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## Comparing U.S. Pediatric and Adult Weight Classification at the Transition from Late Teenage to Young Adulthood

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### Abstract

**Background**—Although pediatric growth charts are recommended for weight assessment prior to age 20, many teenagers transition earlier to adult care where absolute BMI is used. This study examines concordance of weight classification in older teenagers using pediatric percentiles and adult thresholds.

**Methods**—BMI from 23,640 U.S. teens ages 18–19 years were classified using pediatric BMI percentile criteria for underweight (<5<sup>th</sup>), normal (5<sup>th</sup> to <85<sup>th</sup>), overweight (85<sup>th</sup> to <95<sup>th</sup>), obesity (95<sup>th</sup>) and severe obesity (>120%×95<sup>th</sup> percentile) and adult BMI (kg/m<sup>2</sup>) criteria for underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) and obesity: class I (30–34.9), class II (35–39.9) and class III (≥40). Concordance was examined using the Kappa statistic. Blood pressure (BP) from the same visit was classified hypertensive for BP ≥140/90.

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**Results**—The majority of visits (72.8%) occurred in adult primary care. Using pediatric/adult criteria, 3.4%/5.2% were underweight, 66.6%/58.8% normal weight, 15.7%/21.7% overweight, 14.3%/14.3% obese and 4.9%/6.0% severely/Class II–III obese, respectively. Pediatric and adult classification for underweight, normal, overweight and obesity were concordant for 90.3% (weighted Kappa 0.87 [95% confidence interval, 0.87–0.88]). For severe obesity, BMI 120%×95<sup>th</sup> percentile showed high agreement with BMI 35 kg/m<sup>2</sup> (Kappa 0.89 [0.88–0.91]). Normal weight males and moderately obese females by pediatric BMI percentile criteria who were discordantly classified into higher adult weight strata had a greater proportion with hypertensive BP compared to concordantly classified counterparts.

**Conclusions**—Strong agreement exists between U.S. pediatric BMI percentile and adult BMI classification for older teenagers. Adult BMI classification may optimize BMI tracking and risk stratification during transition from pediatric to adult care.

### Keywords

obesity; severe obesity; body mass index; adolescence; young adult

## INTRODUCTION

Given the high prevalence of pediatric obesity in the United States (affecting roughly 17% of children ages 2–19 years)<sup>1, 2</sup> and the rising prevalence of severe pediatric obesity,<sup>3, 4</sup> increasing attention has focused on body mass index (BMI) trajectories during childhood, late adolescence and subsequent adult BMI. Adolescence has been described as an important period in the development and persistence of obesity due to a multitude of both intrinsic and extrinsic factors, such as behavioral, physiological and psychosocial changes that modulate obesity risk.<sup>5</sup> More than 50% of obese adolescents will continue to be obese as adults,<sup>6, 7</sup> emphasizing the importance of weight classification and tracking during the transition to adulthood.

For U.S. children and adolescents, classification of BMI is based on age- and sex-specific BMI percentiles according to the Centers for Disease Control and Prevention (CDC) growth charts where overweight is defined by BMI 85<sup>th</sup> to <95<sup>th</sup> percentile and obesity by BMI 95<sup>th</sup> percentile.<sup>8–10</sup> Among adolescents, the adult criterion of BMI 30 kg/m<sup>2</sup> also defines obesity even if the value is lower than the 95<sup>th</sup> BMI percentile.<sup>10</sup> New consensus recommendations also define the threshold for severe pediatric obesity as BMI 120% of the 95% BMI percentile or BMI 35 kg/m<sup>2</sup>, whichever is lower.<sup>11</sup> Transition to adult BMI classification occurs at age 20 years,<sup>12, 13</sup> shifting from age- and sex-specific BMI percentiles<sup>13</sup> to discrete BMI categories independent of age and sex. According to the World Health Organization (WHO)<sup>14</sup> and National Heart, Lung, and Blood Institute (NHLBI)<sup>15</sup> criteria for adults, overweight is defined by BMI 25.0–29.9 kg/m<sup>2</sup>, obesity by BMI 30 kg/m<sup>2</sup>, and higher order obesity classes I, II, and III by BMI 30–34.9 kg/m<sup>2</sup>, 35–39.9 kg/m<sup>2</sup> and 40 kg/m<sup>2</sup>, respectively.

Multiple approaches also exist internationally for evaluating pediatric overweight and obesity, with varying definitions and age cut-offs.<sup>10, 16–18</sup> The International Obesity Task Force provides age- and sex-specific BMI centile curves that correspond to a BMI of 25

kg/m<sup>2</sup> and 30 kg/m<sup>2</sup> at age 18 years<sup>17, 19</sup> and the 2007 WHO pediatric growth reference curves achieve these same BMI levels (25 kg/m<sup>2</sup> and 30 kg/m<sup>2</sup>) at age 19 years for +1 and +2 standard deviations<sup>16</sup>, respectively. When using the year 2000 CDC growth charts,<sup>8</sup> the 85<sup>th</sup> BMI percentile curves cross a BMI threshold of 25 kg/m<sup>2</sup> at an earlier age of 16½-17 years, whereas the 95<sup>th</sup> BMI percentile curves cross a BMI of 30 kg/m<sup>2</sup> at age 17½ and 19½ years for females and males, respectively. Although CDC recommendations for adult weight classification occur at age 20 years,<sup>12</sup> many 18–19 year olds have already transitioned to care in an adult medical home,<sup>20</sup> where weight is classified according to adult criteria. Hence there remains a need to more clearly examine differences in weight status classification for late adolescents and relevance to clinical risk.

