CDC) has funded state- and community-level interventions,[4] and there have been numerous reports and recommendations issued by the Institute of Medicine,[5] the US Surgeon General,[6] and the White House.[1] Although the prevalence of obesity in the United States is high, with one-third of adults and 17% of children obese,[7] it appears to have leveled off between 2003-2004 and 2009-2010.[8,9] Given the focus of public health efforts on obesity, surveillance of trends in obesity remains important.

The purpose of this study is to provide the most recent national estimates of childhood obesity and analyze trends in childhood obesity between 2003 and 2012. In addition, as a follow-up to recently published estimates of adult obesity,[10] more detailed trend analyses by age are presented. Estimates of overweight prevalence are also presented but are not analyzed for trends because overweight prevalence showed no trends be-

tween 1960 and 2010.[11] Analyses are based on measured values of weight and height from the 2011-2012 National Health and Nutrition Examination Survey (NHANES).

Methods

A detailed description of NHANES is available elsewhere.[12] It is a cross-sectional, complex, probability sample of the US noninstitutionalized population, with both interview and examination components. Although each year represents a nationally representative sample, data are released every 2 years to ensure adequate sample size for analyses and protect confidentiality. The most recent data presented in this analysis are from 2011-2012, and trends were analyzed between 2003-2004 and 2011-2012 with 5 time periods. In 2011-2012, 70% of individuals selected for the survey participated in its examination component compared with 76% in 2003-2004, 77% in 2005-2006, 75% in 2007-2008, and 77% in 2009-2010.[13]

NHANES includes oversampling of different subpopulations, including specific race/Hispanic origin groups. In 2011-2012, Hispanics, non-Hispanic blacks, and non-Hispanic Asians were oversampled. Oversampling of non-Hispanic Asians is a new addition to the NHANES survey. In the collection of NHANES data, survey participants were asked to report their race and whether they were of Hispanic origin. Individuals who reported they were of Hispanic origin were categorized as Hispanic regardless of their race. If they were not of Hispanic origin, they were categorized into 4 different groups (non-Hispanic white, non-Hispanic black, non-Hispanic Asian, and other). All non-Hispanic individuals who reported more than 1 race group were included in the "other" group, which was included in calculations of the total population but not reported separately.

During the NHANES physical examination, weight and height were measured in a standardized fashion.[12] For children younger than 2 years, recumbent length was measured instead of standing height. In 2011-2012, 1.5% (141) of examined participants were missing weight and height or length measurements.

The National Center for Health Statistics Research Ethics Review Board approved NHANES. Written parental permission was obtained for minors younger than 18 years. Children aged 7 to 17 years were also asked to provide documented assent. Written consent was obtained for all adults aged 18 years and older.

Weight status for individuals aged 2 years and older was defined with body mass index (BMI, measured as weight in kilograms divided by height in meters squared) rounded to 1 decimal place. In children and adolescents aged 2 to 19 years, obesity was defined as a BMI at or above the 95th percentile of the CDC sex-specific BMI-for-age growth charts from 2000.[14,15] Overweight was defined as a BMI between the 85th and 95th percentiles. The estimates are presented as greater than or equal to both the 85th and 95th percentiles. Because there is no recommended definition of obesity in children younger than 2 years, excess weight was defined as a weight for recumbent length at or above the 95th percentile on the CDC sex-specific weight for recumbent length growth charts, similar to what has been presented in previous analyses.[9] The World Health Organization (WHO) growth standards have been recommended to monitor growth in children younger than 2 years in the United States.[16] Consequently, the percentage of infants and toddlers at or above the 97.7th percentile of WHO weight for recumbent length growth standards[16] also is presented.

In adults aged 20 years and older, obesity was defined as a BMI greater than or equal to 30. Obesity was further divided into grade 1 (BMI 30-34), grade 2 (BMI 35-39), and grade 3 (BMI ≥40). Overweight among adults was defined as a BMI greater than or equal to 25 but less than 30. The estimates are presented as BMI greater than or equal to 25, 30, 35, and 40.

Prevalence estimates are presented with 95% CIs, which were constructed with the logit transformation.[17] Differences in prevalence between male and female participants overall in 2011-2012 were tested separately in infants, children, and adults at the $\alpha = .05$ level, using 2-sided *t* tests. To test for race/Hispanic origin and age differences in 2011-2012, the null hypothesis of no race/ethnic or age difference was first tested with an analysis of variance. If this hypothesis was rejected, tests for differences between any 2 subgroups were conducted with *t* tests. Tests for differences by race/Hispanic origin were evaluated by comparing the 4 race/Hispanic origin groups described above. Tests for differences by age in children were evaluated with the following comparisons: aged 2 to 5 vs 6 to 11 years, 2 to 5 vs 12 to 19 years, and 6 to 11 vs 12 to 19 years. Similarly, in adults comparisons were made between aged 20 to 39 and 40 to 59 years, 20 to 39 and 60 years or older, and 40 to 59 and 60 years or older. *P* values for test results are shown in the text but not the tables. Adjustments were not made for multiple comparisons.

Trends in the unadjusted prevalence of high weight for recumbent length or obesity from 2003-2004 through 2011-2012 (using 5 time periods: 2003-2004, 2005-2006, 2007-2008, 2009-2010, and 2011-2012) were tested with *t* statistics and orthogonal contrast matrices. Trends were analyzed separately for infants, children, and adults because of different definitions. *P* values for trends, along with the absolute change in obesity prevalence between 2003-2004 and 2011-2012, are reported.

