

Ottawa County 3rd Grade Body Mass Index Survey 2007-2008

INTRODUCTION

Overweight children are at risk for serious health problems during their childhood. Further, individuals who are overweight as children are significantly more likely to become obese as adults. Documented childhood and adult health risks include cardiovascular disease, type 2 diabetes, asthma, gall bladder disease, sleep apnea, osteoarthritis, some types of cancer, and social discrimination. The prevalence of overweight among 6-11 year olds has increased in the last 25 years from 6.5% (1976-1980) to 18.8% (2003-2004).¹ Numerous factors have been associated with this increase in prevalence including higher energy intake, increased sedentary behavior, and socioeconomic stress. All of these risk factors are in-turn affected by a child's home, school, and community environment. Therefore, interventions to prevent the rise in childhood obesity and promote the health of students must be initiated at the local level.

To assess the prevalence of childhood obesity at the local level and help target interventions, the Ottawa County Health Department initiated a survey of body mass index (BMI) in the local 3rd grade population. A stratified cluster sample design was utilized in order to compare the results among private schools, higher income public schools, and lower income public schools (see "Methods" for details).

RESULTS

Overall, 1106 Ottawa County 3rd graders from 18 different schools were assessed for BMI (Table I and Table II). 10.6% of the sampled students were classified as overweight while an additional 13.5% were classified as at risk for overweight (Figure 1 and Table III). The type of school attended was a significant risk factor for overweight. Specifically, 19.7% of students in lower income public schools were classified as overweight compared to 10.0% of students in higher income public schools and 4.8% of students in private schools (Figure 1). After adjusting for gender, students in lower income public schools were 4.8 times (95% CI=3.3-7.0) more likely to be overweight than students in private schools and 2.2 times (95% CI 1.6-3.0) more likely to be overweight than children in higher income public schools. Similarly, students attending higher income public schools were 2.2 times (95% CI 1.4-3.2) more likely to be overweight than private school students. Finally, gender was not significantly associated with any of the BMI categories (Figure 2).

DISCUSSION

Findings

Among Ottawa County 3rd graders, 10.6% of students were classified as overweight and an additional 13.5% were classified as at risk for overweight. Although the prevalence of overweight in Ottawa County is lower than the national average for 6-11 year olds (18.8% in 2003-2004), there were significant differences among students attending the three school types included in the survey. Students in lower income public schools had the highest prevalence of overweight (19.7%) followed by students in higher income public schools (10.0%) and private school students (4.8%). These school categories are assumed to be a rough indicator of individual socioeconomic position, which has been inversely associated with childhood obesity.² To our knowledge however, this is the first study to demonstrate this association among students at the local level.

Limitations

Student-level socioeconomic information was not obtained so a direct association between BMI and socioeconomic position could not be assessed. Further the classification of higher and lower income schools was based on free and reduced lunch enrollment for the 2005-2006 academic year, which may not accurately reflect the average income of the families of students attending the school during the 2007-2008 academic year. Finally, family socioeconomic position is influenced by a complex group of variables including race, ethnicity, neighborhood, parental education, and family makeup. None of these factors were measured in this study thereby preventing an in-depth analysis of their association with childhood obesity.

Intervention Implications

Interventions aimed at promoting healthy lifestyles among Ottawa County elementary school students may consider targeting their interventions to lower income schools.

METHODS

Sampling

Stratified cluster sampling was used to randomly select elementary schools for participation in the Ottawa County BMI survey. Ottawa county elementary schools with 3rd graders (n=65) were stratified into three categories: 1) Private schools (n=16) 2) Higher income public schools (n=37) and 3) Lower income public schools (n=12). The income classification of public schools was determined on the basis of free and reduced lunch (FRL) enrollment during the 2005-2006 academic school year.³ Schools with less than 40% of their students enrolled in the FRL program were classified as higher income schools, and schools with 40% or more of their students enrolled were classified as lower income schools. Schools in each category were then randomized,⁴ and invited to participate in the survey. If a school declined to participate, the next school in the randomly generated list was contacted. Lower income schools were oversampled to obtain a more accurate assessment of this at-risk population. Overall, the number of students necessary to obtain an estimate of the overweight or at risk of overweight population of 3rd graders in Ottawa County was 700 (twice the sample size for a true random sampling strategy).⁵

Measurement

Consent for student participation was passively obtained from parents. All consenting 3rd graders in attendance on the day of a screening were measured for height and weight in a private, participant blinded setting without footwear or large, bulky outer layers. Height and weight measures were obtained in duplicate using a digital scale with attached height rod and casters. After the initial measures, students were told to step off the scale while both instruments were recalibrated. If the second weight measurement differed by more than 0.25 pounds from the initial reading, a third measurement was taken. Similarly, if the second height measurement was more than 0.25 inches different from the first height, a third measurement was taken. Height measurements were recorded by hand to the nearest quarter of an inch while weight measurements were recorded to the nearest tenth of a pound. Additional information recorded included the student's date of birth, the student's gender, and date of measurement. All recorded information was then entered into a Microsoft Access database.