The goal of this study was to compare BMI classification across the four major weight categories (underweight, normal weight, overweight and obesity) and higher order obesity using U.S. pediatric BMI percentile versus adult WHO categories in a diverse real world population of older teens ages 18–19 years. The concordance of adult and pediatric weight classification methods was evaluated to determine whether they accurately represent BMI status for this age group, with examination of blood pressure (BP) findings from the same ambulatory visit to characterize clinical risk. Differences in BMI classification that influence risk stratification were investigated to determine the optimal approach for tracking of BMI and weight status during the transition to adult primary care.

## METHODS

Kaiser Permanente Northern California (KPNC) is a large integrated healthcare delivery system providing care to over three million members in the Northern California region. The cohort for this study consisted of 18–19 year old KPNC teenagers who were previously examined in a population study of blood pressure and body mass index<sup>21, 22</sup> and had follow up measurement of height and weight during 7/1/2007–12/31/2012. Body mass index was calculated as weight in kilograms divided by height in meters squared (kg/m<sup>2</sup>). Blood pressure classification was also examined based on ambulatory measurements obtained at the same visit (available in 93.7%), with a hypertensive blood pressure defined by a systolic and/or diastolic BP ≥ 140 mmHg or ≥ 90 mmHg, respectively. The Institutional Review Board at HealthPartners Institute for Education and Research approved the study with ceding of oversight authority by the KPNC Institutional Review Board. A waiver of informed consent was obtained due to the nature of the study.

To eliminate potentially erroneous values, we excluded visits with outlying height values flagged as biologically implausible by the CDC program,<sup>23</sup> as well as height >90 inches or weight <50 pounds or >500 pounds. In addition, visits at age 18–19 years old were excluded if there was any record of pregnancy up to one year prior to the visit date based on coded diagnoses (International Classification of Diseases, 9<sup>th</sup> revision, ICD-9 V22.x and V23.x). A pediatric endocrinologist (LCG) conducted manual review of anthropometric data for individuals with (1) BMI ≥ 50 kg/m<sup>2</sup>, (2) high BMI values flagged by the CDC program as biologically implausible and without another confirming BMI within 5% of the measurement and (3) BMI values where another BMI was ≥ 20% of the measurement. A

total of 357 growth charts (1.5% of the cohort) were reviewed for such cases and only 26 were excluded due to height or weight entry errors.

The CDC 2000 growth chart reference datasets were used to calculate BMI percentiles,<sup>24, 25</sup> with classification as underweight (BMI <5<sup>th</sup> percentile), normal weight (BMI 5<sup>th</sup> to <85<sup>th</sup> percentile), overweight (BMI 85<sup>th</sup> to <95<sup>th</sup> percentile) and obese (BMI ≥95<sup>th</sup> percentile) using pediatric age- and sex-specific BMI percentile criteria.<sup>9, 10</sup> Stratification of obesity severity according to pediatric criteria was also examined using the percentage of the 95<sup>th</sup> BMI percentile,<sup>26</sup> with severe obesity defined by BMI ≥120% of the 95<sup>th</sup> BMI percentile.<sup>3, 26, 27</sup> Body mass index classification using adult criteria was based on the WHO<sup>14</sup> and NHLBI<sup>15</sup> criteria for adults, including underweight (BMI <18.5 kg/m<sup>2</sup>), normal weight (BMI 18.5–24.9 kg/m<sup>2</sup>), overweight (BMI 25–29.9 kg/m<sup>2</sup>), class I obesity (BMI 30–34.9 kg/m<sup>2</sup>), class II obesity (BMI 35–39.9 kg/m<sup>2</sup>) and class III obesity (BMI ≥40 kg/m<sup>2</sup>). The term moderate obesity was used to describe those individuals with BMI ≥95<sup>th</sup> percentile and <120% of the 95<sup>th</sup> percentile or (alternatively) with class I obesity.

To characterize the concordance between pediatric BMI percentile and adult BMI classification for underweight, normal weight, overweight and obesity in this 18–19 year old cohort, we calculated the weighted Cohen's Kappa ( $\kappa$ ) coefficient and 95% confidence intervals overall and separately for males and females. We also examined severe obesity defined as BMI ≥120% of the 95<sup>th</sup> percentile in comparison with BMI ≥35 kg/m<sup>2</sup> and BMI ≥40 kg/m<sup>2</sup> using the Cohen's Kappa statistic. Differences between groups were compared using the chi-square test and a two-sided p value criterion of <0.05 was chosen as the threshold for statistical significance. All analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC).