Trends in high weight for recumbent length or obesity were also tested in logistic regression models adjusted for age and race/Hispanic origin with the Satterwaite adjusted *F* statistic.[18] We found a significant interaction between survey period and age among youth and adult women, so we conducted sex- and age-specific logistic regression models of obesity adjusted for race/Hispanic origin (results shown in the Supplement). Survey period was treated as a continuous variable.

Analyses were conducted with SAS version 9.3 and SUDAAN version 11.0. All analyses used NHANES examination sample weights that adjust for nonresponse, noncoverage, and unequal probabilities of selection. Standard errors were estimated with Taylor series linearization to take into account the complex sample design. Pregnant females were excluded from all analyses. Obesity estimates for total adults aged 20 years and older were age standardized to the projected es-

Table 1. Unweighted Sample Sizes by Sex, Age, and Race/Hispanic Origin: NHANES 2011-2012

Age, y	All Race/Hispanic Origin Groups[a]	Non-Hispanic White	Non-Hispanic Black	Non-Hispanic Asian	Hispanic
All					
Birth-<2	584	148	144	42	211
2-5	871	160	276	105	282
6-11	1268	299	360	133	403
12-19	1216	269	372	166	350
20-39	1808	630	422	302	381
40-59	1727	582	491	263	347
≥60	1646	687	451	168	309
Male					
Birth-<2	281	80	60	23	103
2-5	439	75	154	44	144
6-11	650	153	175	69	220
12-19	624	144	190	85	172
20-39	941	329	222	154	196
40-59	826	295	215	127	165
≥60	818	337	225	84	154
Female					
Birth-<2	303	68	84	19	108
2-5	432	85	122	61	138
6-11	618	146	185	64	183
12-19	592	125	182	81	178
20-39	867	301	200	148	185
40-59	901	287	276	136	182
≥60	828	350	226	84	155

Abbreviation: NHANES, National Health and Nutrition Examination Survey.

[a] Includes race/Hispanic origin groups not shown separately.

timates of the 2000 US Census by the direct method, using the age groups 20 to 39 years, 40 to 59 years, and 60 years and older. Crude estimates of obesity among all adults are also presented.

Results

There were 9120 persons with measured weights and heights (or recumbent length) in NHANES 2011-2012. More than half of these (5181) were adults aged 20 years and older and 584 were infants and toddlers. Of the 9120 respondents, 1179 were non-Hispanic Asian. Detailed sample sizes by sex, age, and race/Hispanic origin are shown in **Table 1**.

The prevalence of high weight for recumbent length among infants and toddlers from birth to aged 2 years was 8.1% (95% CI, 5.8%-11.1%) (**Table 2**). There was a significant difference between boys and girls; 5% of boys (95% CI, 3.5%-7.0%) and 11.4% of girls (95% CI, 7.3%-17.4%) had high weight for recumbent length (P = .03). There were no significant differences between the race/Hispanic origin groups (P = .32). When WHO growth charts were used to define excess weight for recumbent length, 7.1% (95% CI, 4.9%-10.3%) of infants and toddlers had high weight for recumbent length (Table 2).

In 2011-2012, 31.8% (95% CI, 29.1%-34.7%) of youth were either overweight or obese, and 16.9% (95% CI, 14.9%-19.2%) of youth were obese (**Table 3**). In 2011-2012, there was no difference in obesity prevalence between boys and girls (P = .77), but there were race/Hispanic origin (P = .001, analysis of variance) and age (P < .001, analysis of variance) differences. The prevalence of obesity was lower in non-Hispanic Asian youth (8.6%; 95% CI, 5.7%-12.7%) than in youth who were non-Hispanic white (14.1%; 95% CI, 10.8%-18.2%; P = .04), non-Hispanic black (20.2%; 95% CI, 16.7%-24.2%; P < .001), or Hispanic (22.4%; 95% CI, 20.3%-24.6%; P < .001). The prevalence of obesity was also lower among non-Hispanic white youth compared with non-Hispanic black youth (P = .048) and Hispanic youth (P < .001). There was no difference in prevalence between non-Hispanic black youth and Hispanic youth (P = .31). More than 8% (8.4%; 95% CI, 5.9%-11.6%) of 2- to 5-year-olds were obese compared with 17.7% (95% CI, 14.5%-21.4%) of 6- to 11-year-olds (P < .001) and 20.5% (95% CI, 17.1%-24.4%) of 12- to 19-year-olds (P < .001). There was no difference in obesity prevalence between 6- to 11- and 12- to 19-year-olds (P = .22). Additional information on the unweighted number of participants with high weight for recumbent length or who were obese is detailed in eTable 1 in the Supplement. The percentage of adolescents aged 12 to 19 years with BMI greater than or equal to 30, meeting the adult definition of obesity, was 13.9% (95% CI, 10.9%-17.7%) in 2011-2012.

