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Disparities in peaks, plateaus, and declines in prevalence of high BMI among adolescents

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Abstract

Objectives—To investigate trends in prevalence of high BMI from 2001 to 2008 and examine race/ethnic disparities.

Methods—Subjects: 8,283,718 5th, 7th, and 9th grade students who underwent California's school-based BMI screening between 2001 and 2008. Logistic regression identified trends in prevalence of high BMI ($\geq 85^{\text{th}}$, $\geq 95^{\text{th}}$, $\geq 97^{\text{th}}$, and $\geq 99^{\text{th}}$ %tiles).

Results—Among girls, for 3 of 4 BMI cutpoints, African Americans and American Indians continued to increase in prevalence through 2008; Hispanics plateaued after 2005, while non-Hispanic whites declined to 2001 prevalence levels after peaking in 2005; Asians showed no increases. Among boys, non-Hispanic whites peaked in 2005 then declined to 2001 prevalence levels for all BMI cutpoints; Hispanics and Asians declined after 2005 (for 3 lowest BMI cutpoints only) but remained above 2001 levels; and American Indians peaked later (2007) and only declined for BMI $\geq 95^{\text{th}}$. No girls and few boys showed a decline after peaking in prevalence of BMI $\geq 99^{\text{th}}$. In 2008, disparities in prevalence were greatest for BMI $\geq 99^{\text{th}}$ %tile, with prevalence of 4.9% for American Indian girls (OR 3.8; 95% CI 3.0, 4.8), 4.6% for African Americans (OR 3.6; 95% CI 3.2, 3.9), vs 1.3% for non-Hispanic white girls.

Conclusions—Based on statewide California data, prevalence of high BMI is declining for some groups but has not declined for American Indian and African American girls. These trends portend greater disparities over time, particularly in severe obesity. Interventions and policies tailored to the highest risk groups should be pursued.

Keywords

obesity; disparities; Public Health; Public Policy; Minority Health

BACKGROUND

In the United States, the prevalence of pediatric overweight and obesity tripled from 1970 to 2000.¹ Recent NHANES data suggest a leveling off in prevalence from 1999 to 2008,² representing the first sign of abatement in the pediatric obesity epidemic. Currently, it is

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unclear whether this leveling off reflects a plateau in prevalence or a peak, from which prevalence will decline. This distinction is of significant concern, as obesity is associated with multiple chronic health conditions^{3, 4} that increase with the severity of obesity.^{4, 5}

Recent studies indicate race/ethnic disparities in obesity.^{4, 6, 7} NHANES data from 1999 to 2008 also demonstrated significantly higher prevalence of obesity among Hispanic and African American youth compared to non-Hispanic whites.² Differences in trends over time by race, however, were not statistically significant in NHANES data, suggesting that the rate of change in obesity prevalence was similar among the different race groups from 1999 to 2008. If, in fact, trends in obesity are similar by race, disparities would not be expected to worsen. However, while differences did not reach statistical significance, it is difficult to rule out an effect by race, given the relatively large standard errors for prevalence of high BMI in the NHANES data set. Thus, to date, the NHANES data have not unequivocally addressed trends in disparities.

California has conducted annual school-based BMI screening among all 5th, 7th, and 9th grade public school students since 2001 as part of a state-wide mandate to assess overall student fitness. Almost 13% of U.S. youth under 18 years of age reside in California, and Hispanic children, who are at high risk of weight-related comorbidity,⁸ make up half of the school population in the state. Additionally, California's large BMI screening dataset includes a considerable number of Asian youth and sufficient American Indian youth to examine trends in high BMI among these understudied and at-risk groups.^{9, 10} We sought to use California's school-based BMI screening data to determine prevalence of high BMI in a census-based sample of youth; to determine if prevalence is increasing, leveling off, or declining; and to identify potential gender and race/ethnic disparities in high BMI among five major racial/ethnic groups.

METHODS

Study Population and Design

This study, certified as exempt by the University of California, San Francisco's Committee on Human Research, examined data collected as part of California's mandatory school-based fitness assessments. Since 2001, California schools have conducted the multi-component Fitnessgram assessment,¹¹ which includes annual height and weight measurements for all 5th, 7th and 9th grade students. Schools have the option of participating in training and purchasing equipment for the Fitnessgram; however, documentation of school participation in training is not available.