## RESULTS

A total of 23,640 teenagers (54.3% female) ages 18–19 years old were included in this study. Overall, there were 37.5% non-Hispanic white, 9.4% black, 27.8% Hispanic, 20.6% Asian and 4.6% of other or unknown race. As shown in Table 1, 3.4% were underweight (BMI <5<sup>th</sup> percentile), 66.6% were normal weight (BMI 5<sup>th</sup> to <85<sup>th</sup> percentile), 15.7% were overweight (BMI 85<sup>th</sup> to <95<sup>th</sup> percentile) and 14.3% were obese (BMI ≥95<sup>th</sup> percentile) when pediatric BMI percentile categories were applied. Using adult BMI categories, 5.2% were underweight (BMI <18.5 kg/m<sup>2</sup>), 58.8% were normal weight (BMI 18.5–24.9 kg/m<sup>2</sup>), 21.7% were overweight (BMI 25–29.9 kg/m<sup>2</sup>), and 14.3% were obese (BMI ≥30 kg/m<sup>2</sup>). For these 18–19 year old teenagers, the majority of clinic visits where BMI was ascertained occurred in adult primary care clinics (72.8%), with only 10.2% occurring in pediatric clinics, 9.6% in gynecology clinics, 2.6% in family practice clinics and the remaining 4.8% in other departments.

Figure 1 shows the prevalence of low, normal and high BMI using both pediatric BMI percentile and adult BMI classification by gender. A higher percentage of males compared to females were classified as obese by pediatric BMI percentile criteria (16.8% vs 12.2%,  $p<0.001$ ) and to a lesser degree by adult BMI criteria (15.0% vs 13.7%,  $p<0.01$ ). For higher order obesity, where the overall proportion of teens varied depending on criteria (4.9% with

BMI  $\geq 120\%$  of the 95<sup>th</sup> percentile, 6.0% with BMI  $\geq 35$  kg/m<sup>2</sup>, and 2.2% with BMI  $\geq 40$  kg/m<sup>2</sup>, a male predominance was seen only when using pediatric BMI percentile criteria for severe obesity ( $\geq 120\%$  of the 95<sup>th</sup> percentile, Figure 1). For the higher order adult obesity categories (BMI  $\geq 35$  kg/m<sup>2</sup> and  $\geq 40$  kg/m<sup>2</sup>), the proportions by gender were similar. Figure 2 examines differences in the relative prevalence of elevated BMI within each gender subgroup by race/ethnicity. The prevalence of obesity in males was highest among Hispanics followed by blacks, then whites and Asians, regardless of whether pediatric BMI percentile criteria ( $\geq 95^{\text{th}}$  percentile) or adult BMI criteria ( $\geq 30$  kg/m<sup>2</sup>) were used. For females, the prevalence of obesity was highest in blacks followed by Hispanics, then whites and Asians, also regardless of criteria. For higher order obesity, the prevalence rates were generally highest in Hispanics and blacks, depending on the criteria used.

Table 1 compares the weight status classification for the cohort using pediatric BMI percentile and adult BMI criteria for underweight, normal weight, overweight and obesity. Of the 18–19 year olds with BMI  $< 5^{\text{th}}$  percentile, most (96.1%) were in the underweight (BMI  $< 18.5$  kg/m<sup>2</sup>) adult category, while the remaining 3.9% (N=31) had BMI values (18.5–19.0 kg/m<sup>2</sup>) just within the adult normal range, corresponding to the 2.9<sup>th</sup> – 4.9<sup>th</sup> BMI percentile (median 4.6<sup>th</sup> percentile); all were male and mostly in good health except four with weight loss or low body weight due to illness (Table 1 footnote). Among teens in the normal (5<sup>th</sup> to  $< 85^{\text{th}}$  percentile) or overweight (85<sup>th</sup> to  $< 95^{\text{th}}$  percentile) BMI percentile range, 88.1% and 94.9%, respectively, were similarly classified based on adult criteria, although 8.9% with normal pediatric BMI percentile range had BMI values (25.0–26.9 kg/m<sup>2</sup>) just within the adult overweight range, accounting for 1401 (5.9%) of individuals. An additional 5.1% with overweight BMI percentile had BMI values just within the adult obese range (BMI 30.0–31.4 kg/m<sup>2</sup>, 97.9% female). Finally, 94.2% of those with BMI  $\geq 95^{\text{th}}$  percentile also met BMI criteria for adult obesity, while the remaining 5.8% had BMI values (29.0–29.9 kg/m<sup>2</sup>) just below the adult obesity threshold. Overall, 90.3% of the cohort was concordantly classified; an additional 5.9% were discordantly classified as overweight by adult criteria and normal weight by pediatric criteria and the remaining discordant subgroups each contributed less than 2% of the cohort (Table 1, footnote). Comparing pediatric BMI percentile and adult BMI classification across the four primary weight categories of underweight, normal, overweight and obesity, the weighted Kappa statistic was 0.87 (95% confidence interval, CI 0.87–0.88) overall and similar when stratified by gender (weighted Kappa 0.87, 95% CI 0.86–0.88 for females and 0.88, 95% CI 0.87–0.89 for males), demonstrating a high level of agreement.