Age-adjusted and crude prevalence estimates of overweight and obesity among adults by sex, age, and race/Hispanic origin are shown in **Tables 4** and **5**. The age-adjusted estimates indicate that more than two-thirds (68.5%; 95% CI, 65.2%-71.6%) of adults were either overweight or obese, 34.9%

(95% CI, 32.0%-37.9%) were obese, and 6.4% (95% CI, 5.2%-7.7%) were extremely obese (grade 3 obesity) in 2011-2012. There were significant differences by sex, age, and race/Hispanic origin. For example, the prevalence of grade 3 obesity differed by sex (P = .004), with the prevalence higher in women (8.3%; 95% CI, 6.9%-9.8%) than men (4.4%; 95% CI, 2.8%-6.8%), and by age (P = .03), with the prevalence highest among the middle-age group (7.7%; 95% CI, 6.2%-9.4%) compared with 20- to 39-year-olds (5.6%; 95% CI, 4.4%-7.1%) and adults aged 60 years or older (5.6%; 95% CI, 3.8%-8.0%). The prevalence of grade 3 obesity also varied by race/Hispanic origin (P < .001), with the highest prevalence among non-Hispanic black adults (12.1%; 95% CI, 10.3%-14.0%) compared with 5.6% (95% CI, 4.1%-7.5%) in non-Hispanic white adults, 0.9% (95% CI, 0.3%-2.3%) in non-Hispanic Asian adults, and 5.8% (95% CI, 4.7%-7.1%) in Hispanic adults.

Results of linear unadjusted trend tests between 2003-2004 and 2011-2012 are shown in **Table 6**. Among infants and toddlers from birth to aged 2 years, there was no significant change in high weight for length prevalence (−1.4 percentage points; P = .72). Among children and adolescents aged 2 to 19 years, there was no significant change overall (−0.2 percentage points; P = .78), but there was a significant decrease in obesity prevalence among 2- to 5-year-old children (−5.5 percentage points; P = .03). Among adults, there was no significant change in obesity prevalence in the total population (+2.8 percentage points; P = .09), but there was an increase in prevalence among adults aged 60 years and older (+4.4 percentage points; P = .004).

Sex- and age-specific unadjusted trend results are shown in eTable 2 in the Supplement. In these analyses, the only significant trends were found in women aged 60 years and older (6.6 percentage point increase: 31.5% to 38.1%; P = .006); there was no significant trend among men aged 60 years and older (P = .25). Among girls aged 2 to 5 years, there was a 5.5 percentage point decrease in obesity prevalence, although it was not significant (P = .07). In sex and race/Hispanic origin adjusted analyses of trends, results were similar to those in the unadjusted analyses (eTable 3 in the Supplement). Tests for an interaction between survey period and age found an interaction in children (P = .03) and women (P = .02).

Table 2. Prevalence of High Weight for Recumbent Length, Birth to 2 Years, United States, 2011-2012[a]

	% (95% CI)	
	≥95th Percentile of CDC 2000 Growth Charts	≥97.7th Percentile of WHO 2006 Growth Charts
Total[b]	8.1 (5.8-11.1)	7.1 (4.9-10.3)
Sex		
Boys	5.0 (3.5-7.0)	3.5 (2.3-5.2)
Girls	11.4 (7.3-17.4)	11.0 (7.0-16.8)
Race/ethnicity		
Non-Hispanic		
White	6.6 (3.8-11.3)	5.5 (2.7-11.1)[c]
Black	8.4 (4.6-14.9)	7.3 (3.8-13.5)
Asian	11.8 (3.7-31.7)[c,d]	9.6 (2.7-28.8)[c,d]
Hispanic	9.4 (5.8-14.9)	8.8 (5.2-14.6)[c]

Abbreviations: CDC, Centers for Disease Control and Prevention; WHO, World Health Organization.

[a] Data from the National Health and Nutrition Examination Survey; estimates are weighted.

[b] Includes race/Hispanic origin groups not shown separately.

[c] Relative standard error >30% (but <40%).

[d] No. of cases <10.

Discussion

In 2011-2012, the prevalence of obesity in the United States was 16.9% in youth and 34.9% in adults. The overall prevalence of obesity among youth remained unchanged compared with that in 2009-2010 (16.9%),[9] and there was no significant change since 2003-2004. Similarly, there was no significant change in obesity prevalence among adults between 2003-2004 and 2011-2012. In subgroup analyses, the prevalence of obesity among children aged 2 to 5 years decreased from 14% in 2003-2004 to just over 8% in 2011-2012, and the prevalence increased in women aged 60 years and older, from 31.5% to more than 38%. Because these age subgroup analyses and tests for significance did not adjust for multiple comparisons, these results should be interpreted with caution.

Newly available estimates of obesity among non-Hispanic Asians show that almost 9% of non-Hispanic Asian youth and 10.9% of non-Hispanic Asian adults were obese according to BMI cut points. BMI, however, is not a perfect measure of body fat.[19] It is highly correlated with body fat but does not account for differences in distribution of body fat or differences between race/Hispanic origin groups, sex, and age. Different sex, age, and race/ethnicity groups may have different body fat at the same BMI.[20,21] For example, some research suggests that Asians may have more body fat than whites, especially at lower BMIs.[22] Risk of morbidity and mortality may not be completely captured by BMI.[23] Given concerns that health risks begin at a lower BMI among Asians compared with others, some Asian countries have adopted lower cut points of BMI to define overweight or obesity,[24] and although WHO has recommended continuing to use the standard cutoffs for international comparisons, a WHO expert committee has recommended lower cutoffs for Asians as points for "public health action."[25]

