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Short Communication

Severe obesity among American Indian tribal youth in the Southwest



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Introduction

Children with obesity are at risk for adult obesity, atherosclerotic cardiovascular disease, type 2 diabetes, stroke, and low self-esteem, and are less likely to participate in physical activity than non-obese youth.¹ The obesity epidemic is due largely to lifestyle behaviours and the built environment that shape life habits in obvious and subtle ways.² With early onset of obesity, risks for chronic disease and associated complications have more time to develop. Various studies show that American Indian youth have the highest prevalence of obesity of all racial/ethnic groups in the US.³ The objective of this study was to quantify the levels of severe obesity by sex among select American Indian tribal youth who attended a summer wellness camp aimed at children at risk for or with type 2 diabetes, between 1995 and 2015.

Methods

We analysed data on a select group of American Indian boys and girls from 14 tribes in the Southwestern US, primarily Arizona, who attended a 1-week residential summer wellness camp during 15 camp years between 1995 and 2015. The years during which camp was not held or when too few children attended camp were not included in the analysis. In addition to race, campers also had other risk factors for type 2 diabetes including obesity, prediabetes, family history of diabetes, or a mother with gestational diabetes. The wellness camp focused on educating participants about nutrition and fitness in an effort to help them achieve and maintain healthy lifestyles. Parents or guardians provided informed consent and all youth gave assent. Baseline data from the first day of camp were used in our analyses. For youth who attended camp during more than one summer, only data from their first camp year were included.

Weight and height were measured on the first day of camp. A standardized protocol was followed using SECA Stadiometers and Tanita body composition scales since 2013. In prior years, portable height board and weight scales were used. The camp director, tribal community health personnel and undergraduate students were trained on field-based data collection procedures and performed the measurements. Body mass index (BMI), sex-specific BMI-for-age percentile, BMI as a percent of the 95th percentile, and BMI z-score⁴ were computed using Centers for Disease Control and Prevention SAS code.⁵ Weight status was determined using Centers for Disease Control and Prevention criteria for youth:⁶ normal

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weight (BMI-for-age percentile 5th to <85th percentile), overweight (85th to <95th percentile), obese (≥ 95 th percentile), severe obesity class 2 (120% to <140% of the 95th percentile or $\text{BMI} \geq 35.0 \text{ kg/m}^2$), and severe obesity class 3 ($\geq 140\%$ of the 95th percentile or $\text{BMI} \geq 40.0 \text{ kg/m}^2$).

Generalized logit logistic regression analysis was performed using 5-level weight status as the dependent variable and sex as the independent variable to identify sex differences. Statistical contrasts were then performed among dichotomized weight status categories. Analysis of variance with Satterthwaite adjustment was used for BMI as a percent of the 95th percentile. Results are expressed as odds ratios (OR) with 95% confidence intervals (CI) or as mean \pm standard deviation. The significance threshold was set at $P < 0.05$. Analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

The sample comprised 278 youth (159 girls, 119 boys) who participated in camp during one of the following years: 1995, 1998, 2002, 2003, and 2005–2015. Mean age was 12.5 ± 1.6 years (range 9–16 years). BMI for the overall sample was $31.4 \pm 7.8 \text{ kg/m}^2$ (range 15.8–57.8), BMI-for-age percentile was 94.0 ± 12.7 (range 12.0–99.9), BMI as a percent of the 95th percentile was 124.5 ± 30.2 (range 61.4–235.5), and BMI z-score was 2.02 ± 0.74 (range -1.18 – 3.20). Because a high proportion of youth in our sample had BMI-for-age percentile values above the 95th percentile, the continuous BMI variable that we used for statistical comparisons was BMI as a percent of the 95th percentile. This value was significantly greater among

boys (130.9 ± 337.7) compared with girls (119.8 ± 26.4 , $P = 0.003$).

Fig. 1A and B show the individual BMI values for boys and girls, respectively, plotted on sex-specific BMI-for-age growth curves. Points above the top two curves on each graph reflect severe obesity classes 2 and 3. The prevalence of obesity (classes 1, 2, and 3 combined) was 79.9% overall, with 55.4% of participants meeting the criteria for severe obesity.

Sex differences were observed, with boys more likely than girls to be severely obese (OR = 1.62, 95% CI 1.01–2.63, $P = 0.049$) and to have class 3 obesity (OR = 2.52, 95% CI 1.46–4.35, $P < 0.001$). The proportion of our youth with class 3 obesity was 26.6% overall, with 37.0% of boys and 18.9% of girls in this weight status category. Severe obesity was present in all camp years, with no temporal trends.