Table 1 further examines the categorization of obese teenagers, comparing pediatric obesity stratification of moderate and severe obesity (based on the threshold of  $\geq 120\%$  of the 95<sup>th</sup> BMI percentile) to the adult thresholds for higher order obesity above BMI  $\geq 30$  kg/m<sup>2</sup> designated as class I, II and III obesity. Nearly all teens with adult class I obesity had a BMI  $< 120\%$  of the 95<sup>th</sup> percentile and approximately 71% with class II obesity had BMI  $\geq 120\%$  of the 95<sup>th</sup> percentile. Among the 255 individuals with class II obesity and BMI  $< 120\%$  of the 95<sup>th</sup> percentile, 86.7% were female. These findings are expected given that a BMI of  $\geq 120\%$  of the 95<sup>th</sup> percentile is approximately equivalent to 35 kg/m<sup>2</sup> and 37 kg/m<sup>2</sup> in 18–19 year old males and females, respectively. The corresponding Kappa statistic for comparison of BMI  $\geq 120\%$  of the 95<sup>th</sup> percentile to a uniform threshold of BMI  $\geq 35$  kg/m<sup>2</sup> was 0.89

(95% CI 0.88–0.91). This agreement was much lower when comparing BMI 120% of the 95<sup>th</sup> percentile to BMI 40 kg/m<sup>2</sup> (Kappa statistic 0.62, 95% CI 0.59–0.64).

Figure 3 reports the prevalence of hypertensive BP at the index visit by gender and weight classification, including concordantly and discordantly classified subgroups. Overall, males had a higher prevalence of hypertensive BP compared to females, and across both genders, obese teens had the highest rates of hypertensive BP. An increased prevalence of hypertensive BP was evident among males with normal BMI percentile but BMI in the adult overweight range when compared to males with normal BMI by both criteria (3.3% vs. 1.6%,  $p < 0.001$ ). Females discordantly classified as moderately obese by pediatric criteria and class II obese by adult criteria also had a higher prevalence of hypertensive BP when compared with females concordantly classified as having moderate or Class I obesity (5.0% vs. 2.1%,  $p < 0.02$ ).

## DISCUSSION

In this racially and ethnically diverse cohort of more than 20,000 U.S. teenagers age 18–19 years old, the distributions of BMI using adult WHO definitions and pediatric BMI percentile criteria were examined by gender and race/ethnicity. Overall, a high level of agreement was seen between pediatric and adult classification across the four major weight groups – underweight, normal weight, overweight and obese, with only a small proportion (less than 10%) discordantly classified due to borderline values. Among those discordantly classified into different weight groups by pediatric BMI percentile and adult BMI criteria thresholds, more than half were in the upper normal BMI percentile range with overweight BMI values of 25.0–26.9 kg/m<sup>2</sup>, where the male subgroup was found to have a higher prevalence of hypertensive BP than their normal BMI counterparts. These individuals would arguably benefit from classification as overweight for both BMI tracking and intervention.

Among obese teenagers within this older age range, a high level of agreement was also found between the pediatric BMI percentile threshold for severe obesity and the adult threshold for class II obesity, appropriately so given that a BMI of 120% of the 95<sup>th</sup> percentile for severe pediatric obesity approaches a BMI of 35 kg/m<sup>2</sup> in males and 37 kg/m<sup>2</sup> in females at age 18–19 years.<sup>11</sup> Among females with moderate obesity by pediatric BMI percentile criteria, those with class II adult obesity had a significantly higher prevalence of hypertensive BP compared to those classified as having moderate or class I adult obesity. These BP findings further support use of adult BMI criteria in older teens, including a BMI threshold of 35 kg/m<sup>2</sup> associated with a higher prevalence of hypertensive BP in females. Comprehensive data on fasting glucose, lipids and hemoglobin A1C were not obtained in the majority of patients in this study. However, the greater proportion with elevated BP (albeit limited to a single ambulatory measurement insufficient to support a formal diagnosis of hypertension without repeated BP) in teenagers discordantly classified with lower pediatric BMI percentile but higher adult BMI category supports the use of adult BMI criteria in older adolescents to identify candidates for overweight and obesity intervention.