The prevalence of high weight for recumbent length with the CDC growth charts is slightly higher than the prevalence with WHO growth standards. Overall, among infants and toddlers from birth to aged 2 years, 8.1% were at or above the 95th percentile of sex-specific CDC weight for recumbent length growth charts, whereas 7.1% were at or above the 97.7th percentile on the corresponding WHO growth charts. For all groups (sex and race/Hispanic origin), the estimates were slightly higher with the CDC growth charts than WHO growth standards. The 2 sets of growth charts differ in that the CDC charts represent a growth reference based on the general US population in the 1970s, 1980s, and early 1990s.[15] WHO growth standards, on the other hand, represent growth of children in select settings around the world with optimal feeding practices, among other factors.[26]

Table 3. Prevalence of High Body Mass Index by Selected Cut Points for Youth Aged 2 to 19 Years, by Sex, Age, and Race/Hispanic Origin, United States, 2011-2012[a]

	% (95% CI)			
	2-19 y	2-5 y	6-11 y	12-19 y
Overweight or Obese (BMI for Age ≥85th Percentile of the CDC Growth Charts)				
All race/Hispanic origin groups[b]				
All	31.8 (29.1-34.7)	22.8 (18.7-27.6)	34.2 (30.1-38.5)	34.5 (30.1-39.2)
Boys	32.0 (29.2-35.0)	23.9 (20.1-28.2)	33.2 (27.7-39.1)	35.1 (29.7-40.9)
Girls	31.6 (27.2-36.5)	21.7 (14.6-31.0)	35.2 (29.2-41.8)	33.8 (27.9-40.4)
Non-Hispanic white				
All	28.5 (24.0-33.4)	20.9 (14.4-29.2)	29.4 (21.6-38.7)	31.2 (24.3-39.1)
Boys	27.8 (22.5-33.8)	21.8 (14.9-30.8)	26.5 (18.2-36.8)	31.5 (21.9-42.9)
Girls	29.2 (22.7-36.7)	19.9 (10.0-35.7)	32.7 (19.8-48.8)	31.0 (22.7-40.7)
Non-Hispanic black				
All	35.2 (30.2-40.6)	21.9 (16.7-28.2)	38.1 (30.1-46.8)	39.8 (32.9-47.2)
Boys	34.4 (30.3-38.7)	22.2 (16.9-28.6)	39.3 (30.5-48.9)	37.3 (30.3-44.9)
Girls	36.1 (28.7-44.4)	21.6 (14.6-30.8)	36.9 (26.9-48.1)	42.5 (31.9-53.8)
Non-Hispanic Asian				
All	19.5 (15.7-23.9)	9.0 (4.5-17.3)[c,d]	19.9 (16.2-24.3)	24.6 (17.8-32.9)
Boys	25.1 (18.7-32.8)	8.3 (2.5-24.0)[c,d]	24.5 (16.6-34.5)	33.9 (23.2-46.6)
Girls	13.7 (8.6-21.2)	9.7 (3.3-25.0)[c,d]	14.9 (8.9-23.9)	15.0 (7.3-28.3)[d]
Hispanic				
All	38.9 (36.3-41.6)	29.8 (24.0-36.4)	46.2 (41.5-50.9)	38.1 (31.9-44.8)
Boys	40.7 (37.3-44.1)	31.4 (23.5-40.5)	48.7 (41.1-56.3)	39.6 (31.3-48.5)
Girls	37.0 (33.4-40.8)	28.1 (19.7-38.3)	43.6 (37.5-49.8)	36.5 (28.8-45.0)
Obese (BMI for Age ≥95th Percentile of the CDC Growth Charts)				
All race/Hispanic origin groups[b]				
All	16.9 (14.9-19.2)	8.4 (5.9-11.6)	17.7 (14.5-21.4)	20.5 (17.1-24.4)
Boys	16.7 (13.9-19.8)	9.5 (6.2-14.3)	16.4 (12.9-20.6)	20.3 (15.7-25.9)
Girls	17.2 (14.8-19.9)	7.2 (3.8-13.1)	19.1 (15.8-22.8)	20.7 (16.8-25.1)
Non-Hispanic white				
All	14.1 (10.8-18.2)	3.5 (1.4-8.0)[c,d]	13.1 (7.5-22.0)	19.6 (14.1-26.5)
Boys	12.6 (8.3-18.9)	6.3 (2.2-17.0)[c,d]	8.8 (3.9-18.6)[d]	18.3 (10.7-29.5)
Girls	15.6 (11.6-20.7)	0.6 (0.1-5.0)[c,d]	17.9 (10.8-28.1)	20.9 (13.9-30.1)
Non-Hispanic black				
All	20.2 (16.7-24.2)	11.3 (7.3-17.1)	23.8 (17.8-31.1)	22.1 (15.8-29.9)
Boys	19.9 (17.6-22.4)	9.0 (3.7-20.3)[d]	25.9 (19.8-33.2)	21.4 (16.2-27.8)
Girls	20.5 (14.6-28.0)	13.9 (9.0-20.7)	21.7 (13.9-32.2)	22.7 (14.0-34.8)
Non-Hispanic Asian				
All	8.6 (5.7-12.7)	3.4 (0.7-15.4)[c,d]	8.7 (5.5-13.6)	11.1 (6.7-17.8)
Boys	11.5 (7.7-16.8)	1.9 (0.2-18.6)[c,d]	13.2 (8.1-20.9)[c]	14.8 (8.7-24.2)
Girls	5.6 (2.2-13.4)[d]	4.7 (0.6-29.8)[c,d]	3.7 (0.8-14.7)[c,d]	7.3 (2.8-17.9)[c,d]
Hispanic				
All	22.4 (20.3-24.6)	16.7 (12.0-22.7)	26.1 (22.5-29.9)	22.6 (17.7-28.5)
Boys	24.1 (21.1-27.3)	18.0 (11.7-26.8)	28.6 (22.3-35.9)	23.9 (18.2-30.6)
Girls	20.6 (17.6-24.0)	15.2 (7.9-27.1)	23.4 (18.2-29.5)	21.3 (15.0-29.2)

