Trends in Obesity Prevalence Among Children and Adolescents in the United States, 1988-1994 Through 2013-2014

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Abstract

IMPORTANCE—Previous analyses of obesity trends among children and adolescents showed an increase between 1988–1994 and 1999–2000, but no change between 2003–2004 and 2011–2012, except for a significant decline among children aged 2 to 5 years.

OBJECTIVES—To provide estimates of obesity and extreme obesity prevalence for children and adolescents for 2011–2014 and investigate trends by age between 1988–1994 and 2013–2014.

DESIGN, SETTING, AND PARTICIPANTS—Children and adolescents aged 2 to 19 years with measured weight and height in the 1988–1994 through 2013–2014 National Health and Nutrition Examination Surveys.

EXPOSURES—Survey period.

MAIN OUTCOMES AND MEASURES—Obesity was defined as a body mass index (BMI) at or above the sex-specific 95th percentile on the US Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts. Extreme obesity was defined as a BMI at or above 120% of the sex-specific 95th percentile on the CDC BMI-for-age growth charts. Detailed estimates are presented for 2011–2014. The analyses of linear and quadratic trends in prevalence were

conducted using 9 survey periods. Trend analyses between 2005–2006 and 2013–2014 also were conducted.

RESULTS—Measurements from 40 780 children and adolescents (mean age, 11.0 years; 48.8% female) between 1988–1994 and 2013–2014 were analyzed. Among children and adolescents aged 2 to 19 years, the prevalence of obesity in 2011–2014 was 17.0% (95% CI, 15.5%−18.6%) and extreme obesity was 5.8% (95% CI, 4.9%−6.8%). Among children aged 2 to 5 years, obesity increased from 7.2% (95% CI, 5.8%−8.8%) in 1988–1994 to 13.9% (95% CI,10.7%−17.7%) (P < .001) in 2003–2004 and then decreased to 9.4% (95% CI, 6.8%−12.6%)(P= .03) in 2013–2014. Among children aged 6 to 11 years, obesity increased from 11.3% (95% CI, 9.4%−13.4%) in 1988–1994 to 19.6% (95% CI, 17.1%−22.4%) (P< .001) in 2007–2008, and then did not change (2013–2014: 17.4% [95% CI, 13.8%−21.4%]; P= .44). Obesity increased among adolescents aged 12 to 19 years between 1988–1994 (10.5% [95% CI, 8.8%−12.5%]) and 2013–2014 (20.6% [95% CI, 16.2%−25.6%]; P< .001) as did extreme obesity among children aged 6 to 11 years (3.6% [95% CI, 2.5%−5.0%] in 1988–1994 to 4.3% [95% CI,3.0%−6.1%] in 2013–2014; P= .02) and adolescents aged 12 to 19 years (2.6% [95% CI,1.7%−3.9%] in 1988–1994 to 9.1% [95% CI, 7.0%−11.5%] in 2013–2014; P< .001). No significant trends were observed between 2005–2006 and 2013–2014 (P value range, .09-.87).

CONCLUSIONS AND RELEVANCE—In this nationally representative study of US children and adolescents aged 2 to 19 years, the prevalence of obesity in 2011–2014 was 17.0% and extreme obesity was 5.8%. Between 1988–1994 and 2013–2014, the prevalence of obesity increased until 2003–2004 and then decreased in children aged 2 to 5 years, increased until 2007–2008 and then leveled off in children aged 6 to 11 years, and increased among adolescents aged 12 to 19 years.

Obesity and extreme obesity in children and adolescents are associated with elevated blood pressure and abnormal fasting glucose[1] and, long-term, often tracks into adulthood.[2] In adults, obesity can result in increased morbidity and mortality.[3,4] Obesity in children and adolescents is defined based on body mass index (BMI; calculated as weight in kilograms divided by height in meters squared).[5] The most recent estimate for the prevalence of child and adolescent obesity in the United States is 17% and is based on data for 2011–2014.[6]

Many trend analyses have been published on obesity among children and adolescents based on different time periods. These include analyses of increasing trends between 1963–1965 and 1988–1994,[7,8] 1971–1975 and 1988–1994,[9] 1988–1994 and 1999–2000,[10] 1999–2000 and 2007–2008,[11] 1999–2000 and 2009–2010,[12,13] and 1999–2000 and 2011–2012.[14] Analyses of obesity trends in children and adolescents between 2003–2004 and 2011–2012[15] and between 1999–2000 and 2013–2014[6] showed an increase between 1999–2000 and 2013–2014 but no change between 2003–2004 and 2013–2014. Age-specific trend analyses of obesity prevalence between 2003–2004 and 2011–2012 showed no significant change in children aged 6 to 11 years or in adolescents aged 12 to 19 years, but a decrease in children aged 2 to 5 years.[15] Trend analyses showing an increase in extreme obesity prevalence between 1999–2000 and 2011–2012 also have been published.[14]

Using data from the 2013–2014 National Health and Nutrition Examination Survey (NHANES), the purpose of this study was to investigate age-specific trends in the prevalence

of obesity and extreme obesity in children and adolescents. Only some[7–11,14,15] of the published analyses included age-specific trends and no analyses of total or age-specific trends have been analyzed for data between 1988–1994 and all the NHANES surveys since 1999–2000. To have sufficient power to fully investigate differences in trends by age and because no analyses of obesity or extreme obesity among children and adolescents have included trends from 1988–1994 to the present, this study focused on trends for that period. Detailed subgroup estimates for child and adolescent obesity and extreme obesity prevalence are also presented for 2011–2014.