Analysis

Average height and weight were calculated using the two closest measurements. If three measurements were equally spaced, the two lower measurements were used in order to prevent an overestimation of body mass index. Body mass index was calculated using the formula $BMI = (\text{Weight in kilograms}) / (\text{Height in meters})^2$. Age and gender specific BMI percentiles were calculated using a SAS program available from the Centers for Disease Control.⁶ BMI-for-age was classified using the following scale:

SAS version 9.1.3 was used to analyze the data. All county-wide estimates were weighted based on the probability of selecting schools in the different strata to adjust for the stratified cluster sampling design. Logistic regression was used to estimate the odds of being overweight after adjusting for gender.

TABLES AND FIGURES

Table I: Description of Elementary School Buildings Included in the Assessment

School Type	Buildings Sampled	FRL* Range	FRL* Average
Private	3 of 16	N/A	N/A
Public-Higher Income	8 of 37	10.0%-36.3%	23.0%
Public-Lower Income	7 of 12	43.4%-74.0%	58.8%

* % of students enrolled in the Free and Reduced Lunch program (2005-2006)

Table III: Characteristics of Students Included in the Assessment

	N	%
Total Students	1106	
Gender		
Male	612	55.3%
Female	494	44.7%
School Type		
Private	126	11.4%
Public-Higher Income	630	57.0%
Public-Lower Income	350	31.6%

Table III: BMI for Gender and Age Categories

Weight Status Category	BMI Percentile Range
Underweight	< 5 th percentile
Healthy Weight	5 th - < 85 th percentile
At Risk of Overweight	85 th - < 95 th percentile
Overweight	≥ 95 th percentile

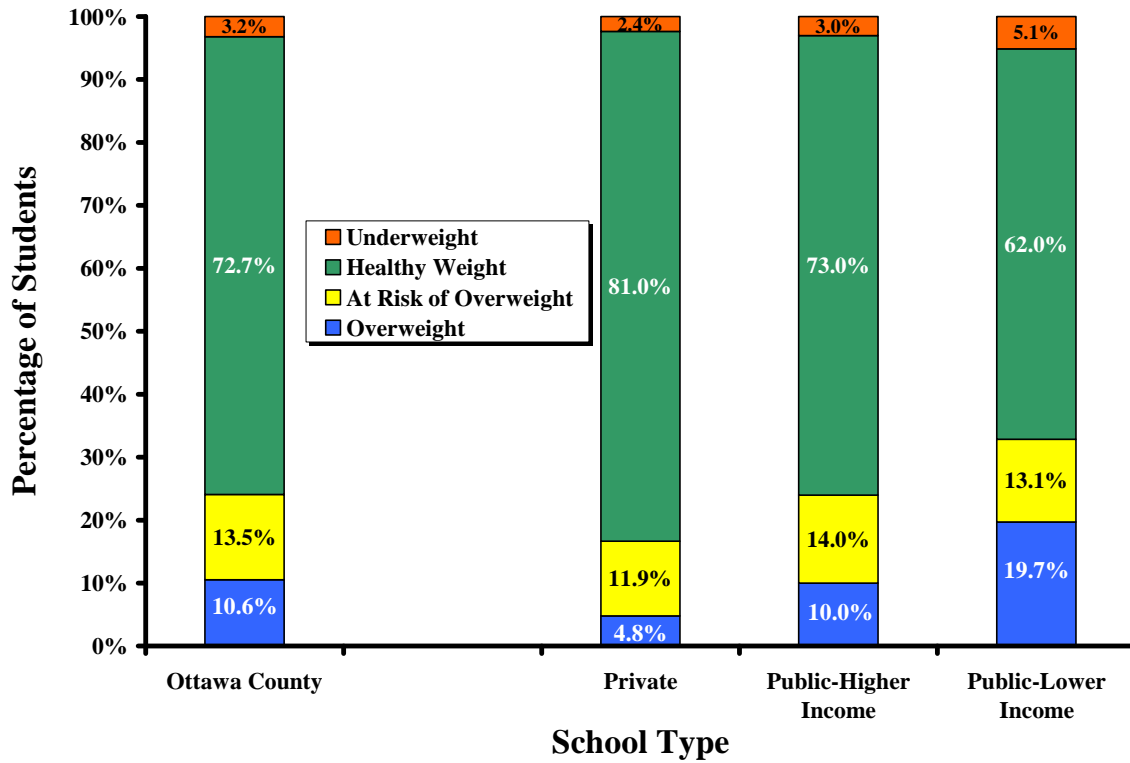


Figure 1: BMI Category by School Type for Ottawa County 3rd Graders (2007-2008)