Abbreviations: BMI, body mass index, calculated as weight in kilograms divided by height in meters squared; CDC, Centers for Disease Control and Prevention.

[a] Data from the National Health and Nutrition Examination Survey; estimates are weighted.

[b] Includes race/Hispanic origin groups not shown separately.

[c] No. of cases <10.

[d] Relative standard errors >30% but <40%.

Recent decreases in the prevalence of obesity have been reported in some populations of youth in the United States. Between 2008 and 2011, significant decreases were reported among low-income preschool-aged children participating in federal nutrition programs in 18 states and the US Virgin Islands. The absolute decreases ranged from 0.3 to 2.6 percentage points.[27] Similarly, between 2003 and 2008 a decrease in obesity prevalence among children younger than 6 years was reported in a multisite pediatric practice in eastern Massachusetts.[28] The decrease we observed among preschool-aged children is consistent with the decreases observed in low-income children in the United States overall and in some states individually.

Analyses of trends in obesity prevalence among middle and high school students have shown mixed results. Among public middle school students in New York City, a recent analysis

Table 4. Prevalence of High Body Mass Index (Overweight and Obesity) for Adults Aged 20 Years or Older by Sex, Age, and Race/Hispanic Origin, United States, 2011-2012[a]

	% (95% CI)				
	≥20 y				
	Crude	Age Adjusted[b]	20-39 y	40-59 y	≥60 y
Overweight or Obese (BMI ≥25)					
All race/Hispanic origin groups[c]					
All	69.0 (65.4-72.3)	68.5 (65.2-71.6)	60.3 (54.2-66.0)	75.3 (72.1-78.2)	71.6 (67.0-75.8)
Men	71.6 (68.0-75.0)	71.3 (68.2-74.2)	62.0 (56.2-67.5)	79.1 (74.8-82.8)	74.7 (70.0-78.9)
Women	66.5 (62.5-70.2)	65.8 (62.0-69.5)	58.5 (51.4-65.2)	71.7 (66.2-76.6)	69.1 (63.2-74.5)
Non-Hispanic white					
All	68.5 (64.3-72.5)	67.2 (63.2-71.0)	57.5 (49.6-65.1)	74.8 (71.0-78.4)	71.7 (65.5-77.1)
Men	72.7 (68.4-76.6)	71.4 (67.5-75.0)	59.9 (51.6-67.7)	80.8 (74.8-85.6)	76.1 (69.6-81.6)
Women	64.6 (59.5-69.3)	63.2 (58.0-68.2)	55 (45.0-64.6)	69.1 (61.5-75.7)	67.9 (59.8-75.1)
Non-Hispanic black					
All	76.3 (72.7-79.5)	76.2 (72.6-79.4)	71.9 (65.6-77.4)	80.3 (75.2-84.5)	76.8 (71.7-81.2)
Men	69.1 (64.7-73.3)	69.2 (64.7-73.4)	62.9 (54.8-70.2)	74.4 (68.5-79.6)	71.8 (65.8-77.2)
Women	82.1 (78.4-85.3)	82.0 (78.2-85.1)	80.0 (72.6-85.8)	85.2 (78.8-89.9)	80.2 (73.2-85.7)
Non-Hispanic Asian					
All	38.2 (33.9-42.6)	38.6 (35.1-42.3)	30.3 (24.6-36.7)	44.6 (40.0-49.4)	43.3 (37.0-49.7)
Men	42.4 (35.8-49.3)	43.0 (37.4-48.8)	34.5 (26.1-44.0)	50.6 (42.2-58.8)	45.5 (35.8-55.6)
Women	34.4 (30.2-38.8)	34.7 (30.8-38.7)	26.2 (19.9-33.8)	39.4 (32.6-46.6)	41.5 (35.6-47.7)
Hispanic					
All	77.1 (73.0-80.7)	77.9 (74.2-81.3)	71.7 (65.1-77.6)	84.4 (80.6-87.5)	78.3 (71.9-83.5)
Men	77.9 (71.6-83.1)	78.6 (73.1-83.2)	73.8 (63.5-82.0)	84.7 (78.3-89.5)	77.0 (68.3-83.9)
Women	76.2 (72.0-79.9)	77.2 (73.3-80.6)	69.5 (63.5-74.9)	84.0 (80.0-87.4)	79.3 (70.2-86.1)
Obese (All Grades, BMI ≥30)					
All race/Hispanic origin groups[c]					
All	35.1 (32.3-38.1)	34.9 (32.0-37.9)	30.3 (26.6-34.4)	39.5 (36.1-43.0)	35.4 (31.3-39.6)
Men	33.7 (30.9-36.6)	33.5 (30.7-36.5)	29.0 (23.9-34.6)	39.4 (36.0-42.9)	32.0 (27.5-36.9)
Women	36.5 (32.9-40.3)	36.1 (32.6-39.8)	31.8 (28.3-35.5)	39.5 (35.1-44.2)	38.1 (32.2-44.5)
Non-Hispanic white					
All	33.4 (29.7-37.3)	32.6 (29.0-36.5)	26.2 (21.6-31.4)	38.7 (34.2-43.3)	34.0 (29.4-39.0)
Men	33.1 (30.4-36.0)	32.4 (29.6-35.3)	24.6 (19.1-31.2)	41.1 (37.5-44.8)	31.8 (26.6-37.5)
Women	33.7 (28.1-39.8)	32.8 (27.4-38.8)	27.8 (21.9-34.7)	36.3 (29.4-43.7)	35.9 (28.5-44.0)
Non-Hispanic black					
All	47.8 (44.4-51.4)	47.8 (44.4-51.3)	46 (40.3-51.8)	49.3 (44.5-54.2)	48.5 (42.5-54.6)
Men	37.0 (33.2-41.0)	37.1 (33.1-41.3)	34.9 (28.5-41.9)	38.2 (32.8-43.9)	39.2 (30.6-48.5)
Women	56.7 (52.2-61.1)	56.6 (52.2-60.9)	55.8 (47.3-64.0)	58.6 (50.5-66.2)	54.8 (47.5-61.9)
Non-Hispanic Asian					
All	10.9 (8.3-14.3)	10.8 (8.2-14.2)	11.4 (7.3-17.6)	11.4 (8.0-16.0)	8.9 (5.0-15.3)
Men	10.4 (7.4-14.3)	10.0 (7.1-14.0)	12.0 (6.7-20.6)	11.0 (6.7-17.6)	4.9 (1.6-13.8)[d,e]
Women	11.4 (7.5-17.0)	11.4 (7.5-17.0)	10.9 (6.0-18.9)	11.8 (6.6-20.0)	11.9 (6.1-22.1)
Hispanic					
All	42.0 (38.3-45.7)	42.5 (39.0-46.0)	39.0 (33.2-45.2)	46.0 (39.8-52.3)	42.8 (36.0-49.8)
Men	40.7 (35.9-45.7)	40.1 (35.8-44.6)	42.0 (33.7-50.8)	39.9 (31.3-49.2)	37.3 (30.4-44.7)
Women	43.3 (38.5-48.1)	44.4 (40.0-48.8)	35.8 (30.0-42.0)	51.9 (45.0-58.7)	47.1 (38.3-56.1)