Methods

Details about NHANES are available elsewhere.[16] In brief, NHANES is a nationally representative, cross-sectional survey of the civilian, noninstitutionalized US population, with both interview and examination components.[17] A complex probability sample, NHANES includes oversampling of certain subgroups. In 2013–2014, non-Hispanic black, non-Hispanic Asian, and Hispanic individuals, among other demographic groups, were oversampled. Beginning in 1999, NHANES has been continuously collecting data and releasing it publicly every 2 years. Prior to the continuous survey, 3 NHANES were conducted, including in 1988–1994 (NHANES III). The NHANES participants aged 18 years or older provided consent, children and adolescents aged 7 to 17 years provided documented assent, and parental permission was obtained for those younger than 18 years. NHANES was approved by the National Center for Health Statistics research ethics review board. In 2013–2014, 76% of children and adolescents aged 1 to 19 years selected for the survey participated in the examination component of the survey.[18] Comparable numbers for this age group for 1988–1994, 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, and 2011–2012 ranged between 77% and 87%.[18]

During the examination component of NHANES 2013–2014, standardized measurements of weight and height were obtained. Standardized measurement procedures were used between 1988 and 2014. Child and adolescent obesity was defined as a BMI at or above the sex-specific 95th percentile on the US Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts.[19,20] Extreme obesity was defined as a BMI at or above 120% of the sex-specific 95th percentile on the CDC BMI-for-age growth charts.[21,22]

Demographic covariates included sex, age, race/Hispanic origin, and education level of the household head. Age was reported during the NHANES examination and was grouped as children aged 2 to 5 years and 6 to 11 years and adolescents aged 12 to 19 years. During the interview, participants or proxy respondents (such as parents) were asked to report race and Hispanic origin. Data on race/Hispanic origin were categorized as non-Hispanic white, non-Hispanic black, non-Hispanic Asian, Hispanic, and other for 2011–2014. For trend analyses, race and Hispanic origin was categorized as non-Hispanic white, non-Hispanic black, Mexican American, and other because reliable estimates for non-Hispanic Asian and Hispanic were not possible across all the survey periods. Individuals reporting multiple races were categorized as other and were included in the analyses of the entire population but not shown separately. Education level of the household head was categorized as less than a high

school degree, a high school degree (including those who received a general equivalency diploma), and greater than a high school degree.

Estimates of prevalence and 95% confidence intervals were examined by sex, age group, race/Hispanic origin, and education level of the household head using data from NHANES 2011–2014 (4 years of data). Combining 2 cycles of NHANES data increases the efficiency of the prevalence estimates by increasing the sample size. Demographic differences in obesity and extreme obesity among US children and adolescents for 2011–2014 were tested using logistic regression models.

The 2-year cycles of NHANES were used for trend tests of obesity and extreme obesity to increase the number of time points. Analyses of both unadjusted and adjusted trends in obesity and extreme obesity prevalence were conducted using the following periods: 1988–1994, 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, 2011–2012, and 2013–2014.

Overall and age-specific trends in obesity and extreme obesity prevalence among children and adolescents aged 2 to 19 years were conducted. Unadjusted trends as well as trends adjusted for sex, race/Hispanic origin, and education level of the household head were tested using logistic regression models in which the survey period was treated as a continuous variable using the midpoint of the period as the time point. Linear trends were tested separately and quadratic trends were tested with both linear and quadratic terms included in the models. If the quadratic term was significant in the model that contained the linear term, then the model with the quadratic term was the better fit. If a quadratic trend was found, Joinpoint software was used to find the inflection point and differences in slopes between the 2 segments were tested using piecewise linear regression.[23] Unadjusted linear trend analyses during the most recent decade (2005–2006 to 2013–2014) also were conducted. Significance was assessed using the Satterthwaite-adjusted F test.[24]

To characterize the shift in the distribution of BMI over time, the internal sex-and age-specific values of the 50th and 95th percentiles of BMI are presented for 1988–1994 and 2011–2014. Because BMI varies with age in children and adolescents, percentiles are presented by single year of age. Percentiles are shown graphically for males and females.

