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# Adolescents Who Visit the Emergency Department Are More Likely to Make Unhealthy Dietary Choices: An Opportunity for Behavioral Intervention

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## Abstract

To identify health behaviors that may be amenable to brief screening and intervention among children in the emergency department (ED), we described the prevalence of health behaviors known to contribute to childhood obesity among middle school students who used the ED recently. Participants included 1590 5th, 7th, and 8th grade students who completed health surveys in 2011. Multivariate logistic regression was used to examine the association between health behaviors and ED use. Children who used the ED reported more unhealthy dietary behaviors, including greater consumption of energy-dense foods such as fried chicken, french fries, and ice cream (OR 1.20, 95% CI 1.06–1.37), fast food (OR 1.07, 95% CI 1.00–1.14) and sugar-sweetened beverages (OR 1.24, 95% CI 1.14–1.35). There was no association with fruit and vegetable consumption, physical activity, or screen time. Unhealthy dietary behaviors are associated with ED use in a low-resource urban population of middle school students.

### Keywords

Nutrition surveys; emergency service; hospital; obesity; public health

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As more children and their parents turn to the emergency department (ED) as a source of care, often for non-emergent conditions,[1] clinicians are exploring creative methods to use these opportunities to intervene to improve the health of children.[2,3] The rise in utilization of ED services by adults and children of all ages[4,5] has been concurrent with the rapid growth trajectory of childhood obesity. Given the enormous health burden posed by obesity, emerging literature encourages ED clinicians to consider brief, focused interventions to take place in the ED aimed at preventing childhood obesity.[6,7] The purpose of the current investigation was to identify obesogenic behaviors prevalent in pediatric consumers of ED services in a low-resource urban population to inform the use of brief obesity-related behavioral interventions among children in the ED. This investigation was conducted with students in an urban middle school setting and surveyed children regarding a wide range of demographic characteristics and health and behaviors in addition to collecting physical measurements including blood pressure and body mass index.

## Behaviors associated with obesity

In response to the growing body of evidence suggesting that child behavior shapes adult health, including the association between childhood obesity and premature death in adulthood,[8] the American Academy of Pediatrics has made recommendations for actions to prevent childhood obesity and its long-term consequences.[9] The Academy recommends that clinicians encourage specific behavior changes based on evidence that certain behaviors contribute to the prevention of childhood obesity: (1) adequate fruit and vegetable consumption;[10] (2) fewer fast foods and energy-dense foods; (3) fewer sugar-sweetened beverages;[11] (4) less screen time; and (5) at least 60 minutes of exercise daily.[9,12] This investigation uses these recommendations as the basis for identifying prevalent behaviors among children who report use of ED services.

## ED use and potential for brief interventions in the ED

Between 1997 and 2007 the total annual increase in ED utilization was almost twice what could be expected based on U.S. population growth alone, with EDs increasingly serving as safety nets for the medically underserved and uninsured.[5] During this decade, ED visits for children ages 5–14 increased to more than 13 million visits annually,[13] and more children came to rely on the ED as a source of care—especially low-income, publicly-insured, and African American children.[14] Further, wait times in EDs are increasing; therefore, there are more opportunities for clinicians and hospital educators to take advantage of these wait times for counseling.[15]

Interest has grown in ensuring that those who present to the ED are provided with basic primary care preventive health screenings.[16,17] Brief screenings and interventions for smoking cessation, injury prevention, substance abuse, and domestic violence are all well-described in the emergency medicine literature, with some positive results for both the pediatric and adult populations. For example, brief interventions in the ED have been effective at reducing adolescent peer aggression;[18] and even low-intensity screening in the ED without intervention may prompt adult smokers to quit or attempt to quit.[19] Although brief screenings and interventions can produce lasting results, few studies have focused on

interventions for pediatric behaviors relating to diet, screen time, or physical activity, which are the target areas identified by the American Academy of Pediatrics for the prevention of childhood obesity. In a recent study in an urban pediatric ED, parents were generally receptive to screening and counseling for obesity, whatever the child's current weight status.[6]

Despite these findings and the American Academy of Pediatrics's recommendations that physicians participate in efforts to prevent childhood obesity, momentum for screenings and interventions for specific health behaviors has yet to build, perhaps in part due to a lack of knowledge about which modifiable behaviors are most prevalent in the pediatric ED population. Likewise, health promotion has traditionally been relegated to the realm of the primary care physician, and little is known about the role that emergency care providers can play in screening and prevention.[7]

Following the American Academy of Pediatrics' recommendations for the prevention of childhood obesity, the objective of this investigation is to identify obesity-related behaviors in an urban low-resource population of children that are more prevalent among children who have reported recent use of the ED for care compared to those who have not. Building on both the obesity and the emergency medicine literatures, we can begin to form a coherent strategy for obesity prevention efforts in the ED. Results may inform the development and implementation of evidence-based brief screening and intervention initiatives for this population.