Student-level Fitnessgram data were obtained from the California Department of Education (CDE) for each year from 2001 to 2008 (aggregate-level data are publicly available from the CDE's website¹²). Data records include student grade, age (years), sex, height (inches), weight (pounds), and race/ethnicity (African American, American Indian/Alaskan Native, Asian, Filipino, Hispanic/Latino, Pacific Islander, or White - Not of Hispanic Origin). To protect student confidentiality, the CDE included Filipino and Pacific Islander students in the Asian category. The CDE redacted data for any student who, based on sex, grade, and race, would be among a group of 10 or fewer students in her or his school district. Data on total enrollment in California were obtained from the CDE website.¹²

Fitnessgram data records were available for a total of 11,001,223 students for the years 2001 to 2008, representing 91.7% of 5th, 7th, and 9th graders enrolled during the study period. A total of 2,477,450 youth were excluded from analysis due to missing or invalid data: 2,279,757 had no height and/or weight data due to data redaction or missing data; 71,341 were missing age or had an implausible value for age (5th grader < 8 yrs or > 13 yrs; 7th

grader < 10 yrs or > 15 yrs; 9th grader < 12 yrs or > 17 yrs); and 126,352 had a biologically implausible height, weight, or BMI (according to the CDC SAS protocol for biologically implausible values¹³), or an absolute BMI z score > 5. Of the remaining 8,523,773 with valid BMI and age data, 240,055 with unknown or “Other” race were excluded from the analysis, leaving 8,283,718 youth aged 8–17 years from 2001–2008 (69% of total students enrolled) included in the final analyses.

BMI z-scores were calculated in SAS Version 9.2 (SAS Institute Inc., Cary, NC) using the CDC’s program¹⁴ based on the 2000 sex-specific BMI-for-age growth charts. Each student’s BMI percentile was calculated from the BMI z-score and a binary indicator was assigned for four high BMI-for-age cut points: $\geq 85^{\text{th}}$ (overweight), $\geq 95^{\text{th}}$ (obese), $\geq 97^{\text{th}}$, and $\geq 99^{\text{th}}$ (severely obese) percentiles.

Differences in prevalence of high BMI in 2008 by race/ethnicity and age category (8–11 years vs. 12–17 years, similar to categories used in prior analyses of NHANES data¹⁵) were assessed with logistic regression. Trends in high BMI for age between 2001–2008 were modeled using logistic regression, accounting for clustering by school district and using robust standard errors. Year was a categorical predictor (reference year 2001), controlling for race/ethnic group and age category. To clarify trends in prevalence, the year in which prevalence of high BMI was highest between 2001 and 2008 was set as the reference in a separate model. Because significant interaction in trends over time by sex, and by race/ethnicity within sex were seen, trends were modeled separately for all sex/race groups, adjusting for age category. The significance of any increase in prevalence over levels in 2001 was determined based on the adjusted OR comparing prevalence in peak year to prevalence in 2001. Similarly, the significance of declines in prevalence post peak was determined by adjusted OR comparing prevalence in 2008 to prevalence in peak year. All tests of significance were two-sided with an alpha of 0.05. Statistical analyses were done using StataMP 11 (StataCorp LP, College Station, TX).

RESULTS

Among the 8,283,718 students with valid data, 46.4% were Hispanic, 32.8% non-Hispanic white, 12.6% Asian, 7.7% African-American, and 0.5% American Indian.

Prevalence in 2008

Among public school students in California in 2008 (n=1,171,708), 38.0% were overweight (BMI $\geq 85^{\text{th}}$ percentile), including 19.8% obese (BMI $\geq 95^{\text{th}}$ percentile) and 3.6% severely obese youth (BMI $\geq 99^{\text{th}}$ percentile) (Table 1). Boys were more likely to have a high BMI-for-age than girls (p<0.001), as were 8–11 year olds compared to 12–17 year olds (p<0.001 for all categories except BMI $\geq 99^{\text{th}}$, where p = 0.007).