All estimated prevalences, standard errors, and percentiles were based on weighted data. The NHANES examination sample weights adjusted for oversampling, nonresponse, and noncoverage. Standard errors were estimated using Taylor series linearization.[25] The complex sample design was incorporated in the standard error estimates and all statistical testing. Confidence intervals were constructed using the approach described by Korn and Graubard.[26] In testing for differences or trends, a 2-sided P value of .05 was used to assess statistical significance. No adjustments were made for multiple comparisons. Analyses were conducted using SAS version 9.3 (SAS Institute Inc), SUDAAN version 11.0 (RTI International), and Joinpoint version 3.0.1 (National Cancer Institute).

Results

Obesity Prevalence in 2011–2014

Among children and adolescents aged 2 to 19 years in 2011–2014, 139 of 7017 (2%) were missing values for weight, height, or both and were not included in the analysis. Of these 139 children and adolescents, 18 (13%) were pregnant. The un-weighted sample sizes in 2011–2014 appear in Table 1 by sex, age, and race/Hispanic origin. In the analyses that included education level of the household head, an additional 224 (3%) children and adolescents were excluded due to missing data.

Weighted estimates of obesity and extreme obesity prevalence appear in Table 2 by sex, age, and race/Hispanic origin in 2011–2014. Among children and adolescents aged 2 to 19 years, the prevalence of obesity in 2011–2014 was 17.0%[6] (95% CI, 15.5%–18.6%) and extreme obesity was 5.8% (95% CI, 4.9%–6.8%). Among children aged 2 to 5 years, the prevalence of obesity was 8.9% (95% CI, 7.1%–11.0%), it was 17.5% (95% CI, 15.2%–20.1%) among children aged 6 to 11 years, and it was 20.5% (95% CI, 17.8%–23.5%) among adolescents aged 12 to 19 years. Estimates of obesity and extreme obesity by age group and education level of the household head appear in eTable 1 in the Supplement.

In 2011–2014, there were significant differences in obesity and extreme obesity prevalence by age, race/Hispanic origin, and education level of household head. The odds ratios (ORs) from logistic regression models containing all 4 demographic covariates appear in eTable 2 in the Supplement. The odds of obesity were significantly higher among children aged 6 to 11 years (17.5% [95% CI, 15.2%–20.1%]; OR, 2.29 [95% CI,1.73–3.03]) and adolescents aged 12 to 19 years (20.5% [95% CI,17.8%–23.5%]; OR, 2.82 [95% CI, 2.08–3.84]) compared with children aged 2 to 5 years (8.9%; 95% CI, 7.1%–11.0%). The odds of obesity also were higher among non-Hispanic black children and adolescents (19.5% [95% CI, 17.1%–22.2%]; OR, 1.34 [95% CI, 1.03–1.75]) and Hispanic children and adolescents(21.9% [95% CI, 20.0%–23.9%]; OR, 1.48 [95% CI, 1.23–1.78]) compared with non-Hispanic white children and adolescents(14.7%; 95% CI, 12.3%–17.3%).

In contrast, the odds for obesity were lower for non-Hispanic Asian children and adolescents (8.6% [95% CI, 6.4%–11.2%]; OR, 0.57 [95% CI, 0.39–0.82]) compared with non-Hispanic white children and adolescents. The odds of obesity were higher among children and adolescents in households headed by individuals with less than a high school degree (21.0% [95% CI, 18.5%–23.8%]; OR, 1.41 [95% CI, 1.13–1.75]) or a high school degree (22.2% [95% CI, 19.1%–25.5%]; OR, 1.61 [95% CI, 1.27–2.04]) compared with those in households in which the household head had greater than a high school degree (14.1%; 95% CI, 12.0%–16.4%). Findings were the same in relation to extreme obesity.

Trend Analyses

Among the 3598 children and adolescents aged 2 to 19 years in 2013–2014, 75 (2%) were missing values of weight, height, or both and were not included in the analysis. Of these 75 children and adolescents, 10 (13%) were pregnant. Analyses that included education level of the household head excluded an additional 93 children and adolescents (3%) due to missing

data. Measurements from 40 780 children and adolescents (mean age, 11.0 years; 48.8% female) between 1988–1994 and 2013–2014 were analyzed.

Unadjusted trends in prevalence of obesity and extreme obesity appear in Figure 1 (children and adolescents aged 2–19 years) and by age group in Table 3 and in eFigures 1 and 2 in the Supplement. Among children and adolescents aged 2 to 19 years, there was a significant quadratic trend in obesity (P= .004) suggesting a change in slope (Figure 1 and Table 3) between 1988–1994 and 2013–2014. The Joinpoint analysis and piecewise regression analysis found an inflection point at 2003–2004 and a significant difference (P= .01) in slopes before and after this period. Obesity increased until 2003–2004 (slope, 0.51 [95% CI, 0.35 to 0.67]; P< .001) and did not change after that period (slope, 0.08 [95% CI, −0.15 to 0.30]; P= .49). The prevalence of extreme obesity increased between 1988–1994 and 2013–2014 (linear P< .001). In the models adjusted for sex, age, race/Hispanic origin, and education level of the household head, results related to obesity and extreme obesity did not change (eTable 3 in the Supplement).

