Original article

The Association of Obesity and School Absenteeism Attributed to Illness or Injury Among Adolescents in the United States, 2009

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A B S T R A C T

Purpose: School attendance can impact academic performance. Childhood obesity-related physical and psychosocial consequences are potentially associated with school absenteeism. Thus, we examined the association between school absenteeism attributed to illness or injury and obesity among adolescents aged 12–17 years.
Methods: We used a weighted sample of 3,470 U.S. adolescents from the 2009 National Health Interview Survey. School absenteeism was measured from the parent-reported number of sick days taken in the preceding 12 months. Body mass index was calculated from parent-reported weight and height. Weight status was classified based on the sex-specific body mass index-for-age percentile defined by the CDC growth charts. Poisson regression was conducted to examine the association between school absenteeism and weight status, controlling for selected sociodemographic characteristics and disease status.
Results: The mean number of annual sick days was 3.9 days overall; 3.4 days among normal-weight, 4.4 days among overweight, and 4.5 days among obese adolescents. Obese adolescents had a higher proportion of missing ≥4 days of school per year than adolescents of normal weight. Our multivariate analyses found that compared with adolescents of normal weight, overweight and obese adolescents had greater than one-third more sick days annually (rate ratio = 1.36 for overweight and 1.37 for obese adolescents).
Conclusions: Overweight and obese adolescents had 36% and 37% more sick days, respectively, than adolescents of normal weight. The results suggest another potential aspect of obesity prevention and reduction efforts among children and families is to improve children's school attendance.
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IMPLICATIONS AND CONTRIBUTION

The finding that obesity is associated with school absenteeism attributed to illness or injury among adolescents adds to concerns about the negative consequences of obesity. This further underscores the importance of implementing effective obesity prevention and control initiatives in multiple settings to prevent obesity among adolescents.

The United States has increasingly recognized that childhood obesity is a major health problem among the nation's youth. Using measured weight and height, the National Health and Nutrition Examination Survey (NHANES) documented tripling of the prevalence of obesity among adolescents aged 12–19 years, increasing from 5.0% to 18.1% between 1976–1980 and 2007–2008. The sharpest increase in prevalence occurred between 1976–1980 and 1999–2000, with no significant increasing trend from 1999–2000 to 2007–2008 [1–3].

Childhood obesity can affect physical and psychosocial health. For example, obesity is related to reduced quality of life and comorbidities, such as diabetes, hypertension, and metabolic syndrome, among children and adolescents [4–7]. In addition, childhood obesity may cause negative psychological and social consequences, such as depression, lower self-esteem, social isolation, and stigmatization [8–11]. These comorbidities and consequences may affect other aspects of children's lives,

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such as increasing their school absenteeism, which could lead to lower academic performance [12–14]. Given the high obesity prevalence, many U.S. children and adolescents may be at risk for these negative consequences.

At least three previous studies have examined the relationship between school attendance and obesity among young children or with local-level samples. One cohort study of a nationally representative sample of U.S. children entering kindergarten in 1998 and followed through the third grade found that overweight boys experienced more absences from schools than boys of normal weight [15]. One study conducted in 2002 demonstrated that severely obese children and adolescents aged 5–18 years who were referred to pediatric gastroenterology or nutrition clinics at the Children's Hospital and Health Center in San Diego missed more school days than their normal-weight peers [7]. Another study published in 2007 that was conducted among fourth to sixth graders from nine elementary schools in Philadelphia noted that obese children were absent significantly more than children of normal weight [16]. However, there are limited recent national studies, to our knowledge, that have examined this association among the general U.S. adolescent population. Therefore, the purpose of our study was to examine the association between school absenteeism attributed to illness or injury (sick days) and obesity among U.S. adolescents aged 12–17 years using a nationally representative sample. Confirmation of this association could help highlight the importance of obesity prevention among adolescents to improve their school attendance.