For African American, Hispanic, and American Indian girls, the odds of having high BMI were 2–3 times those of non-Hispanic white girls, with odd ratios increasing as severity of high BMI-for-age increased (Table 2). Similar patterns existed for boys, but with lesser disparities.

Peaks in high BMI

With all race/ethnic groups combined, boys’ and girls’ prevalence of high BMI peaked in 2005 (Table 3), with the exception of girls with BMI $\geq 99^{\text{th}}$ percentile, whose prevalence was highest in 2008. (While no single racial/ethnic subgroup of girls peaked in prevalence of BMI $\geq 99^{\text{th}}$ in 2008, for all subgroups of girls, prevalence of BMI $\geq 99^{\text{th}}$ percentile in 2008 was second only to prevalence in peak year.)

American Indian youth demonstrated later peaks and larger increases in prevalence over 2001 than any other group (Table 3). Both African American and American Indian girls had the highest prevalence in 2008 for BMI categories $\geq 85^{\text{th}}$, $\geq 95^{\text{th}}$, and $\geq 97^{\text{th}}$ percentile.

American Indian boys peaked in 2007 across BMI categories. Hispanic and non-Hispanic white boys peaked in 2005 across BMI categories, while Asian boys demonstrated earlier peaks except for BMI $\geq 99^{\text{th}}$ percentile. African American boys showed no increase in prevalence from 2001 to 2008 except for BMI $\geq 99^{\text{th}}$ percentile, which peaked in 2007. The figures show unadjusted trends by race/ethnic group for BMI $\geq 99^{\text{th}}$ percentile (Figure 1) and BMI $\geq 95^{\text{th}}$ percentile (Figure 2).

Notably, the greatest proportional increase in prevalence from 2001 to peak year was seen for BMI $\geq 99^{\text{th}}$ percentile: from 2001 to 2005 (peak year), boys increased by 0.9% ($p<0.001$), representing a proportional increase of 26.0%; girls increased by 0.5% ($p<0.001$) from 2001 to 2008 (peak year), representing a 23.9% proportional increase. In comparison, the proportional increase over 2001 for boys and girls respectively was 16.7% and 13.7% for BMI $\geq 97^{\text{th}}$, 13.4% and 11.3% for BMI $\geq 95^{\text{th}}$, and 8.3% and 7.3% for BMI $\geq 85^{\text{th}}$ percentiles (all significant at $p<0.001$). Similarly, within each race/ethnic subgroup, the proportional increase over 2001 was incrementally larger with each higher category of BMI. American Indians demonstrated the greatest proportional increases over 2001: 80.6% for BMI $\geq 99^{\text{th}}$ ($p=0.005$), 65.2% for BMI $\geq 97^{\text{th}}$, 53.0% for BMI $\geq 95^{\text{th}}$, and 30.2% for BMI $\geq 85^{\text{th}}$ percentile (all significant at $p<0.001$).

Declining prevalence post peak

Table 3 shows the adjusted decrease in prevalence from peak year to 2008. With all race/ethnic groups combined, prevalence across all categories of BMI declined from peak until 2008, but remained above prevalence in 2001 (except for girls' prevalence of BMI $\geq 99^{\text{th}}$ percentile, which was highest in 2008).

African American and American Indian girls did not decline in prevalence in any BMI category after peaking. Hispanic girls plateaued rather than declined for all categories except BMI $\geq 85^{\text{th}}$ percentile. In contrast, prevalence among non-Hispanic white girls declined after peaking and reached 2001 levels for all but BMI $\geq 99^{\text{th}}$ percentile.

Prevalence of high BMI among boys was more likely to decline after peaking than among girls (Table 3). However, American Indian boys plateaued rather than declined for all categories except BMI $\geq 95^{\text{th}}$ percentile. While Hispanic and Asian boys showed some declines post peak, only non-Hispanic whites returned to 2001 levels of prevalence, and then only for BMI $\geq 85^{\text{th}}$, $\geq 95^{\text{th}}$, and $\geq 97^{\text{th}}$ percentiles.

Within each sex/race subgroup, prevalence of BMI $\geq 99^{\text{th}}$ percentile did not decline after peaking, except among Asian and non-Hispanic white boys (Table 3).

