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CDC Extended BMI-for-Age Percentiles Versus Percent of the 95th Percentile

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In December 2022, the Centers for Disease Control and Prevention (CDC) released Extended BMI-for-age growth charts^{1,2} for children and adolescents with high BMI values. These charts extend to a BMI of 60 and add 4 growth curves (98th, 99th, 99.9th, and 99.99th percentiles). Obesity among children and adolescents is defined as BMI ≥ 95th percentile of BMI-for-age and severe obesity as BMI ≥ 120% of the 95th percentile or ≥ 35.³ The recent American Academy of Pediatrics guideline for the treatment of obesity recommends using percentages of the 95th percentile of BMI-for-age to indicate different levels of severe obesity.⁴ This analysis compares CDC extended BMI-for-age percentiles with 120% and 140% of the 95th percentile and illustrates the differences between the prevalence of US children and adolescents 2 to 19 years of age with a BMI ≥ extended 98th percentile using the newly defined curve and those ≥ 120% of the 95th percentile using 2017 to March 2020 National Health and Nutritional Examination (NHANES) data.

METHODS

Extended percentiles from the 98th to 99.99th and percentages of the 95th percentile (120% and 140%) were plotted by using the CDC Extended BMI-for-age growth charts file.⁵

Prevalence estimates were calculated by using data from the nationally representative NHANES.⁶ Parental permission was obtained for youth <18 years of age, along with documented assent for participants 7 to 17 years of age and consent for participants 18 and older. Standardized measurements of weight and height were obtained during physical examinations. The National Center for Health Statistics Ethics Review Board approved

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Dr Ogden conceptualized and designed the study, drafted the initial manuscript, and critically reviewed and revised the manuscript; Drs Freedman and Hales conceptualized and designed the study and critically reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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NHANES and the examination response rate for youth 1 to 19 years of age was 51.5% from 2017 to March 2020.^{7,8}

The prevalence of children and adolescents with a BMI extended 98th percentile of BMI-for-age and 120% of the 95th percentile along with the 95% confidence intervals are presented. The full definition of severe obesity, including a BMI ≥ 35 , was not included in these comparisons because the ages at which the extended 98th percentile and 120% of the 95th percentile were at or above a BMI of 35 were virtually identical.

Estimates are shown by sex, age (2–5, 6–11, and 12–19 years), and race/Hispanic origin (Asian, Black, Hispanic, White, and other, which includes individuals reporting multiple races).

Differences in the prevalence of youth above the 2 cut points were tested by using a Z-statistic. National Center for Health Statistics presentation standards⁹ were used to evaluate the reliability of estimates. NHANES examination sample weights were used to adjust for oversampling, nonresponse, and noncoverage. Data were analyzed by using SAS (version 9.4) and SUDAAN (version 11.0).

Figure 1 reveals that 120% and 140% of the 95th percentile levels are higher than both the extended 98th and 99th BMI-for-age percentiles at younger ages (approximately ages 2 to 6 years). The extended 98th percentile approximates 120% of the 95th percentile for ages 7 and older.

RESULTS

The sample size from NHANES 2017 to March 2020 was 4749 nonpregnant persons 2 to 19 years of age with measured weight and height. Among children and adolescents 2 to 19 years of age, 7.7% (95% confidence interval [CI] 6.5% to 9.0%) had BMIs \geq 98th percentile compared with 6.7% (95% CI 5.5% to 8.1%) who had BMIs \geq 120% of the 95th percentile (Table 1). The patterns by sex and race/Hispanic origin were similar to the overall estimates, except that the estimates for Asian children and adolescents were the same (2%) using both metrics. The patterns by age varied. Among children 2 to 5 years of age, the percentage \geq extended 98th percentile was higher than the percentage \geq 120% of the 95th percentile (4.5%, 95% CI 3.3% to 6.0% versus 2.5%, 95% CI 1.5% to 4.0%, $P = 5.02$). Among children 6 to 11 years of age, 8.3% had BMIs \geq extended 98th percentile compared with 6.9% with BMIs \geq 120% of the 95th percentile. Among adolescents 12 to 19 years, the percentage \geq extended 98th percentile was virtually the same as that based on \geq 120% of the 95th percentile (8.7%, 95% CI 7.0% to 10.8% versus 8.5%, 95% CI 6.8% to 10.5%).

DISCUSSION

The 98th percentile of the CDC Extended BMI-for-age Growth Charts approximates 120% of the 95th percentile for older children. Among young children, however, a higher percentage were above the 98th percentile than above 120% of the 95th percentile. The extended method overcomes technical limitations of the CDC 2000 growth chart, which restricted the use of BMI percentiles and z-scores above the 97th percentile,¹⁰ thus

permitting the use of higher percentiles and z-scores for assessing obesity severity. Clinical studies could determine if the 98th percentile is associated with comparable levels of health risk across the age span.