Abbreviation: BMI, body mass index, calculated as weight in kilograms divided by height in meters squared.

[a] Data from the National Health and Nutrition Examination Survey; estimates are weighted.

[b] Age adjusted by the direct method to the 2000 Census population, using the age groups 20-39, 40-50, and 60 years and older.

[c] Includes race/Hispanic origin groups not shown separately.

[d] No. of cases <10.

[e] Relative standard error >30% but <40%.

Table 5. Prevalence of High Body Mass Index (Obesity Grades 2 and 3) for Adults Aged 20 Years or Older by Sex, Age, and Race/Hispanic Origin, United States, 2011-2012[a]

	% (95% CI)				
	≥20 y				
	Crude	Age Adjusted[b]	20-39 y	40-59 y	≥60 y
Obese Grades 2 and 3 (BMI ≥35)					
All race/Hispanic origin groups[c]					
All	14.5 (12.8-16.4)	14.5 (12.8-16.4)	13.6 (11.5-16.1)	15.7 (13.4-18.3)	14.0 (11.1-17.6)
Men	11.9 (9.8-14.2)	11.9 (9.9-14.2)	11.9 (9.5-14.9)	12.2 (9.1-16.3)	11.2 (7.3-16.6)
Women	17.1 (14.9-19.4)	17.0 (14.9-19.3)	15.4 (13.1-18.0)	19.1 (16.2-22.3)	16.3 (12.8-20.6)
Non-Hispanic white					
All	13.5 (11.2-16.2)	13.3 (11.0-16.0)	11.7 (8.9-15.4)	14.8 (12.0-18.2)	13.4 (10.0-17.8)
Men	11.3 (9.0-14.2)	11.2 (9.0-13.9)	10.0 (7.2-13.5)	12.8 (8.6-18.6)	10.9 (7.1-16.4)
Women	15.5 (12.5-19.1)	15.3 (12.3-18.9)	13.7 (10.0-18.3)	16.9 (13.7-20.7)	15.5 (10.9-21.6)
Non-Hispanic black					
All	23.4 (21.3-25.6)	23.3 (21.2-25.5)	24.7 (21.1-28.6)	23.7 (21.0-26.8)	20.1 (15.6-25.4)
Men	16.1 (12.9-19.9)	15.9 (12.8-19.6)	18.0 (11.9-26.2)	15.7 (11.8-20.6)	12.8 (8.4-18.9)
Women	29.3 (26.3-32.5)	29.2 (26.3-32.4)	30.6 (26.5-35.1)	30.4 (26.1-35.1)	25.0 (19.7-31.3)
Non-Hispanic Asian					
All	2.4 (1.3-4.4)	2.4 (1.3-4.5)	2.5 (1.2-4.8)[d,e]	2.5 (0.8-7.7)[d,e]	2.4 (0.8-6.5)[d,e]
Men	1.9 (0.9-4.0)[d,e]	1.7 (0.8-3.4)[d,e]	3.8 (1.7-8.2)[d,e]	0[d]	0.8 (0.1-6.0)[d,e]
Women	2.9 (1.2-7.1)[e]	3.0 (1.2-7.1)[e]	1.1 (0.2-5.4)[d,e]	4.6 (1.3-14.6)[d,e]	3.6 (1.0-11.5)[d,e]
Hispanic					
All	16.0 (13.7-18.5)	16.2 (14.0-18.7)	15.0 (10.6-20.8)	17.2 (13.0-22.5)	16.7 (11.9-22.9)