To demonstrate changes in BMI at the population level over time, Figure 3 shows the smoothed distribution of BMI by race in years 2001, 2005 and 2008. Compared to 2001, distributions in 2005 and 2008 are shifted right for Hispanic, African American and American Indian groups. Non-Hispanic whites are the only group for which the distributions in 2001 and 2008 are nearly identical.

DISCUSSION

The present study takes advantage of California's mandated school-based BMI screening to examine trends in prevalence of high BMI from 2001 to 2008. The large sample size of this

dataset is a unique strength, providing ample power to identify significant trends over time, and disparities in trends. To our knowledge, this is the first study to document a population-based decline in prevalence of high BMI after 2005, among most boys and for white girls. Even Hispanic boys, long leading in prevalence of obesity, declined in prevalence after peaking. However, Hispanic girls demonstrate no decline after peaking, and African American and American Indian girls had the highest prevalence across BMI categories in 2008, the last year for which data were available. Differing patterns of plateau vs. decline by race/ethnicity suggest that the alarming disparities in prevalence of high BMI in 2008 are expected to widen.

Overall prevalence of high BMI in 2008 in California's dataset was similar to or slightly higher than prevalence among NHANES youth age 6–19 years in 2007–08: 13.3% at BMI $\geq$ 97th percentile in both datasets; 19.8% in California and 18.7% in NHANES at BMI $\geq$ 95th percentile; and 38.0% of California youth vs. 34.7% of NHANES youth had BMI $\geq$ 85th percentile.² Across BMI categories, we demonstrate a larger magnitude of disparities than those seen in NHANES data,² largely because California's non-Hispanic white youth had lower prevalence of high BMI. This pattern replicates regional differences in obesity seen among adults in the CDC BRFSS data,¹⁶ with non-Hispanic whites in the West having lower prevalence of obesity than whites in any other region, while Hispanics in the West have higher obesity prevalence than that seen nationally.¹⁶ Thus, higher prevalence in California is expected given a higher proportion of individuals of Hispanic ethnicity in California relative to the U.S. population as a whole. While this study is limited to California, it represents a large proportion of U.S. children: current census data reveal that 1 in 8 children in the U.S. live in California.

These findings are a call to action for policies and interventions tailored for use in high-risk populations. School- and after-school-based programs have demonstrated improvements in weight status among African American^{17–19} and Hispanic youth.^{20, 21} More such interventions are needed and more work must be done to address weight status in understudied American Indian youth, who demonstrated the greatest increases in prevalence of high BMI in the present study, and are at high risk for weight-related comorbidities.^{9, 22} Future interventions should build on the work done and lessons learned in the NHLBI-funded Pathways study.^{23, 24} Interventions in early childhood will also be critical as national data demonstrate increasing obesity prevalence among low-income American Indian preschool children as well.²⁵

We demonstrate that disparities increase with increasing severity of obesity. However, while disparities are greatest for BMI $\geq$ 99th percentile, concerns around severe obesity apply to all youth. All race/ethnic subgroups experienced the greatest proportional increase in prevalence for BMI $\geq$ 99th percentile. This has also been demonstrated in NHANES data for African American, Hispanic, and non-Hispanic white youth.⁴ In the present study, no subgroups except white and Asian boys showed a decline after peaking in prevalence of severe obesity. This is of significant consequence because the adverse effects of high BMI worsen as severity of obesity increases, with respect to risk for future complications and economic impacts,^{3, 5, 26} as well as risk for morbidity in adolescence.^{27–31}

Reversing childhood obesity will require concerted public health efforts, similar to the multi-faceted approach taken to reduce smoking.^{32–34} Interventions to be considered might include: restricting advertising of unhealthy products both in schools and during television programming targeted at children;^{35, 36} taxing sugar sweetened beverages, which have been causally linked to obesity;³⁷ banning the sale of sugar-sweetened beverages and snacks high in fat or sugar during the school day (such policies in California may be related to declines in obesity seen after 2005);³⁸ and increasing the quality and quantity of physical

education.^{39–42} Providing levers to allow low-income communities to benefit first and most from such policies may address disparities.