There was a significant quadratic trend in obesity prevalence between 1988–1994 and 2013–2014 among children aged 2 to 5 years (P= .001) (Table 3). The Joinpoint analysis and the piecewise regression analysis found an inflection point in 2003–2004 and a significant difference (P< .001) in the slope before and after this period. The prevalence of obesity increased until 2003–2004 (slope, 0.42 [95% CI, 0.23 to 0.62], P< .001) and then decreased (slope, −0.33 [95% CI, −0.63 to −0.04]; P= .03). There was no change in extreme obesity prevalence in this age group between 1988–1994 and 2013–2014 (P= .59). The results related to obesity and extreme obesity did not change in the models adjusted for sex, race/ Hispanic origin, and education level of the household head (eTable 3 in the Supplement).

There was a significant quadratic trend in obesity among children aged 6 to 11 years (P= .03; Table 3). The Joinpoint analysis identified a potential inflection point at 2007–2008; however, the piecewise regression analysis did not find a significant difference (P= .06) in slope before and after this period. The prevalence of obesity increased between 1988–1994 and 2007–2008 (slope, 0.44 [95% CI, 0.26 to 0.61]; P< .001) but did not change after that period (slope, −0.23 [95% CI, −0.82 to 0.36]; P= .44). Extreme obesity increased between 1988–1994 and 2013–2014 (linear P= .02). The results related to obesity and extreme obesity did not change in the models adjusted for sex, race/Hispanic origin, and education level of the household head (eTable 3 in the Supplement).

Among adolescents, there was a significant increasing linear trend for both obesity (P< .001) and extreme obesity (P< .001), but no quadratic trends between 1988–1994 and 2013– 2014 (Table 3). The results related to obesity and extreme obesity did not change in the models adjusted for sex, race/Hispanic origin, and education level of the household head (eTable 3 in the Supplement).

No unadjusted or adjusted linear trends in obesity or extreme obesity prevalence during the last decade (2005–2006 through 2013–2014) were significant for any age group (eTable 4 in the Supplement).

The sex-and age-specific values of the 50th and 95th percentiles of BMI in 1988–1994 and 2011–2014 appear in Figure 2. For example, in 1988–1994, the 95th percentile of BMI among 17-year-old males was 31.5 (ie, 5% of males had a BMI >31.5), and in 2011–2014 the 95th percentile was 36.2 (ie, 5% of males had a BMI >36.2). Change over time in the 95th percentile for both males and females increased with age. Among males, the 95th percentiles of BMI in 1988–1994 were generally lower than in 2011–2014. Among females, there was little difference between the 95th percentiles in 1988–1994 and 2011–2014 until they reached the age of 10 years (BMI unit range, 0.3–1.8) compared with the ages of 11 to 19 years during which the majority of values in 1988–1994 compared with 2011–2014 were 5.5 or more BMI units lower. In contrast, little change can be seen in the 50th percentiles of BMI over time, illustrating the increased skewness of the BMI distribution among older children and adolescents.

Discussion

Trends in child and adolescent obesity varied by age. During an approximately 25-year period (1988–1994 through 2013–2014), the prevalence increased until 2003–2004 but then decreased among children aged 2 to 5 years. Among children aged 6 to 11 years, the prevalence increased until 2007–2008 and then leveled off. Among adolescents aged 12 to 19 years, obesity prevalence increased between 1988–1994 and 2013–2014. Trends in extreme obesity prevalence showed no change between 1988–1994 and 2013–2014 among children aged 2 to 5 years, whereas it increased among children aged 6 to 11 years and among adolescents aged 12 to 19 years. No significant changes in either obesity or extreme obesity were seen between 2005–2006 and 2013–2014, suggesting any recent changes among adolescents were small.

Other research conducted in the United States has shown declines in obesity prevalence among children aged 2 to 5 years. Data on low-income preschool-aged children who participate in federal nutrition programs,[27] clinical data on children who participate in Kaiser Permanente in southern California,[28] and children in a health maintenance organization in Boston, Massachusetts[29] have also shown small decreases in obesity prevalence among preschool-aged children.

Studies of trends in obesity prevalence among US adolescents have shown inconsistent results. Results based on the Youth Risk Behavioral Surveillance System (YRBS) found a significant linear increase in obesity prevalence based on self-reported weight and height between 1999 and 2013.[30] Similar to the results from YRBS, NHANES showed an increase in prevalence among adolescents between 1999 and 2012,[14] but no significant changes were found in this study between 2005–2006 and 2013–2014. On the other hand, data from electronic health records in southern California showed a significant decline (4.5%) in obesity prevalence between 2008 and 2013 among adolescents.[28]

Studies conducted in children and adolescents suggest that those with very high BMIs (based on varying definitions) are at a higher risk for elevated blood pressure, abnormal glucose, and abnormal lipids.[22,31,32] In addition, research has shown low health-related

quality-of-life levels in children and adolescents with extreme obesity[33] and weight-based victimization in children and adolescents with obesity.[34]

Body mass index is an imperfect measure of body fat and health risk. There are racial and ethnic differences in body fat at the same BMI level.[35,36] Among children and adolescents, the definition of obesity is statistical.[19] Children and adolescents are compared with a group of US children in the 1960s to early 1990s, so the prevalence of obesity is dependent on the characteristics of the age-specific population during that period. In addition, among young children, small changes in weight can lead to relatively large changes in BMI percentile.