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ABBREVIATIONS

CDC	Centers for Disease Control and Prevention
NHANES	National Health and Nutrition Examination Survey

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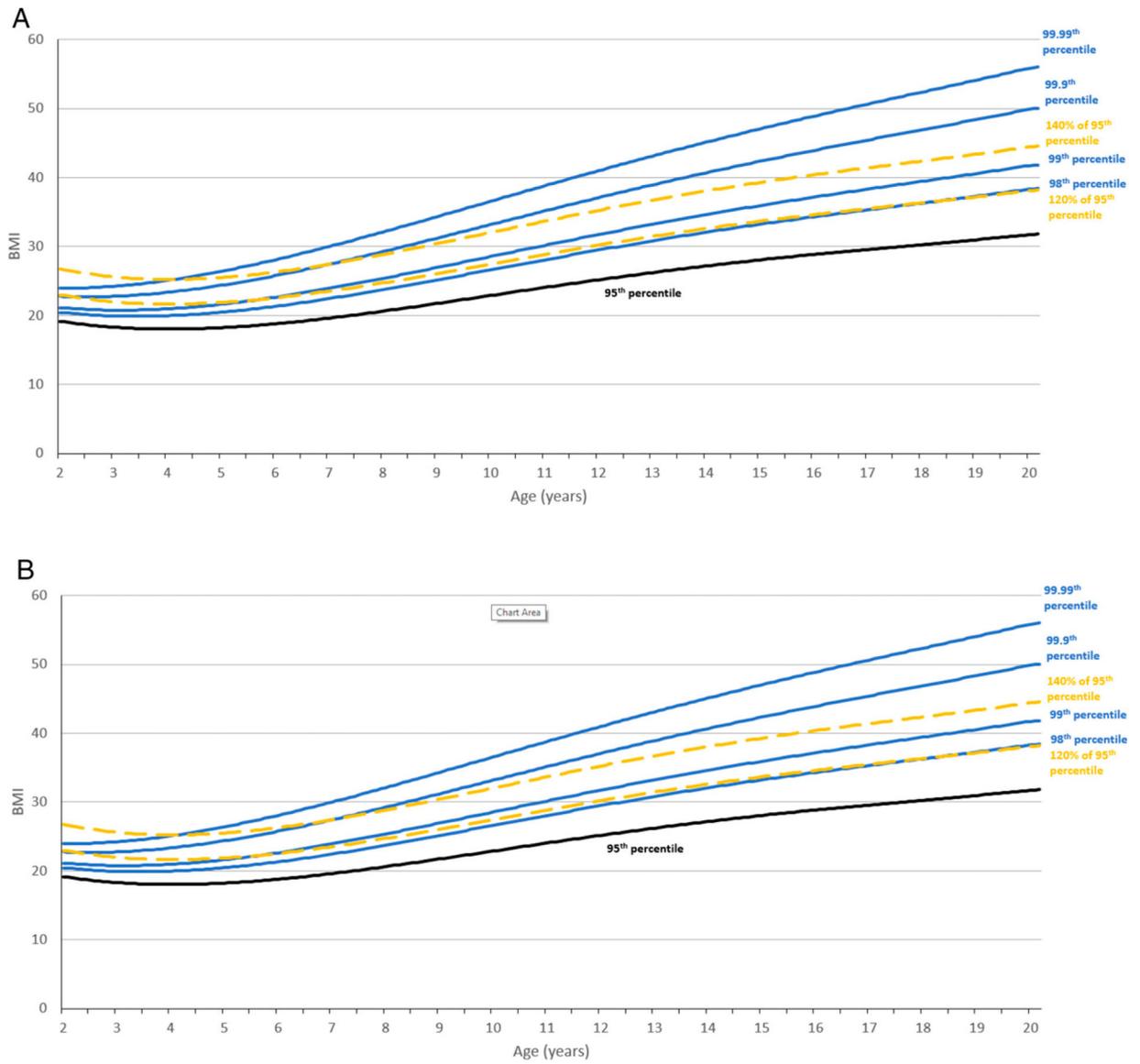


FIGURE 1. Select CDC Extended BMI-for-age percentiles, 95th percentile and 120% and 140% of the 95th percentile, (A) Girls and (B) Boys.¹

Notes: Percentiles above the 95th percentile are Extended CDC BMI-for-age percentiles.

TABLE 1

Percentage of US children and adolescents 2–19 years above the extended 98th percentile and 120% of the 95th percentile, by sex, age and race/Hispanic origin, 2017–March 2020

	<i>n</i>	Weighted Proportion of Population	Percentage (95% CI)		<i>P</i> -value for Difference*
			Extended 98th Percentile	120% of 95th Percentile	
Total	4749	100.00	7.7 (6.5–9.5)	6.7 (5.5–18.1)	0.23
Sex					
Female	2339	50.6	7.1 (5.7–8.7)	6.1 (4.9–7.6)	0.34
Male	2410	49.4	8.3 (6.8–10.0)	7.3 (5.9–9.0)	0.30
Age (y)					
2–5	1141	20.8	4.5 (3.3–6.0)	2.5 (1.5–4.0)	0.02
6–11	1765	33.4	8.3 (6.1–11.0)	6.9 (5.0–9.3)	0.36
12–19	1843	45.8	8.7 (7.0–10.8)	8.5 (6.8–10.5)	0.87
Race/Hispanic origin					
Asian	420	5.0	2.0 (0.7–4.5)	2.0 (0.7–4.5)	0.68
Black	1270	13.4	11.7 (9.7–14.0)	10.3 (8.4–12.5)	0.32
Hispanic	1143	25.0	9.9 (8.0–12.1)	8.1 (6.2–10.4)	
Other	445	6.5	7.6 (4.2–12.4)	7.2 (3.9–11.9)	0.19
White	1471	50.2	6.1 (4.2–8.6)	5.5 (3.6–8.1)	0.88

n, unweighted sample size; CI, confidence interval.

* Z-statistic greater than 1.96 or less than –1.96, was used for pairwise statistical testing. Z-statistics: (Estimate1-Estimate2)/ (SE2 Estimate1) + (SE2 Estimate2).

Source: NHANES.