According to the 2000 CDC growth charts for children and adolescents age 2–19 years old, the reference values for height, weight and BMI are age- and sex-dependent<sup>25</sup> until the



transition to adult BMI classification at age 20 years.<sup>12</sup> However, the CDC growth chart upper limit of BMI 36–37 kg/m<sup>2</sup> makes it difficult to track BMI percentile in the heaviest adolescents,<sup>28</sup> many of whom have BMI 40 kg/m<sup>2</sup> that well exceeds the 99<sup>th</sup> percentile. As such, expressing BMI as a percentage above the 95<sup>th</sup> BMI percentile enables specific BMI tracking for severely obese children and adolescents,<sup>26, 28</sup> and has been shown in preliminary studies to be associated with clinically relevant health risk.<sup>22</sup> However, this approach requires specialized growth charts<sup>11, 28</sup> and is not practical in the young adult clinic setting. In the current study, 6% met criteria for class II adult obesity or higher and 2.2% met criteria for class III obesity (similar to rates reported from nationally representative data)<sup>4</sup> with BMI values ranging as high as 78 kg/m<sup>2</sup>. In addition to existing recommendations for BMI 30 kg/m<sup>2</sup> to further classify pediatric obesity and more recent recommendations for BMI 35 kg/m<sup>2</sup> to define severe obesity in children and adolescents with BMI <120% of the 95<sup>th</sup> percentile (aligning with class II obesity or greater),<sup>11</sup> our study findings support the use of discrete BMI values for classifying and tracking overweight and obesity severity in older teens with high BMI, providing a practical approach to weight assessment and management. This older adolescent age range also corresponds to an expected plateauing in linear growth,<sup>8</sup> albeit weight and corresponding BMI may continue to increase.

In summary, in this diverse, community-based cohort of older U.S. teenagers in whom obesity and severe obesity were prevalent, a high degree of concordance was seen when classifying BMI using either pediatric BMI percentile or adult BMI criteria, with an absolute BMI threshold of 35 kg/m<sup>2</sup> to define severe obesity. Furthermore, in a significant number of overweight at-risk older adolescents, using adult BMI criteria may better identify individuals who could benefit from closer observation and lifestyle intervention. From a real-world clinical perspective, the adult WHO/NHLBI classification criteria for BMI provides a practical approach for management of teen health for the many teenagers who have transitioned from pediatric to adult primary care.

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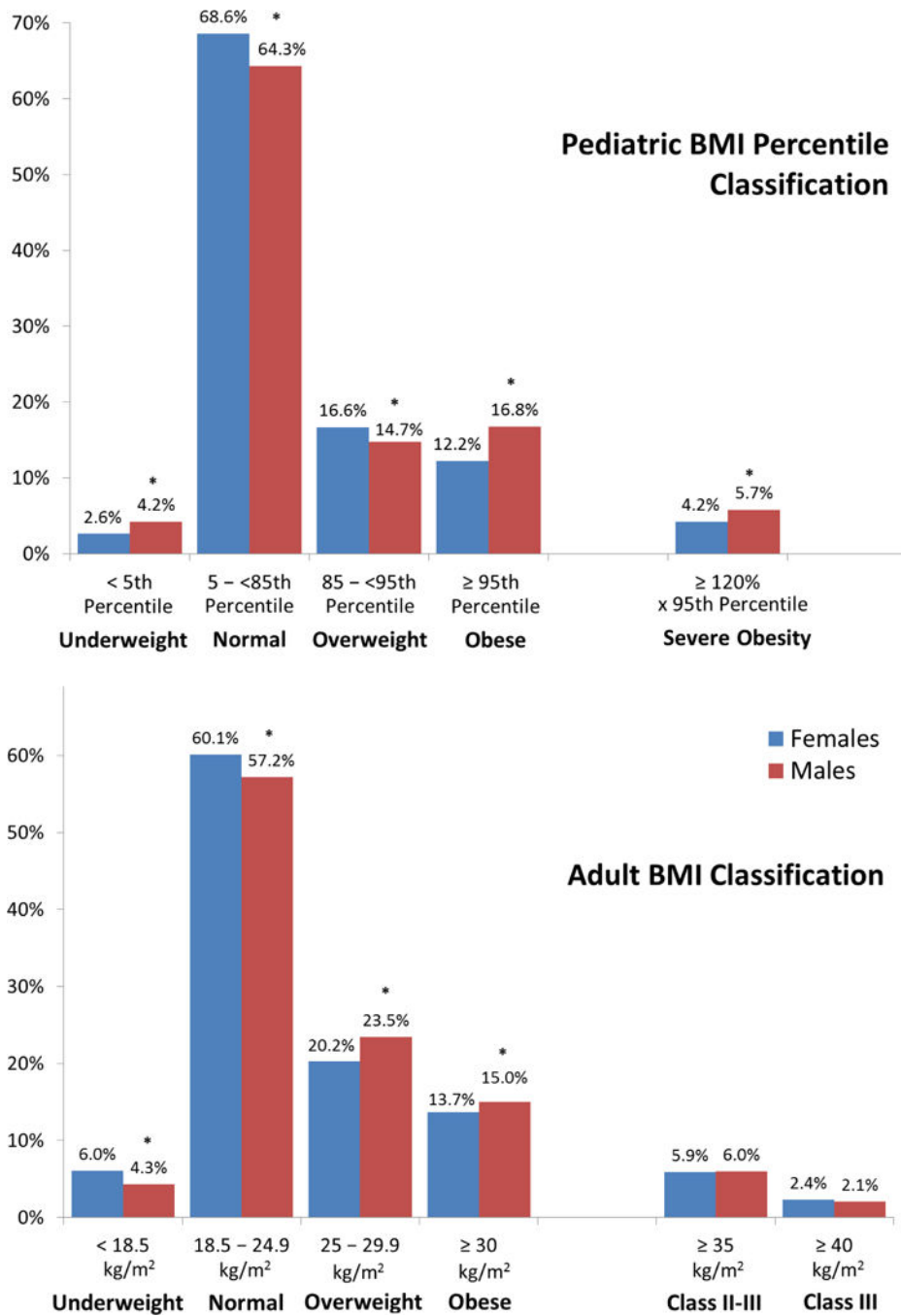
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**What is already known about this subject**