Limitations

While school-based BMI screening provides objective data on a vast number of youth, data quality is unknown. There is no surveillance of Fitnessgram test administration, and data collection methods and integrity likely vary (which will decrease precision of prevalence estimates), and may vary by school (which might bias estimates of prevalence, although less likely to bias estimates of trends over time). Additionally, not all students enrolled in a school complete the Fitnessgram. The test, most often administered during PE, is more likely to miss students not taking PE. Because greater participation in PE has been associated with improved BMI,³⁹ missing data might result in an underestimate of prevalence in the present study.

Examining four BMI cutpoints could be considered multiple hypothesis testing. Applying Bonferroni adjustments with a p-value of 0.0125 (0.05 divided by 4) would suggest greater disparities: among girls, only non-Hispanic whites would demonstrate a decline post peak; non-Hispanic white boys would remain the only group to decline across BMI cutpoints, and American Indian boys would show no decline at any cutpoint. Finally, using a cutpoint of BMI at the 99th percentile is problematic as percentiles greater than the 97th are beyond the range of the data from which parameters for estimating BMI z-scores (based on CDC growth charts) were derived. Therefore, “extrapolation beyond this range should be done with caution.”⁴³ However, given the potential public health impact of increasing rates of severe obesity, highlighting this problem is critical.

Conclusion

The encouraging first signs of a decline in the obesity epidemic demonstrated in the present study are tempered by concerns for increasing disparities. The groups of greatest concern are first, African American and American Indian girls who have not demonstrated any reduction in prevalence of high BMI; second, American Indian boys and Hispanic girls, whose rates plateaued rather than declined after peaking; and finally Hispanic boys, who showed only very small declines, and not for the most severe obesity. Clinicians’ voices supporting policy approaches that focus on preventing and reducing prevalence of high BMI among these groups will be critical in reversing childhood obesity.

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Abbreviations

BMI	Body Mass Index
NHANES	National Health and Nutrition Examination Survey
CDE	California Department of Education
OR	Odds Ratio
PE	Physical Education

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Figure 1.

Body Mass Index for Age $\geq$ 99th Percentile by Race/Ethnicity in 2001–2008

Error bars indicate 95% confidence intervals and are only visualized for American Indians; all other ethnicities had negligible SE.

Students were in 5th, 7th or 9th grade.

Figure 2.

Body Mass Index for Age $\geq$ 95th Percentile by Race/Ethnicity in 2001–2008

Error bars indicate 95% confidence intervals and are only visualized for American Indians; all other ethnicities had negligible SE.

Students were in 5th, 7th or 9th grade.

Figure 3.
Change in distribution of body mass index by race; 2001, 2005, and 2008

