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The Role of Poverty Status and Obesity on School Attendance in the United States

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A B S T R A C T

Purpose: Several studies have shown that obesity influences school performance. Little is known about the joint effect of poverty and obesity associated with school attendance.
Methods: Data are from the National Survey of Children's Health (N = 93,151), a nationally representative sample of U.S. youth aged 10–17 years. Our dependent variable was ≥11 days of school days missed per year. Body mass index was classified as normal, overweight, and obese using age- and sex-specific criteria. Federal poverty level (FPL) was classified as <200%, 200%–399%, and ≥400% (high income). Covariates included gender, age, child's race or ethnicity, maternal physical and mental health, child's health, family composition, and household tobacco use. Logistic regression models and prevalence ratios were estimated, accounting for the complex survey design.
Results: The odds of missing ≥11 days of school among overweight youth was 1.5 times that of normal-weight youth (95% confidence interval (CI) = 1.22–1.85) and 1.7 (95% CI = 1.35–2.13) times among obese youth in fully adjusted models. In joint effects models, the probability of missing school was significantly greater for obese youth in both the <200% FPL group (prevalence ratio = 1.78, CI = 1.36–2.34) and the ≥400% FPL group (prevalence ratio = 2.88, CI = 1.91–4.35), when compared with their normal-weight, higher income peers. Predicted probabilities revealed sharper gradients for higher income youth.
Conclusions: Obesity influences school absenteeism across all income categories. Nonetheless, there may be distinct reasons for missing school for lower and higher income youth, and the long-term consequences of school absences may also differ for these populations.

IMPLICATIONS AND CONTRIBUTION

Previous research has neglected the potential synergistic influence of poverty and obesity on school attendance. Our study found that obesity influenced school absenteeism across income categories, although the reasons for missing school and long-term consequences of severe absenteeism may nonetheless differ for poor versus nonpoor youth.

The prevalence of obesity has increased more than three-fold among youth aged 12–19 years in the United States over the past 30 years [1,2]. A growing body of research has demonstrated the deleterious health effects of obesity on childhood health status [3–6] and across the life course [7,8]. Moreover, obesity is likely to influence all aspects of children's development, including schooling. Given that the United States ranks 22 of 27 on upper secondary education graduation rates among industrialized nations [9], the obesity epidemic among adolescents may further contribute to the pressing school challenges facing the nation.

Studies conducted to date generally show that obesity is associated with worse school indicators [10–16]. However, previous research has neglected potential synergistic influences of poverty and obesity on school performance, thus missing the true impact of obesity for the most vulnerable of children. For example, in the education literature, poverty has been

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consistently associated with increasing school absences, often resulting in poor academic performance and problems with social and cognitive development [17–21]. The extent to which poverty exacerbates the role of obesity on school indicators has not been established. Most work to date has largely examined their independent effects. Using data from children enrolled in public schools in Philadelphia during the 2004–2006 academic years, Rappaport et al. [22] found that only the most obese youth (body mass index [BMI] >99th percentile) were more likely to miss school than youth of normal-weight status. In this study population, the authors also found that school absence was 24% greater among children who qualified for a reduced price on school lunches than those who did not qualify for the program, suggesting that poverty was an important predictor of school attendance.

In the present study, we directly investigate if poverty and obesity jointly pattern school attendance. We hypothesized that poverty would modify previously observed obesity–school associations, with poor obese youth showing stronger associations than other youth because of the added health and social consequences resulting from living in poverty. We tested this hypothesis using data from the 2003 and 2007 National Survey of Children's Health (NSCH), a nationally representative sample of U.S. youth containing data on school absences, BMI, and several measures of health status of the child and the mother.