Methods

Sample

We used data from the 2009 National Health Interview Survey (NHIS), which has monitored the health of the United States since 1957. Conducted by the National Center for Health Statistics (NCHS), CDC [17], the NHIS is an ongoing, cross-sectional, in-person interview survey of the civilian noninstitutionalized U.S. population based on a multistage sampling of households. Basic health and sociodemographic data were collected for all household members, and more extensive data were collected for each family by randomly selecting one sample adult and one sample child for further query. An adult from the household, typically a parent or guardian, served as the proxy respondent for the child [17]. In the 2009 NHIS, the total household-level response rate was 82.2%, the conditional response rate for the family component was 99.3%, and the conditional response rate for the sample child component was 89.9% [17]. The NHIS was approved by the NCHS Research Ethics Review Board.

We used a sample of 4,026 U.S. adolescents aged 12–17 years. We excluded adolescents whose parents did not respond to the question about the number of school days missed (n = 53), and adolescents whose parents responded "refused," "not ascertained," "not available," or "unknown," as well as those missing values for height or weight (n = 503), which yielded a final sample for analysis of data on 3,470 adolescents.

School absenteeism, weight status, and other covariates

Our outcome of interest was school absenteeism attributed to illness or injury, which was measured from the number of parent-reported sick days based on the following question:

"During the past 12 months, that is since {12-month reference date}, about how many days did {child's name} miss school because of illness or injury?" The number of sick days was a continuous variable with a value ranging from 0 to 240.

Our key exposure variable, weight status, was classified based on the sex-specific body mass index (BMI)-for-age percentile defined by the CDC growth charts [18]: obesity, ≥95th percentile; overweight, 85th–<95th percentile; normal weight, 5th–<85th percentile; and underweight, <5th percentile. BMI (weight [kg]/height [m²]) was calculated from parent-reported child's current weight and height. Because of concerns about the considerable parental reporting bias on weight and height information for children aged <12 years [19,20], the 2009 NHIS limited data on child's weight and height to children aged 12–17 years [17]. An internal consistency check for the weight and height was added to the survey instrument to improve data quality. The interviewers verified data entry and repeated the weight and height questions to parents who reported extreme values. Furthermore, the highest and lowest 1.5% of the weight and height values were recoded by NCHS as "not available" in 2009 survey data [17].

Other exposure variables included sociodemographic characteristics and disease status. Sociodemographic characteristics were classified as follows: age groups (12–13, 14–15, and 16–17 years), sex, racial/ethnic groups (non-Hispanic white, non-Hispanic black, and Hispanic). The category "other racial/ethnic group" was included in our analyses, but not reported, because it is difficult to interpret the meaning of this variable. We used four levels of family poverty-to-income ratio (PIR): <1.00, 1.00–1.99, 2.00–3.99, and ≥4.00. Approximately 11% of data on PIR were missing. To increase sample size and precision of our income estimates, we merged the original NHIS Family, Person, and Child data files with five imputed income data sets provided by NCHS. Among the various diseases/conditions possibly related to school attendance, we excluded a number of factors, including mental retardation, autism, diabetes, heart disease, diarrhea/colitis, anemia, seizure, and limitation in walk/run/play, from our analyses owing to small sample size (n < 50). We created dichotomous (yes/no) variables for the following diseases: having respiratory allergy or eczema, or any kind of skin allergy, during the 12 months preceding survey; and having ever been diagnosed with attention deficit hyperactivity disorder (ADHD).

Statistical analyses

We used SAS-Callable SUDAAN (version 9.2; SAS Institute, Cary, NC) for our statistical analyses. The estimates were adjusted to the NHIS complex multilevel sampling design to represent the civilian noninstitutionalized U.S. population.

We examined the characteristics of the study sample and mean sick days using descriptive statistics. We used χ^2 test to compare the weighted percentages of sociodemographic characteristics and sick days among normal-weight, overweight, and obese adolescents. Underweight adolescents were not included for comparison because this population subgroup may have low school attendance and confound our results. The statistically significant level was set as $p < .05$. Because the outcome variable—the number of school days missed—is a count, we used Poisson regression to examine the association between school absenteeism and obesity, controlling for sociodemographic characteristics and disease status. We calculated rate ratios (RRs) corresponding to the relative difference in mean school days