Table 1

Prevalence of High BMI for Age Among California Children in 2008

All		Non-Hispanic White		African American		Hispanic		Asian		American Indian		
	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)
BMI ≥ 99% of the CDC Growth Charts												
Ages-both sexes (y)												
8-17	1,171,708	3.6 (b)	346,950	1.7 (b)	83,219	4.5 (a)	586,850	5.0 (b)	150,486	1.7 (b)	4,203	5.2 (0.3)
8-11	293,857	3.7 (b)	83,252	1.6 (b)	20,509	4.5 (0.1)	148,646	5.3 (a)	40,577	1.8 (a)	873	4.8 (0.7)
12-17	877,851	3.5 (b)	263,698	1.7 (b)	62,710	4.5 (a)	438,204	4.9 (b)	109,909	1.7 (b)	3,330	5.3 (0.4)
Boys' age												
8-17	597,831	4.3 (b)	178,024	2.1 (b)	41,989	4.3 (0.1)	297,933	6.2 (b)	77,780	2.4 (a)	2,105	5.6 (0.5)
8-11	143,052	4.3 (a)	39,810	1.8 (a)	9,939	4.2 (0.2)	72,602	6.2 (a)	20,298	2.5 (0.1)	403	5.2 (1.1)
12-17	454,779	4.3 (b)	138,214	2.1 (b)	32,050	4.4 (0.1)	225,331	6.2 (a)	57,482	2.4 (a)	1,702	5.6 (0.6)
Girls' age												
8-17	573,877	2.8 (b)	168,926	1.3 (b)	41,230	4.6 (0.1)	288,917	3.8 (b)	72,706	1.0 (b)	2,098	4.9 (0.5)
8-11	150,805	3.1 (b)	43,442	1.4 (a)	10,570	4.8 (0.2)	76,044	4.4 (a)	20,279	1.1 (a)	470	4.5 (1.0)
12-17	423,072	2.6 (b)	125,484	1.3 (b)	30,660	4.5 (0.1)	212,873	3.6 (b)	52,427	0.9 (b)	1,628	5.0 (0.5)
BMI ≥ 97% of the CDC Growth Charts												
Ages-both sexes (y)												
8-17	1,171,708	13.3 (b)	346,950	7.6 (b)	83,219	14.4 (0.1)	586,850	18.0 (a)	150,486	7.8 (a)	4,203	17.0 (0.6)
8-11	293,857	15.2 (a)	83,252	8.3 (a)	20,509	15.9 (0.3)	148,646	20.6 (0.1)	40,577	9.3 (0.1)	873	18.8 (1.3)
12-17	877,851	12.7 (b)	263,698	7.3 (a)	62,710	13.9 (0.1)	438,204	17.1 (a)	109,909	7.2 (a)	3,330	16.5 (0.6)
Boys' age												
8-17	597,831	15.6 (a)	178,024	8.9 (a)	41,989	13.6 (0.2)	297,933	21.2 (a)	77,780	10.5 (0.1)	2,105	18.2 (0.8)
8-11	143,052	18.1 (0.1)	39,810	9.8 (0.1)	9,939	15.3 (0.4)	72,602	24.5 (0.2)	20,298	12.8 (0.2)	403	20.1 (2.0)
12-17	454,779	14.8 (a)	138,214	8.6 (a)	32,050	13.0 (0.2)	225,331	20.1 (a)	57,482	9.7 (0.1)	1,702	17.8 (0.9)
Girls' age												
8-17	573,877	11.0 (b)	168,926	6.2 (a)	41,230	15.3 (0.2)	288,917	14.7 (a)	72,706	4.9 (a)	2,098	15.8 (0.8)
8-11	150,805	12.5 (a)	43,442	6.9 (0.1)	10,570	16.4 (0.4)	76,044	17.0 (0.1)	20,279	5.7 (0.2)	470	17.7 (1.8)