Methods

Study population

Our study population included youth sampled in the NSCH [23]. This survey is conducted by the National Center for Health Statistics and sponsored by the Maternal and Child Health Bureau, Health Resources and Services Administration, U.S. Department of Health and Human Services. The NSCH is a representative sample of U.S. youth aged <17 years. Households with at least one child aged ≤17 years are sampled using random digit dialing (RDD) in each of the 50 states and the District of Columbia. In households with more than one child, a child was chosen at random to be the subject of the study. Interviews were performed with parents or guardians who were the most knowledgeable about the child's health. In the present study, we combine data from 2003 and 2007 to increase the stability of estimates obtained on number of school days missed. The 2003 survey was conducted between January 2003 and July 2004 and gathered data from 102,353 respondents with a weighted response rate of 55.5%. The 2007 survey was conducted between April 2007 and July 2008 among 91,642 participants, with a 46.7% weighted response rate among households with children.

Study measures

Our dependent variable was the number of school days missed and main independent variables included BMI and poverty status. Based on categories created by the NSCH, we used the category of ≥11 days of school days missed per year to represent a "high" number of school absences. The NSCH obtained weight and height of children through parental report and BMI is calculated only for children ≥10 years. Children were classified as normal weight, overweight, or obese if their BMI percentile was ≤85%, 85%–94%, or ≥95%, respectively, using age- and sex-specific percentile classifications established by the Centers for Disease Control and Prevention [24]. The federal poverty level (FPL) of the home in which the child lived was based on federally established thresholds of income and number of family members per household. Using categories commonly applied in the literature and by the NSCH, we classified youth as living <200% of the FPL, 200%–399% of the FPL, and ≥400% of the FPL. Additional covariates included gender, age, race or ethnicity, maternal physical and mental health (classified as excellent or very good; good; or fair or poor), the child's overall health status (excellent or very good; good; or fair or poor), family composition (two-parent household, single-parent, and other), and tobacco use in the household (yes or no).

Statistical analysis

Percent distributions and means were calculated for all study participants and by FPLs. We fit logistic regression models (odds ratios [OR]) to examine the association between BMI and the number of school absences and included potential confounders based on the literature and measures we considered relevant to our study question. Model 1 included BMI of the child as a main predictor, model 2 included BMI, age, gender, and child's race or ethnicity, model 3 included variables in model 2 plus FPL, model 4 additionally adjusted for physical and mental health of the mother, child's health, tobacco use, and family composition. We fit models estimating prevalence ratios (PR) and predicted probabilities to test for the joint effect of poverty and BMI to avoid potential biases introduced by use of OR when testing for interaction [25]. We calculated the joint effect of BMI and poverty status by creating a nine-level variable combining across categories of BMI and FPL: <200% FPL with normal weight; 200%–399% FPL with normal weight; ≥400% FPL with normal weight; <200% FPL with overweight; 200%–399% FPL with overweight; ≥400% FPL with overweight; <200% FPL and obese; 200%–399% FPL and obese; and ≥400% FPL and obese. Children with normal weight and ≥400% of FPL served as the referent group. We also conducted post hoc pairwise comparisons of these groups. Our final analytic data set includes 94,639 children aged 10–17 years. All analyses were performed in SAS version 9.2 (SAS Institute Inc., Cary, NC) and SAS-callable SUDAAN 11.0.0 (Research Triangle Institute, Research Triangle Park, NC) to account for the complex survey design of NCHS. The study was approved by the authors' institutional review board.

Results

Table 1 presents descriptive characteristics of the study participants. The mean age of participating youth was 13.5 years, which was similar across all categories of poverty. Slightly more than half of study participants were male and 60.5% of youth were non-Hispanic white, 17.1% were Hispanic, 15.2% were non-Hispanic black, and 7.2% were other, non-Hispanic. Overall, nearly 6% of youth missed ≥11 days of school per year. Youth living in households at <200% of the FPL had the highest percentage of school absences at 7.6% compared with 4.4% of youth in higher income categories. Eight percent of Hispanic and non-Hispanic black youth were living in the highest income category (≥400% FPL) compared with 76.5% of non-Hispanic white youth. Overall, 16% of youth were obese, which increased to 21.8% for youth living in households <200% the FPL. Most youth were in excellent or very good health (82.5%) and most mothers were also in either excellent or very good physical and mental health,