Strengths and Limitations

A strength of NHANES is that weight and height are measured rather than reported. Research has shown that adolescents and adults underreport weight and overreport height, which leads to biased (lower) BMI values.[37] Parental report of weight and height can result in underreporting of height, which results in biased (higher) BMI values.[38] NHANES measurements are standardized over time and transferred directly from the scale and stadiometer into the database, reducing the potential for recording errors.

Study limitations also need to be considered. NHANES sample sizes for some demographic subgroups, as well as the number of primary sampling units, are small. Although NHANES is released every 2 years and the estimates based on those 2 years are nationally representative, the NHANES survey design is based on 4 years of data collection.[16] Combining multiple survey cycles is recommended for many analyses, such as estimates of conditions with low prevalence (<5%).[39] Estimates based on 4 years of data have a greater number of degrees of freedom, larger sample sizes (denominators), and greater numbers of cases (numerator), and are therefore more stable than the estimates based on 2 years of data, particularly when examining subgroups. For example, the sample size was 31 with only 4 degrees of freedom for non-Hispanic Asian females aged 2 to 5 years with measured weight and height and fewer than 10 obese persons in 2013–2014 compared with a sample size of 92 with 15 degrees of freedom for this subgroup using 4 years of data from 2011–2014. Even with combined data, there were still subgroups in which the number of cases was less than 10, especially for extreme obesity. As a result, detailed estimates of obesity by subgroup were based on 4 years of NHANES data, similar to a recent publication.[6]

The current analysis contains multiple statistical significance tests to determine the trends and differences. Multiple statistical tests can result in some outcomes being statistically significant merely by chance. Consequently, the results presented should be interpreted with this in mind.