- Body mass index (BMI) classification of weight status in the United States (U.S.) changes from pediatric BMI percentile categories to adult BMI categories at age 20 years.
- Many teenagers transition at age 18 to adult medical care, where pediatric growth charts are unlikely to be used for weight classification.
- Although the pediatric and adult BMI cut points roughly approach similar thresholds for overweight and obesity in older teenagers, the extent to which weight status is discordantly classified in this age group and the relationship with clinical risk stratification is unknown.

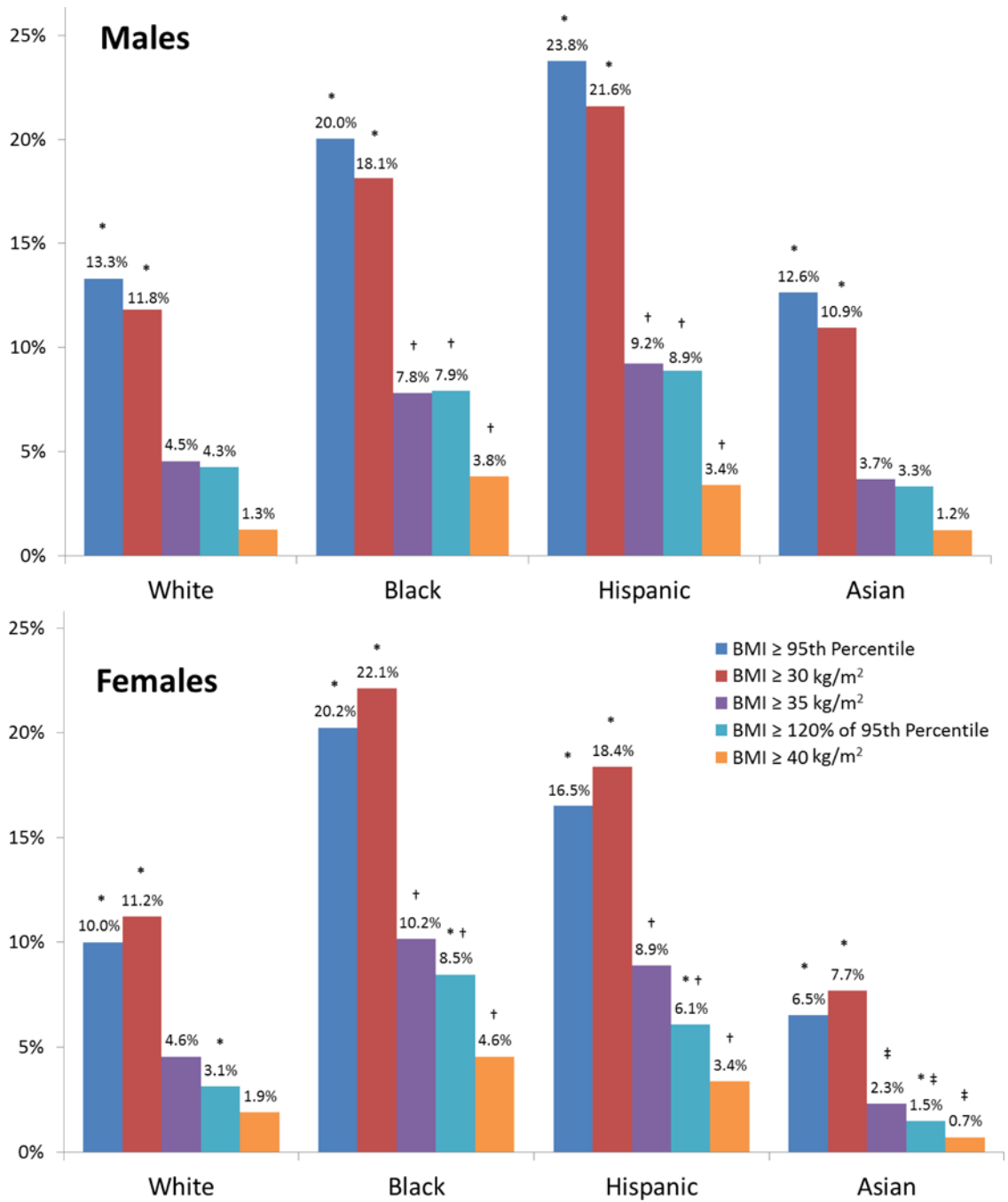
**What this study adds**

- For 18–19 year old U.S. teenagers, a high level of agreement exists between pediatric BMI percentile and adult BMI thresholds across underweight, normal, overweight and obese categories, with less than 10% discordant; a high level of agreement also exists between pediatric severe obesity and the BMI threshold for adult class II obesity.
- Normal weight males and moderately obese females by pediatric BMI percentile criteria who were discordantly classified into a higher adult weight strata had significantly higher rates of hypertensive blood pressure compared to their concordantly classified counterparts.
- Adult BMI weight classification provides a practical approach for risk stratification and tracking of weight status in older teenagers, many of whom have already transitioned to adult medical care.