	All		Non-Hispanic White		African American		Hispanic		Asian		American Indian	
	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)	N	% (SE)
12-17	423,072	10.5 (a)	125,484	5.9 (a)	30,660	14.9 (0.2)	212,873	13.9 (a)	52,427	4.6 (a)	1,628	15.2 (0.9)
	All		Non-Hispanic White		African American		Hispanic		Asian		American Indian	
BMI ≥ 95% of the CDC Growth Charts												
Ages-both sexes (y)												
8-17	1,171,708	19.8 (b)	346,950	12.1 (a)	83,219	20.7 (0.1)	586,850	26.0 (a)	150,486	12.5 (a)	4,203	24.3 (0.7)
8-11	293,857	22.6 (a)	83,252	13.5 (0.1)	20,509	23.0 (0.3)	148,646	29.7 (0.1)	40,577	14.9 (0.2)	873	26.7 (1.5)
12-17	877,851	18.9 (b)	263,698	11.7 (a)	62,710	19.9 (0.2)	438,204	24.8 (a)	109,909	11.6 (0.1)	3,330	23.7 (0.7)
Boys' age												
8-17	597,831	22.5 (a)	178,024	13.9 (a)	41,989	19.1 (0.2)	297,933	29.7 (a)	77,780	16.4 (0.1)	2,105	25.6 (1.0)
8-11	143,052	26.2 (0.1)	39,810	15.7 (0.2)	9,939	21.9 (0.4)	72,602	34.3 (0.2)	20,298	20.0 (0.3)	403	28.0 (2.2)
12-17	454,779	21.3 (a)	138,214	13.4 (a)	32,050	18.3 (0.2)	225,331	28.2 (a)	57,482	15.2 (0.1)	1,702	25.0 (1.0)
Girls' age												
8-17	573,877	16.9 (a)	168,926	10.2 (a)	41,230	22.2 (0.2)	288,917	22.2 (a)	72,706	8.3 (0.1)	2,098	23.1 (0.9)
8-11	150,805	19.1 (0.1)	43,442	11.4 (0.2)	10,570	24.0 (0.4)	76,044	25.2 (0.2)	20,279	9.7 (0.2)	470	25.5 (2.0)
12-17	423,072	16.2 (a)	125,484	9.8 (a)	30,660	21.6 (0.2)	212,873	21.2 (a)	52,427	7.8 (0.1)	1,628	22.4 (1.0)
BMI ≥ 85% of the CDC Growth Charts												
Ages-both sexes (y)												
8-17	1,171,708	38.0 (b)	346,950	27.7 (a)	83,219	39.4 (0.2)	586,850	46.5 (a)	150,486	28.0 (0.1)	4,203	42.4 (0.8)
8-11	293,857	41.7 (a)	83,252	30.3 (0.2)	20,509	42.0 (0.3)	148,646	50.7 (0.1)	40,577	32.1 (0.2)	873	46.6 (1.7)
12-17	877,851	36.8 (a)	263,698	26.9 (a)	62,710	38.5 (0.2)	438,204	45.1 (a)	109,909	26.4 (0.1)	3,330	41.3 (0.9)
Boys' age												
8-17	597,831	40.5 (a)	178,024	29.9 (0.1)	41,989	36.4 (0.2)	297,933	49.3 (a)	77,780	33.6 (0.2)	2,105	42.3 (1.1)
8-11	143,052	45.8 (0.1)	39,810	33.4 (0.2)	9,939	40.4 (0.5)	72,602	55.0 (0.2)	20,298	39.9 (0.3)	403	46.7 (2.5)
12-17	454,779	38.9 (a)	138,214	28.8 (0.1)	32,050	35.2 (0.3)	225,331	47.4 (0.1)	57,482	31.4 (0.2)	1,702	41.3 (1.2)
Girls' age												
8-17	573,877	35.4 (a)	168,926	25.5 (0.1)	41,230	42.4 (0.2)	288,917	43.6 (a)	72,706	21.9 (0.2)	2,098	42.4 (1.1)
8-11	150,805	37.9 (0.1)	43,442	27.5 (0.2)	10,570	43.5 (0.5)	76,044	46.5 (0.2)	20,279	24.3 (0.3)	470	46.6 (2.3)
12-17	423,072	34.6 (a)	125,484	24.8 (0.1)	30,660	42.0 (0.3)	212,873	42.5 (0.1)	52,427	21.0 (0.2)	1,628	41.2 (1.2)

$SE < 0.1\%$
(a)
 $SE > 0.05\%$
(b)

Table 2

Logistic Regression of High BMI for Age in Children and Adolescents, 2008

	Odds Ratio (95% Confidence Interval)							
	≥ 99 th Percentile of the CDC Growth Chart		≥ 97 th Percentile of the CDC Growth Charts		≥ 95 th Percentile of the CDC Growth Charts		≥ 85 th Percentile of the CDC Growth Charts	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Age								
8–11	1.0 (0.9–1.0)	1.2 (1.1–1.3)	1.3 (1.2–1.3)	1.2 (1.2–1.3)	1.3 (1.3–1.3)	1.2 (1.2–1.3)	1.3 (1.3–1.4)	1.2 (1.1–1.2)
12–17	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)
Race/ethnicity								
African American	2.2 (2.0–2.4)	3.6 (3.2–3.9)	1.6 (1.5–1.7)	2.7 (2.6–2.9)	1.5 (1.4–1.6)	2.5 (2.4–2.7)	1.3 (1.3–1.4)	2.2 (2.0–2.3)
Hispanic	3.1 (2.9–3.4)	2.9 (2.7–3.2)	2.8 (2.6–2.9)	2.6 (2.5–2.8)	2.6 (2.5–2.7)	2.5 (2.4–2.7)	2.3 (2.2–2.4)	2.3 (2.1–2.4)
Asian	1.2 (1.1–1.3)	0.7 (0.7–0.9)	1.2 (1.1–1.3)	0.8 (0.7–0.9)	1.2 (1.1–1.3)	0.8 (0.7–0.9)	1.2 (1.1–1.2)	0.8 (0.8–0.9)
American Indian	2.8 (2.2–3.6)	3.8 (3.0–4.8)	2.3 (2.0–2.7)	2.9 (2.5–3.4)	2.1 (1.9–2.4)	2.7 (2.4–3.0)	1.7 (1.6–1.9)	2.2 (1.9–2.5)
Non-Hispanic White	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)	1 (Reference)