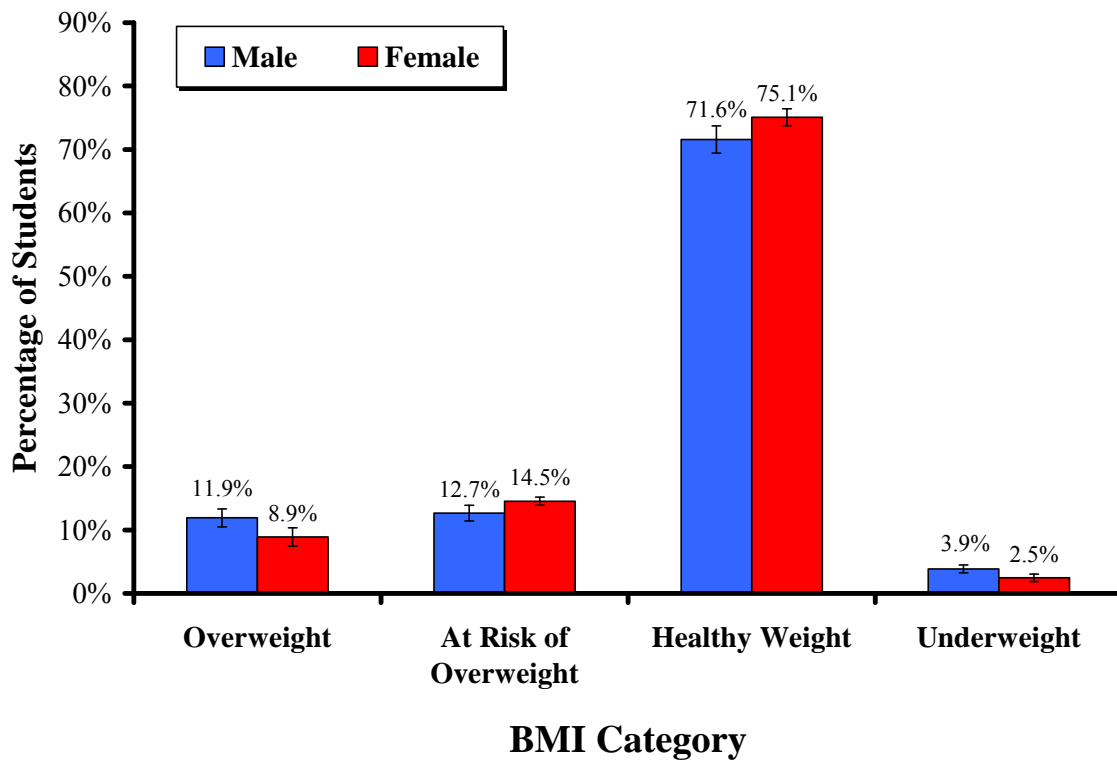


Figure 2: BMI Category by Gender for Ottawa County 3rd Graders (2007-2008)

REFERENCES

¹ NHANES data on the Prevalence of Overweight Among Children and Adolescents: United States, 2003–2004. CDC National Center for Health Statistics, Health E-Stat.

http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_child_03.htm

² Shrewsberry V and Wardle J. 2008. Obesity (Silver Spring). Socioeconomic status and adiposity in childhood: a systematic review of cross sectional studies 1990-2005. 16(2): 275-284.

³ Michigan Center for Education Performance & Information.

http://www.michigan.gov/cepi/0,1607,7-113-21423_30451_36965-146259--,00.html Accessed July 31st, 2007.

⁴ Random.org. <http://www.random.org/> Accessed July 31st, 2007.

⁵ $n = x \cdot \left(\frac{z^*}{m} \right)^2 \cdot p(1 - p)$ ----- $z^*=1.96$; $m=0.05$; $p=35\%$ =proportion at risk; $x=2$ =cluster sample factor

⁶ A SAS Program for the CDC Growth Charts.

<http://www.cdc.gov/nccdphp/dnpa/growthcharts/resources/sas.htm> Accessed May 5th, 2008.