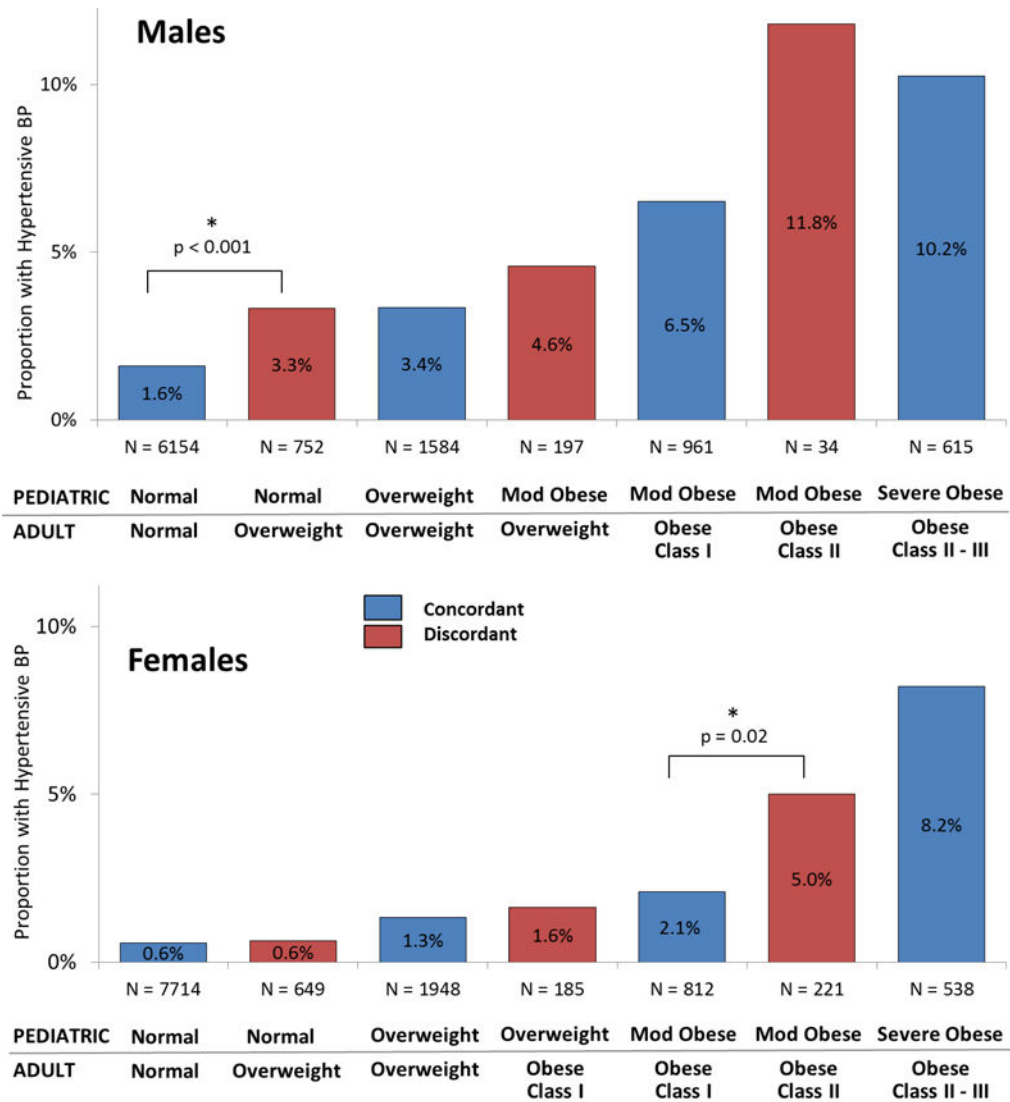


**Figure 1. The proportion of older teens ages 18–19 years old by body mass index (BMI) classification method**

\* p < 0.01 for females versus males.