Men	12.4 (9.4-16.1)	11.9 (9.5-14.8)	14.9 (8.7-24.4)	8.7 (5.0-14.7)	11.9 (8.3-17.0)
Women	19.6 (16.6-23.1)	20.2 (17.1-23.7)	15.1 (10.9-20.6)	25.5 (20.4-31.4)	20.5 (13.7-29.5)
Obese Grade 3 (BMI ≥40)					
All race/Hispanic origin groups[c]					
All	6.4 (5.2-7.7)	6.4 (5.2-7.7)	5.6 (4.4-7.1)	7.7 (6.2-9.4)	5.6 (3.8-8.0)
Men	4.4 (2.7-7.0)	4.4 (2.8-6.8)	3.5 (2.4-5.2)	5.4 (3.1-9.2)	4.1 (1.8-8.8)[e]
Women	8.3 (7.0-9.8)	8.3 (6.9-9.8)	7.7 (6.1-9.7)	9.8 (8.3-11.6)	6.8 (4.8-9.4)
Non-Hispanic white					
All	5.7 (4.2-7.6)	5.6 (4.1-7.5)	4.7 (3.1-7.0)	7.0 (4.9-9.8)	5.0 (3.2-7.7)
Men	3.9 (1.9-7.6)[e]	3.8 (1.9-7.2)[e]	2.6 (1.2-5.6)[e]	5.2 (2.2-11.4)[e]	3.6 (1.5-8.2)[e]
Women	7.4 (5.7-9.5)	7.4 (5.6-9.7)	6.8 (4.4-10.4)	8.8 (7.0-10.9)	6.2 (3.8-9.8)
Non-Hispanic black					
All	12.2 (10.4-14.2)	12.1 (10.3-14.0)	11.9 (10.4-13.5)	13.8 (10.8-17.4)	9.5 (6.0-14.7)
Men	7.0 (5.3-9.1)	6.9 (5.3-8.9)	5.6 (3.5-8.9)	8.9 (6.0-13.0)	5.7 (2.7-11.7)[e]
Women	16.5 (13.5-20.0)	16.4 (13.5-19.8)	17.5 (14.6-20.8)	17.9 (13.2-23.7)	12.1 (7.3-19.5)
Non-Hispanic Asian					
All	0.9 (0.3-2.4)[d,e]	0.9 (0.3-2.3)[d,e]	0.9 (0.2-3.1)[d,e]	1.0 (0.2-4.4)[d,e]	0.5 (0.1-4.5)[d,e]
Men	0.3 (0-2.2)[d,e]	0.2 (0-2.0)[d,e]	0.6 (0.1-5.2)[d,e]	0[d]	0[d]
Women	1.4 (0.5-3.7)[d,e]	1.4 (0.5-3.6)[d,e]	1.1 (0.2-5.4)[d,e]	1.9 (0.4-8.5)[d,e]	1.0 (0.1-8.1)[d,e]
Hispanic					
All	5.8 (4.7-7.1)	5.8 (4.7-7.1)	5.6 (3.9-8.0)	6.0 (4.2-8.6)	5.6 (3.0-10.0)
Men	4.1 (3.1-5.6)	3.7 (2.7-5.0)	5.4 (3.4-8.5)	2.9 (1.5-5.4)[d]	2.2 (0.6-7.8)[d,e]
Women	7.4 (5.7-9.5)	7.6 (6.0-9.7)	5.8 (3.2-10.4)	9.1 (6.3-13.1)	8.2 (4.2-15.4)[e]

Abbreviation: BMI, body mass index, calculated as weight in kilograms divided by height in meters squared.

[a] Data from the National Health and Nutrition Examination Survey; estimates are weighted.

[b] Age adjusted by the direct method to the 2000 Census population, using the age groups 20-39, 40-50, and 60 years and older.

[c] Includes race/Hispanic origin groups not shown separately.

[d] No. of cases <10.

[e] Relative standard error >30% but <40%.