Conclusions

In this nationally representative study of US children and adolescents aged 2 to 19 years, the prevalence of obesity in 2011–2014 was 17.0% and extreme obesity was 5.8%. Between 1988–1994 and 2013–2014, the prevalence of obesity increased until 2003–2004 and then decreased in children aged 2 to 5 years, increased until 2007–2008 and then leveled off in children aged 6 to 11 years, and increased among adolescents aged 12 to 19 years.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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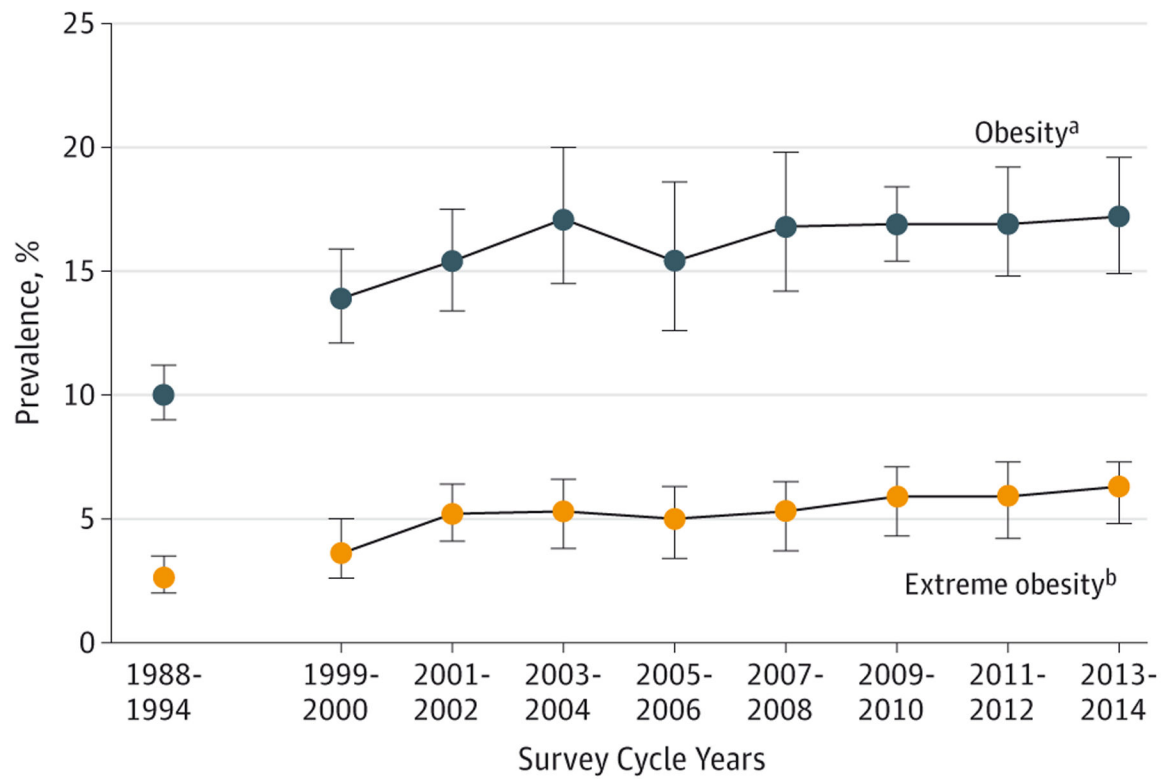
Figure 1.
Prevalence of Obesity and Extreme Obesity in US Children and Adolescents Aged 2 to 19
Years From 1988–1994 Through 2013–2014
Data are from the National Health and Nutrition Examination Surveys. The error bars
indicate 95% confidence intervals. The prevalence estimates are weighted.
[a] Defined as at or above the sex-specific 95th percentile on the US Centers for Disease
Control and Prevention (CDC) BMI-for-age growth charts.
[b] Defined as at or above 120% of the sex-specific 95th percentile on the CDC BMI-for-age
growth charts.
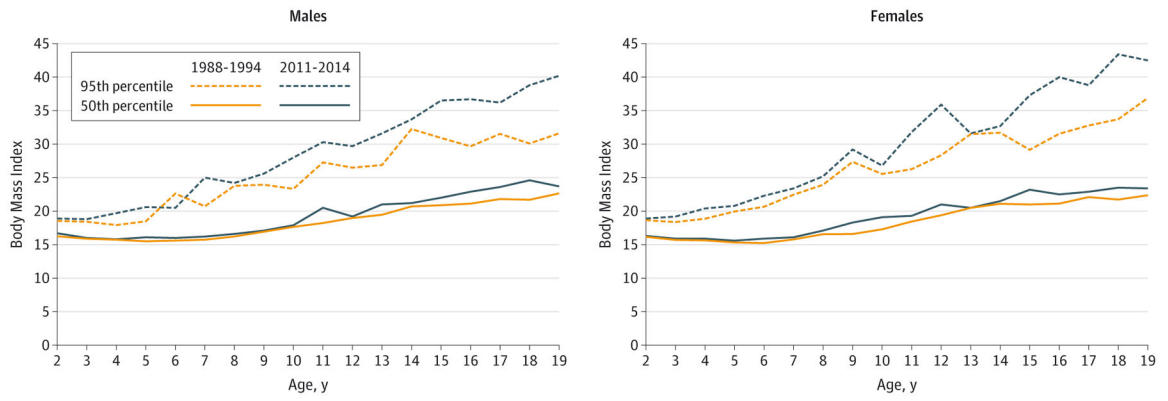
Figure 2.
Weighted Estimates for US Children and Adolescents Aged 2 to 19 Years in the 50th and
95th Percentiles of Body Mass Index From 1988–1994 and 2011–2014
Data are from the National Health and Nutrition Examination Surveys.

Table 1.

Unweighted Sample Sizes for Children and Adolescents Aged 2 to 19 Years by Sex, Age Group, and Race/Hispanic Origin: NHANES 2011–2014

Age Group, y	All Groups[a]	No. of Participants by Race/Hispanic Origin			
		Non-Hispanic			Hispanic
		White	Black	Asian	
All participants					
2–19	6878	1647	1910	728	2178
2–5	1714	390	485	175	547
6–11	2562	638	714	236	810
12–19	2602	619	711	317	821
Males					
2–19	3507	865	986	358	1094
2–5	867	188	260	83	279
6–11	1315	340	361	119	417
12–19	1325	337	365	156	398
Females					
2–19	3371	782	924	370	1084
2–5	847	202	225	92	268
6–11	1247	298	353	117	393
12–19	1277	282	346	161	423

Abbreviation: NHANES, National Health and Nutrition Examination Surveys.

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

Table 2.

Weighted Prevalence of Obesity and Extreme Obesity in US Children and Adolescents Aged 2 to 19 Years by Sex, Age, and Race/Hispanic Origin: NHANES 2011–2014