Discussion

The major finding of our study is the high prevalence of severe obesity among American Indian youth, 28.8% of the sample with class 2 obesity and 26.6% with class 3 obesity. The prevalence of severe obesity among our American Indian youth was higher than the national prevalence of 6.3% among youth aged 2–19 years.¹ Furthermore, boys were significantly more likely than girls to have severe obesity, particularly at the class 3 level. Severe obesity is increasingly recognized as a distinct category of excess weight^{7,8} that has been associated with significant cardio-metabolic risks.^{9,10} Although our sample is selective of youth at risk or already diagnosed with type 2 diabetes, it is important to know the magnitude of risk among American Youth at highest risk for significant

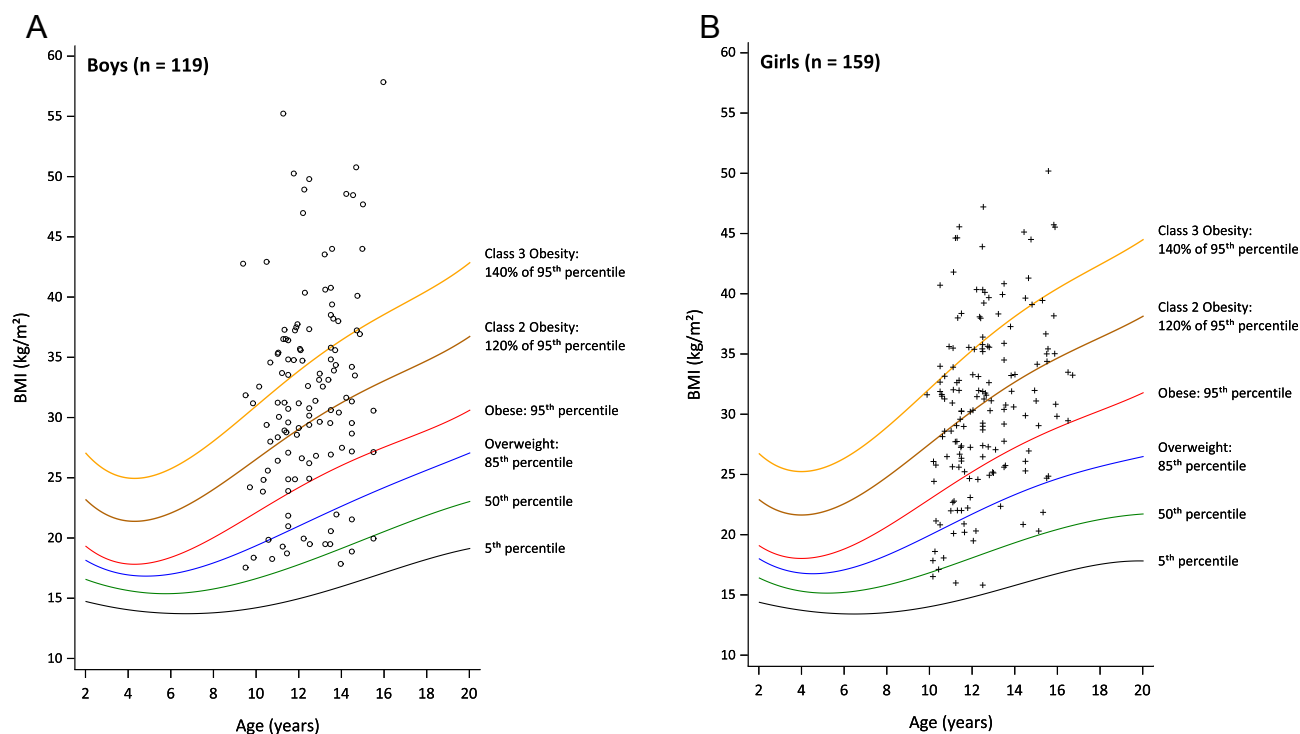


Fig. 1 – Individual body mass index (BMI) values plotted on sex-specific BMI-for-age growth curves. Percentile curves on each graph reflect sex- and age-specific cut-points for each weight category. A shows individual BMI values for boys ($n = 119$); B shows individual BMI values for girls ($n = 159$).

cardio-metabolic disease. In a cross-sectional analysis of 2977 American Indian youth aged 5–17 years, Wheelock et al. reported that BMI percentile correlated with blood pressure and triglycerides and the prevalence of diabetes was over 7% among the severely obese adolescents.¹⁰

This study provides novel data on severe obesity in American Indian youth, using two recently defined categories of severe obesity. It is important to recognize these differing levels of obesity so that healthcare providers can provide or recommend more intensive medically supervised weight loss intervention for those most at risk. Identifying the prevalence and consequences of severe obesity is also important for community-based efforts for the design of culturally appropriate behavioural interventions, programmatic efforts, and public health policy.

A limitation of this study is that the boys and girls in our sample were specially selected for the camp and do not represent the broader American Indian youth population. Furthermore, this analysis does not include other important variables such as physical activity and dietary patterns. Despite these limitations, our findings provide valuable information on the problem of severe obesity among American Indian boys and girls, which should serve to raise awareness of this serious and persistent public health problem.

In summary, our study highlights the public health problem of severe obesity among American Indian youth throughout the past 20 years. These youth are at highest risk of adverse health outcomes. Future research should focus on these categories of obesity so that interventions for American Indian youth with class 2 and class 3 obesity can be targeted and prioritized.

Author statements

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Ethical approval

The University of Arizona Human Subjects Protection Program approved the study protocol.

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Competing interests

None declared.

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