**Figure 2. Body Mass Index (BMI) by race/ethnicity and sex in teens ages 18–19 years old**  
 \* p < 0.05 compared to all other race/ethnic subgroups (white, black, Hispanic or Asian), except for comparisons between white and Asian males  
 † p < 0.05 compared to whites and Asians  
 ‡ p < 0.05 compared to whites



Pediatric BMI Percentile Criteria	WEIGHT CLASSIFICATION			Adult BMI Criteria
5 <sup>th</sup> to <85 <sup>th</sup> percentile	Normal weight			18.5 – 24.9 kg/m <sup>2</sup>
85 <sup>th</sup> to <95 <sup>th</sup> percentile	Overweight			25.0 – 29.9 kg/m <sup>2</sup>
95 <sup>th</sup> to <120% of 95 <sup>th</sup> percentile	Moderate	Obese	Class I	30.0 – 34.9 kg/m <sup>2</sup>
≥120% of 95 <sup>th</sup> percentile	Severe		Class II	35.0 – 39.9 kg/m <sup>2</sup>
			Class III	≥ 40.0 kg/m <sup>2</sup>

**Figure 3. Hypertensive blood pressure (BP) by weight status in 18–19 year old teens<sup>†</sup>**

\* p<0.05 comparing adjacent groups

<sup>†</sup> All adjacent groups were compared. Underweight teens (N = 1267) and those in discordant overweight/obese subcategories with N = 5 (9 overweight/obese males) are not shown.

**Table 1**  
Comparison of pediatric body mass index (BMI) percentile and adult BMI criteria for weight classification in 23,640 older teens ages 18–19 years old  
(column percentages are represented)

ADULT CRITERIA for absolute BMI Classification	PEDIATRIC CRITERIA for BMI Percentile Classification					BMI PERCENTILE IN THE OBESE RANGE BMI 95 <sup>th</sup> percentile	
	Underweight <5 <sup>th</sup> percentile N = 792	Normal weight 5 <sup>th</sup> to <85 <sup>th</sup> percentile N = 15,744	Overweight 85 <sup>th</sup> to <95 <sup>th</sup> percentile N = 3721	Obese 95 <sup>th</sup> percentile N = 3383			
<b>Underweight</b> <18.5 kg/m <sup>2</sup> N = 1236	761 (96.1%)	475 (3.0%) §	0	0	Moderate obesity <120% × 95 <sup>th</sup> percentile N = 2225	Severe obesity 120% × 95 <sup>th</sup> percentile N = 1158	
<b>Normal</b> 18.5–24.9 kg/m <sup>2</sup> N = 13,899	31 (3.9%) €	13,868 (88.1%)	0	0			
<b>Overweight</b> 25–29.9 kg/m <sup>2</sup> N = 5130	0	1401 (8.9%) *	3532 (94.9%) ‡	197 (5.8%) ‡	197 (8.8%) ‡	0	
<b>Obese</b> 30 kg/m <sup>2</sup> N = 3375	0	0	189 (5.1%) †	3186 (94.2%)			
<b>ABSOLUTE BMI IN THE OBESE RANGE BMI 30.0 kg/m<sup>2</sup></b>	<b>Class I obesity</b> 30.0–34.9 kg/m <sup>2</sup> N = 1967		189 (5.1%) †		1773 (79.7%)	5 (0.4%)	
	<b>Class II obesity</b> 35.0–39.9 kg/m <sup>2</sup> N = 879		0	0	255 (11.5%)	624 (53.9%)	
	<b>Class III obesity</b> 40 kg/m <sup>2</sup> N = 529		0	0	0	529 (45.7%)	

Pediatric criteria for BMI percentile classification: 3.4%, underweight, 66.6% normal weight, 15.7% overweight, 14.3% obese.

Adult criteria for BMI classification in the cohort: 5.2%, underweight, 58.8% normal weight, 21.7% overweight, 14.3% obese.

Bolded numbers and percentages represent concordant classification based on pediatric BMI percentile and adult BMI categories

§ These 475 (2.0% of cohort, 38 male, 437 female) had underweight BMI values (17.6–18.4 kg/m<sup>2</sup>) and normal range BMI percentiles (5.0–12.9<sup>th</sup> percentile)

€ These 31 (0.1% of cohort) were all male with normal BMI values (18.5–19.0 kg/m<sup>2</sup>) and underweight BMI percentiles (2.9–4.9<sup>th</sup>, median 4.6<sup>th</sup> percentile). They included 4 with chronic/acute illness (3 with subsequently normal BMI during the ensuing 2 years and 1 with no follow-up BMI). Among the remaining 27, 10 had no follow-up BMI, 13 had normal follow-up BMI (18.5–24.9 kg/m<sup>2</sup>) and 4 had low follow-up BMI (BMI 17.7–17.9 kg/m<sup>2</sup>, all with height >70 inches and no active health issues) using adult criteria.

\* These 1401 (5.9% of cohort, 752 male, 649 female) had overweight BMI values (25.0–26.9 kg/m<sup>2</sup>) and normal range BMI percentiles (72.1–84.9<sup>th</sup> percentile)

† These 189 (0.8% of cohort, 4 male, 185 female) had obese BMI values 30.0–31.4 kg/m<sup>2</sup> and overweight range BMI percentiles (93.4–94.9<sup>th</sup> percentile)



These 197 (0.8% of cohort) were all male with overweight BMI values 29.0–29.9 kg/m<sup>2</sup> and obesity range BMI percentiles (95.0–96.4<sup>th</sup> percentile)

These 255 (1.1% of the cohort, 34 male, 221 female) had BMI ranging 35.0–37.7 kg/m<sup>2</sup>.

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