Table 3

Prevalence of high BMI in 2001 with increase to and decline from prevalence in peak year

Ethnicity	BOYS					GIRLS				
	Prevalence in 2001	Increase 2001 to Peak ^a	Peak Year	Decrease, Peak to 2008 ^b	p	Prevalence in 2001	Increase 2001 to Peak ^a	Peak Year	Decrease, Peak to 2008 ^b	p
BMI ≥ 99th percentile										
All	3.5%	0.9%	* 2005	0.1%	.029	2.2%	0.5%	* 2008	-	-
African American	3.6%	0.8%	* 2007	0.0%	NS	3.8%	0.8%	* 2007	0.0%	NS
Hispanic	5.3%	1.1%	* 2005	0.2%	NS	3.2%	0.6%	* 2005	0.0%	NS
Asian	2.2%	0.4%	* 2006	0.2%	.009	0.9%	0.2%	2002	0.2%	.034
American Indian	3.4%	3.0%	* 2007	0.8%	NS	2.4%	2.5%	.013 2006	0.0%	NS
Non-Hispanic White	1.9%	0.4%	* 2005	0.3%	*	1.2%	0.2%	* 2005	0.1%	NS
BMI ≥ 97th percentile										
All	13.7%	2.3%	* 2005	0.3%	*	9.7%	1.3%	* 2005	0.0%	.049
African American	13.0%	-	-	-	-	13.5%	1.8%	* 2008	-	-
Hispanic	19.2%	2.7%	* 2005	0.7%	*	13.6%	1.4%	* 2005	0.2%	NS
Asian	9.8%	1.3%	* 2003	0.7%	*	5.0%	-	-	-	-
American Indian	11.7%	8.0%	* 2007	1.5%	NS	9.4%	6.4%	* 2008	-	-
Non-Hispanic White	8.9%	1.0%	* 2005	1.0%	*	5.8%	0.7%	* 2005	0.3%	.020
BMI ≥ 95th percentile										
All	20.3%	2.7%	* 2005	0.5%	*	15.3%	1.7%	* 2005	0.1%	.014
African American	18.8%	-	-	-	-	20.0%	2.2%	* 2008	-	-
Hispanic	27.4%	3.2%	* 2005	0.9%	*	20.8%	1.8%	* 2005	0.3%	NS
Asian	15.7%	1.7%	* 2003	0.9%	*	8.6%	-	-	-	-
American Indian	17.8%	10.3%	* 2007	2.6%	.042	15.1%	8.1%	* 2008	-	-
Non-Hispanic White	14.2%	1.1%	* 2005	1.4%	*	9.9%	1.0%	* 2005	0.6%	.004
BMI ≥ 85th percentile										
All	38.3%	3.2%	* 2005	0.9%	*	33.1%	2.4%	* 2005	0.1%	.007
African American	36.4%	-	-	-	-	39.8%	2.6%	.002 2008	-	-
Hispanic	47.4%	3.4%	* 2005	1.5%	*	42.0%	2.1%	* 2005	0.5%	.018
Asian	32.3%	2.4%	* 2003	1.1%	.002	21.7%	-	-	-	-

Ethnicity	BOYS					GIRLS				
	Prevalence in 2001	Increase 2001 to Peak ^a	p	Peak Year	Decrease, Peak to 2008 ^b	Prevalence in 2001	Increase 2001 to Peak ^a	p	Peak Year	Decrease, Peak to 2008 ^b
American Indian	33.5%	11.1%	*	2007	2.3%	32.8%	9.6%	.008	2008	-
Non-Hispanic White	30.5%	1.4%	*	2005	2.0%	25.0%	1.5%	*	2005	1.0%
										.006

^a Significance levels for increase in prevalence given for OR comparing prevalence in 2001 to prevalence in peak year.

^b Significance levels for decrease in prevalence given for OR comparing prevalence in peak year to prevalence in 2008.

* p≤0.001;

NS: p>0.05