Table 6. Unadjusted Tests of Linear Trends of High Weight for Length[a] and Obesity[b,c] by Age, United States, 2003-2012[d]

	% (95% CI)					Change 2003-2004 to 2011-2012, Point (95% CI)[e]	*P* Value[f]
	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012		
High weight for length (birth-<2 y)							
All	9.5 (7.1 to 12.7)	8.2 (6.1 to 10.9)	9.5 (7.5 to 12)	9.7 (7.6 to 12.3)	8.1 (5.8 to 11.1)	−1.4 (−4.9 to 2.1)	.72
Childhood obesity, 2-19 y							
2-19	17.1 (14.6 to 20)	15.4 (12.8 to 18.5)	16.8 (14.3 to 19.7)	16.9 (15.4 to 18.4)	16.9 (14.9 to 19.2)	−0.2 (−3.4 to 3)	.78
2-5	13.9 (10.8 to 17.6)	10.7 (8.5 to 13.3)	10.1 (7.8 to 12.9)	12.1 (9.9 to 14.8)	8.4 (5.9 to 11.6)	−5.5 (−9.6 to −1.4)	.03
6-11	18.8 (16.2 to 21.7)	15.1 (11.3 to 20.1)	19.6 (17.2 to 22.4)	18.0 (16.3 to 19.8)	17.7 (14.5 to 21.4)	−1.1 (−5.2 to 3.0)	.88
12-19	17.4 (14 to 21.3)	17.8 (14.2 to 22)	18.1 (14.7 to 22)	18.4 (15.8 to 21.3)	20.5 (17.1 to 24.4)	3.1 (−1.7 to 7.9)	.20
Adult obesity, ≥20 y							
≥20	32.2 (29.7 to 34.8)	34.3 (31.5 to 37.3)	33.7 (31.5 to 36.1)	35.7 (33.8 to 37.7)	34.9 (32 to 37.9)	2.8 (−0.8 to 6.4)	.09
20-39	28.5 (25.3 to 31.9)	29.1 (25 to 33.7)	30.7 (26.6 to 35.1)	32.6 (29 to 36.4)	30.3 (26.6 to 34.4)	1.9 (−2.8 to 6.6)	.20
40-59	36.8 (33 to 40.8)	40.4 (36.1 to 44.7)	36.2 (32.8 to 39.8)	36.6 (34.5 to 38.7)	39.5 (36.1 to 43)	2.7 (−2.1 to 7.5)	.78
≥60	31.0 (28.2 to 33.9)	33.4 (31.1 to 35.9)	35.1 (32.9 to 37.3)	39.7 (36.6 to 42.9)	35.4 (31.3 to 39.6)	4.4 (−0.3 to 9.1)	.004

[a] High weight for length defined as at or above the 95th percentile on the sex-specific Centers for Disease Control and Prevention (CDC) 2000 growth charts.

[b] Obesity for youth aged 2 to 19 years defined as body mass index (BMI) at or above the 95th percentile on the CDC sex-specific BMI for age growth charts.

[c] Obesity in adults defined as BMI ≥30.

[d] Data from the National Health and Nutrition Examination Survey.

[e] Percentage points.

[f] From the *t* test.

found a decrease in obesity prevalence between 2006-2007 and 2010-2011.[29] Other researchers using a school-based survey found an increase in obesity prevalence among US adolescents between 2001-2002 and 2005-2006 but no change between 2005-2006 and 2009-2010.[30] In addition, data from the Youth Risk Behavior Surveillance System showed an increase in the prevalence of obesity between 1999 and 2011 but no change between 2009 and 2011.[31] NHANES results among middle school- and high school-aged children show no significant change in prevalence between 2003-2004 and 2011-2012.

Data from many countries have shown a decline or stabilization of obesity levels, especially in children.[32] For example, in Germany a study of children aged 4 to 16 years found a significant decline in overweight or obesity between 2004 and 2008 among the youngest children (aged 4-7 years) and a stabilization in other ages.[33] In England, the rate of increase in adult BMI has decreased.[34]

Analysis of time trends depends on what is chosen as the initial point of examination. In this analysis, we selected 2003-2004 as the starting point because previous analyses had shown no change in sex- or race/Hispanic origin-specific trends in obesity prevalence between 2003-2004 and 2009-2010.[8,9] The selection of the initial point can have an effect on findings. For example, analyses of childhood obesity trends between 1976-1980 and 2011-2012 show an increase in childhood obesity, whereas trends between 2003-2004 and 2011-2012 do not.

In the current analysis, trend tests were conducted on different age groups. When multiple statistical tests are undertaken, by chance some tests will be statistically significant (eg, 5% of the time using α of .05). In some cases, adjustments are made to account for these multiple comparisons, and a *P* value lower than .05 is used to determine statistical significance. In the current analysis, adjustments were not made for multiple comparisons, but the *P* value is presented.

Conclusions

Overall, there have been no significant changes in obesity prevalence in youth or adults between 2003-2004 and 2011-2012. Obesity prevalence remains high and thus it is important to continue surveillance.

ARTICLE INFORMATION

Author Contributions: Dr Ogden had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Ogden, Flegal.
Analysis and interpretation of data: Ogden, Carroll, Kit, Flegal.
Drafting of the manuscript: Ogden.
Critical revision of the manuscript for important intellectual content: Ogden, Carroll, Kit, Flegal.
Statistical analysis: Carroll, Kit.
Study supervision: Ogden.

Conflict of Interest Disclosures: All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Role of the Sponsors: All data used in this study were collected by the National Center for Health Statistics, Centers for Disease Control and Prevention (CDC). The CDC reviewed and approved this article before submission.

Disclaimer: The findings and conclusions in this article are those of the authors and not necessarily those of the CDC.

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