	Weighted Prevalence by Age Group, % (95% CI)			
	2–19 y	2–5 y	6–11 y	12–19 y
Obesity (BMI at or above the sex-specific 95th percentile on the CDC BMI-for-age growth charts)				
All race/Hispanic origin groups[a]				
Both sexes	17.0 (15.5–18.6)	8.9 (7.1–11.0)	17.5 (15.2–20.1)	20.5 (17.8–23.5)
Males	16.9 (15.1–19.0)	9.2 (6.5–12.4)	17.6 (14.6–20.9)	20.1 (16.8–23.6)
Females	17.1 (15.1–19.3)	8.6 (6.2–11.6)	17.5 (14.9–20.3)	21.0 (17.3–25.2)
Non-Hispanic white				
Both sexes	14.7 (12.3–17.3)	5.2 (3.1–8.3)	13.6 (9.8–18.3)	19.6 (14.7–25.3)
Males	14.3 (11.2–17.9)	6.1 (2.6–12.0)[b]	13.0 (9.0–17.9)	18.7 (13.0–25.7)
Females	15.1 (11.7–19.1)	4.4 (2.0–8.2)	14.4 (9.3–20.9)	20.4 (13.6–28.8)
Non-Hispanic black				
Both sexes	19.5 (17.1–22.2)	10.4 (7.5–14.0)	21.4 (17.5–25.8)	22.6 (18.0–27.8)
Males	18.4 (16.1–21.0)	9.0 (4.8–14.9)	21.2 (16.6–26.5)	20.9 (16.4–25.9)
Females	20.7 (17.1–24.6)	11.9 (8.0–16.8)	21.6 (16.8–27.0)	24.4 (18.4–31.3)
Non-Hispanic Asian				
Both sexes	8.6 (6.4–11.2)	5.0 (1.6–11.3)[b,c]	9.8 (6.1–14.9)	9.4 (6.4–13.2)
Males	11.8 (8.3–16.1)	4.8 (0.7–15.2)[b,c]	14.7 (7.9–24.1)	12.9 (8.0–19.1)
Females	5.3 (2.9–8.6)	5.1 (0.9–15.3)[b,c]	4.7 (1.6–10.2)[b,c]	5.7 (2.7–10.5)
Hispanic				
Both sexes	21.9 (20.0–23.9)	15.6 (12.5–19.2)	25.0 (22.0–28.1)	22.8 (19.5–26.3)
Males	22.4 (19.9–24.9)	16.7 (12.0–22.2)	25.8 (20.7–31.4)	22.7 (18.7–27.1)
Females	21.4 (18.8–24.1)	14.6 (9.4–21.2)	24.1 (19.9–28.7)	22.8 (18.5–27.7)
Extreme obesity (BMI at or above 120% of the sex-specific 95th percentile on the CDC BMI-for-age growth charts)				
All race/Hispanic origin groups[a]				

	Weighted Prevalence by Age Group, % (95% CI)			
	2–19 y	2–5 y	6–11 y	12–19y
Both sexes	5.8 (4.9–6.8)	1.7 (1.0–2.7)	5.6 (4.5–6.9)	7.8 (6.3–9.6)
Males	5.7 (4.7–6.9)	1.3 (0.7–2.3)	5.8 (4.2–7.7)	7.7 (5.9–9.8)
Females	5.9 (4.7–7.3)	2.1 (1.0–3.9)[b]	5.5 (4.3–6.9)	8.0 (5.8–10.7)
Non-Hispanic white				
Both sexes	4.4 (3.2–6.0)	1.0 (0.2–2.9)[bc]	3.4 (1.6–6.4)[b]	6.7 (4.6–9.2)
Males	3.9 (2.5–5.9)	0.3 (0–2.5)[bc]	3.4 (1.2–7.2)[b]	5.9 (3.7–9.0)
Females	5.0 (3.3–7.2)	1.8 (0.3–5.7)[bc]	3.4 (1.7–6.2)	7.4 (4.1–12.3)
Non-Hispanic black				
Both sexes	8.6 (6.8–10.8)	2.1 (0.7–4.8)[bc]	8.8 (6.5–11.6)	11.6 (8.5–15.4)
Males	8.4 (6.6–10.4)	1.9 (0.4–5.5)[bc]	9.3 (5.8–14.1)	10.7 (7.7–14.3)
Females	8.9 (6.3–12.1)	2.2 (0.6–5.9)[bc]	8.2 (5.4–11.9)	12.7 (8.1–18.5)
Non-Hispanic Asian				
Both sexes	1.3 (0.5–2.8)[b]	0.50 (0.01–3.04)[bc]	1.0 (0.2–3.3)[bc]	2.0 (0.6–4.5)[bc]
Males	2.2 (0.8–4.7)[bc]	0.99 (0.01–6.18)[bc]	1.4 (0.1–5.8)[bc]	3.3 (0.9–8.6)[bc]
Females	0.43 (0.04–1.77)[bc]	0[d]	0.6 (0–4.2)[bc]	0.52 (0.01–3.23)[bc]
Hispanic				
Both sexes	7.6 (6.3–9.2)	3.0 (1.3–5.6)[b]	9.3 (7.4–11.5)	8.8 (6.8–11.2)
Males	8.0 (6.0–10.3)	3.2 (1.5–6.0)[bc]	9.6 (6.8–13.1)	9.2 (6.2–13.1)
Females	7.3 (5.4–9.5)	2.7 (0.6–7.5)[bc]	8.9 (6.3–12.2)	8.3 (5.7–11.7)

Abbreviations: BMI, body mass index; CDC, Centers for Disease Control and Prevention; NHANES, National Health and Nutrition Examination Surveys.