## Methods

### Procedure

Data are drawn from a study conducted by the Yale School of Public Health's Community Alliance for Research and Engagement in partnership with the New Haven Public Schools. Study sites included 12 K–8 schools that were randomly selected from the 27 K–8 schools in the district. Students completed online health surveys (Survey monkey.com, LLC; Palo Alto, CA) in the fall of 2011 during their computer class time. Trained research staff read the survey aloud to account for varied literacy levels. Surveys took approximately 30 minutes, and a small gift (a water bottle) was given to each child who participated.

Additionally, trained research assistants took physical measurements of student participants. Measures were taken privately and recorded with only school-assigned identification numbers to enable linkage to survey data. Measurements were based on the World Health Organization Expanded STEPS protocol.[20] A standardized stadiometer (Charder Electronic Co.) and digital scale (Seca) were used to measure height and weight. Body mass index (BMI) was calculated based on height and weight, and adjusted for age and sex.[21]

All procedures were approved by the Yale University Human Subjects Committee and the local Board of Education. Parental consent and child assent were obtained for all participants in English or Spanish.

## Participants

All students from grades 5, 7, and 8 from the 12 selected schools were invited to participate in the survey. Participants included 1,727 students, representing an 87.8% participation rate. Students with missing data on the variables of interest (N=137) were excluded from this investigation, leaving 1,590 students in the analytic sample.

## Measures

The outcome of interest was ED use, assessed by the question, “Since the start of school, did you have to go to a hospital emergency room because you got sick or hurt? (Yes/No)”

When choosing behaviors that might be amenable to brief intervention in the ED, we identified factors articulated by the American Academy of Pediatrics Recommendations for Prevention of Childhood Obesity: 1) adequate fruit and vegetable consumption; (2) fewer fast foods and energy-dense foods; (3) fewer sugar-sweetened beverages; (4) less screen time; and (5) at least 60 minutes of exercise daily.[9]

Participants were asked whether they ate certain food items the previous day. Mirroring the AAP Recommendations, dietary items were grouped into “fruit and vegetable” and “energy-dense” categories, creating a three-item sum for each ranging from zero to three items in each category that was consumed on the previous day. “Fruit and vegetable” items were green salad, fruits, and other vegetables. “Energy-dense” items were fried chicken, french fries, and ice cream. Participants also reported the number of days in the prior week that they ate fast food (range of 0–7 days). Finally, participants reported the number of different types of sugar-sweetened beverages they drank the previous day, and a sum was created ranging from zero to six types of sugar-sweetened beverages having been consumed the previous day (diet drinks, regular soda, sports drinks, energy drinks, flavored fruit drinks, sweetened coffee drinks).[22]

Participants reported the number of days in a typical week that they did physical activity for 60 minutes or more (range of 0–7 days).[23] In addition, they reported the number of hours of screen time they typically engaged in on a school day (0–6 hours) and on a weekend day (0–6 hours).

Several demographic and clinical control variables were used in these analyses. Demographic controls included race/ethnicity, gender and age. These data were obtained directly from the school district. Data from the school district on students’ eligibility for the free and reduced-price school lunch program was used as an indicator of socioeconomic status. We also controlled for BMI percentile, adjusted for sex and age per guidelines from the U.S. Centers for Disease Control and Prevention,[21] and whether participants reported having been told by a doctor that they had asthma or diabetes, as these are well-known reasons for increased visits to the ED.[24,25]

## Data analysis

Descriptive statistics were calculated for the study sample. A multivariate logistic regression analysis was used to test the associations of dietary behaviors, physical activity, and screen time with ED use, while controlling for demographic and clinical factors. To adjust for the

school-stratified sampling design and any confounding by school, we controlled for school clustering in all analytic models. Analyses were conducted using SAS 9.2 (SAS Institute, Cary, NC).

## Results

### Study sample

Descriptive results are shown in Table 1. Approximately one-fifth (18.2%) of our sample reported ED use since the start of the school year, and 13.5% reported that the ED was their usual source of care. Only half (52.3%) reported a primary doctor as their usual source of care. Slightly over one-half of the sample was female, and most were Latino or Black, reflecting school district demographic characteristics. Participants were on average 12 years old. More than 80% of students were eligible for free or reduced-price lunch. Two percent of students reported that a doctor had told them they had diabetes, and 24% reported asthma. The average BMI percentile of the middle school students in our sample was 72% (SD = 28.3).

### Behaviors associated with ED use

Results of the logistic regression analysis are in Table 2. Children who engaged in more unhealthy eating behaviors were significantly more likely to have visited the ED since the start of school. The strongest association was with sugar-sweetened beverage consumption, with more types of sugar-sweetened beverages consumed the previous day significantly associated with greater odds of visiting the ED since the start of school (OR 1.24, 95% CI 1.14–1.35). Eating more energy-dense foods the previous day (OR 1.20, 95% CI 1.06–1.37) and consuming fast food more times in the prior week were also associated with greater odds of ED use (OR 1.07, 95% CI 1.00–1.14). Neither physical activity nor weekday and weekend screen time were significantly associated with odds of ED use in our sample.