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

[b] The relative standard errors are greater than 30%.

[c] The number of cases is less than 10.

[d] The 95% confidence interval cannot be calculated because the number of cases is 0.

Table 3.

Age-Specific Trends in Obesity and Extreme Obesity Prevalence in US Children and Adolescents for 1988–1994 Through 2013–2014[a]

Survey Year	Ages 2–19 y		Ages 2–5 y		Ages 6–11 y		Ages 12–19 y	
	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)
Obesity (BMI at or above the sex-specific 95th percentile on the CDC BMI-for-age growth charts)								
1988–1994	10 777	10.0 (9.0–11.2)	4373	7.2 (5.8–8.8)	3279	11.3 (9.4–13.4)	3125	10.5 (8.8–12.5)
1999–2000	4039	13.9 (12.1–15.9)	726	10.3 (7.0–14.6)	1048	15.1 (12.2–18.3)	2265	14.8 (12.9–16.9)
2001–2002	4261	15.4(13.4–17.5)	795	10.6 (7.0–15.1)	1165	16.2 (12.9–20.1)	2301	16.7 (14.3–19.2)
2003–2004	3961	17.1 (14.5–20.0)	819	13.9 (10.7–17.7)	982	18.8 (16.1–21.7)	2160	17.4 (13.9–21.3)
2005–2006	4207	15.4 (12.6–18.6)	952	10.7 (8.4–13.3)	1114	15.1 (11.0–20.1)	2141	17.8 (14.0–22.0)
2007–2008	3249	16.8 (14.2–19.8)	853	10.1 (7.7–12.9)	1197	19.6 (17.1–22.4)	1199	18.1 (14.6–22.0)
2009–2010	3408	16.9 (15.4–18.4)	903	12.1 (9.8–14.8)	1213	18.0 (15.9–20.3)	1292	18.4 (15.7–21.3)
2011–2012	3355	16.9 (14.8–19.2)	871	8.4 (5.8–11.7)	1268	17.7 (14.4–21.5)	1216	20.5 (16.9–24.4)
2013–2014	3523	17.2 (14.9–19.6)	843	9.4 (6.8–12.6)	1294	17.4 (13.8–21.4)	1386	20.6 (16.2–25.6)
P value for trend								
Linear		<.001		.29		<.001		<.001
Quadratic		.004		.001		.03		.25
Extreme obesity (BMI at or above 120% of the sex-specific 95th percentile on the CDC BMI-for-age growth charts)								
1988–1994	10 777	2.6 (2.0–3.5)	4373	1.3 (0.6–2.5)[b]	3279	3.6 (2.5–5.0)	3125	2.6 (1.7–3.9)
1999–2000	4039	3.6 (2.6–5.0)	726	1.7 (0.6–3.8)[b]	1048	3.1 (1.8–5.0)	2265	5.0 (3.5–6.9)
2001–2002	4261	5.2 (4.1–6.4)	795	2.7 (0.9–6.0)[b]	1165	6.2 (4.4–8.6)	2301	5.4 (4.1–6.9)
2003–2004	3961	5.1 (3.8–6.6)	819	2.8 (1.5–4.8)	982	5.3 (4.0–6.9)	2160	5.9 (4.1–8.2)
2005–2006	4207	4.7 (3.4–6.3)	952	1.5 (0.7–2.9)[b]	1114	3.9 (2.6–5.6)	2141	6.7 (4.8–9.0)
2007–2008	3249	4.9 (3.7–6.5)	853	1.8 (0.6–3.9)[b]	1197	5.7 (4.3–7.5)	1199	5.9 (3.9–8.6)
2009–2010	3408	5.6 (4.3–7.1)	903	2.7 (1.6–4.1)	1213	5.1 (3.7–6.8)	1292	7.4 (4.8–10.8)
2011–2012	3355	5.6 (4.2–7.3)	871	1.6 (0.7–3.2)[b]	1268	6.9 (5.2–8.9)	1216	6.6 (4.4–9.5)

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	Ages 2–19 y		Ages 2–5 y		Ages 6–11 y		Ages 12–19 y	
Survey Year	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)	Unweighted Sample Size	Weighted Prevalence, % (95% CI)
2013–2014	3523	6.0(4.8–7.3)	843	1.7 (0.8–3.3)[b]	1294	4.3 (3.0–6.1)	1386	9.1 (7.0–11.5)
P value for trend								
Linear		<.001		.59		.02		<.001
Quadratic		.17		.16		.35		.37

Abbreviations: BMI, body mass index; CDC, Centers for Disease Control and Prevention.

[a]Data are from the National Health and Nutrition Examination Surveys. *P* values are from logistic regression models.

[b]Relative standard errors are greater than 30% but less than 40%.