## Discussion

Drawing on the recommendations of the American Academy of Pediatrics for the prevention of childhood obesity, we have identified specific dietary behaviors that are widely accepted to contribute to childhood obesity and that may be amenable to brief intervention in the ED because of their prevalence among children visiting the ED. Children who reported unhealthy eating behaviors in general were more likely to have visited the ED since the start of the school year. These behaviors included increased consumption of energy-dense foods, fast food, and sugar-sweetened beverages.

However, we found no differences between the children who visited the ED and those who did not with regards to fruit and vegetable consumption, screen time or physical activity. Still, our study sample as a whole reported an average of 3.5 hours per day of school-day screen time, nearly double the American Academy of Pediatrics recommendation of no more than two hours per day. Additionally, the students averaged only 3.7 days per week of 60 minutes of physical activity or more, versus the American Academy of Pediatrics recommendations for 60 minutes every day of moderate-to-vigorous physical activity. Despite the fact that the children who visited the ED were no more likely to engage in these

behaviors than those who did not, they nonetheless could likely benefit from counseling about the adverse effects of sedentary behavior as recommended by the American Academy of Pediatrics.

The current study was conducted in a small city with substantial socioeconomic inequalities. Therefore, our sample is likely representative of some of the most low-resource, vulnerable populations of urban students.[26] A 2009 report noted that the rate of ED utilization in this city was two to three times the state average and was increasing.[27] Nearly one in five middle school students in our sample reported having been to the ED since the start of the school year (i.e., in the past 2–3 months); this is on track to surpass national trends by the year's end. Nationwide ED use among children has increased 30% in the past two decades.[28] Further, 13.5% of participants reported that the ED is the place they usually go when they get sick, and only slightly more than half reported that they usually go to their own doctor when they get sick. Thus, although not all children have had contact with the ED in the prior two to three months, there are a substantial number of children do not appear to have or be aware of a primary care doctor that is their usual source of care. This further adds to the argument that it is important for clinicians in the ED to consider screening and prevention of obesity as part of their job, as they are effectively serving as the primary care providers for a great number of children.

Prior studies have focused on obesity screening and the factors that predict obesity in a sample of children drawn from the ED; the effectiveness of brief screenings and interventions in the ED; and the receptiveness of parents to these screening and intervention efforts. This study adds to the literature by looking outside of a patient population to the general population of pre-adolescent children to understand their ED use and the prevalence of obesogenic behaviors that, when modified, may prevent the development of obesity and its consequences. Our findings that middle-school children who report ED use are more likely than their peers to have engaged in unhealthy eating behaviors is a novel finding. These unhealthy dietary behaviors were associated with use of the ED even after controlling for important clinical and sociodemographic factors. Further, by concentrating on evidence-based behavior modification strategies as recommended by the American Academy of Pediatrics, we are able to expose specific behaviors that are more prevalent in the population of children who visit urban EDs, making brief, behavior-directed interventions rather than broad screenings more feasible for busy clinicians. In particular, focusing on reducing the consumption of energy-dense foods, fast food, and sugar-sweetened beverages has the potential to reduce the development and progression of childhood obesity in the population of children who use the ED.

## Limitations and strengths

As with all cross-sectional studies, we are unable to make any statements about causality, though our primary aim was not to determine what brought children to the ED or make claims about the direction of effects, but rather to characterize those who presented to the ED in order to identify modifiable behaviors that may be more prevalent among ED users. We also have no data to document reasons for ED use. Presumably, children who have been to the ED with a serious condition may not be an appropriate target audience for counseling

regarding fast food intake, for example. In addition, all data were collected primarily from students and no information was confirmed with parents or guardians, as this additional level of data collection would have proved too cumbersome given our resources. Finally, results may not be generalizable to the population at large because this was an urban, mostly Black and Latino, low-resource population with higher than national-average rates of ED utilization.

At the same time, this study has several strengths. It was conducted in an urban setting with children who are representative of a low-income population—a population known both to use ED services disproportionately and to have higher rates of obesity. Our findings among a population-based sample of middle-school children are novel, as previous studies have focused solely on ED patients and not the general public, and therefore have been unable to compare ED users with their non-ED user peers. Even after controlling for important clinical and demographic risk factors, ED use was associated with unhealthy dietary behaviors. Further, by focusing on evidence-based behavior modification strategies as recommended by the American Academy of Pediatrics, we expose specific behaviors that are more prevalent in the population of children who visit urban EDs, making brief, behavior-directed interventions rather than broad screenings more feasible for busy clinicians.

### Future directions

Clinical investigators should develop and implement brief interventions for pediatric ED users that focus on specific behaviors known to be both more prevalent in this population and correlated with adverse health outcomes. We can make recommendations for further study into ED-based brief interventions, but cannot predict whether these potential interventions will be effective at improving health behaviors or whether they will be cost effective. However, the results from the current investigation suggest that unhealthy eating behaviors are more prevalent among children using the ED, and therefore unhealthy eating behaviors may be a particularly fruitful area for targeted interventions in the ED.

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**Table 1**

CHARACTERISTICS OF STUDY SAMPLE (N=1590)

| **Demographic Characteristics** | **% (N) or Mean (SD)** |
|---|---|
| Emergency Department Visit | |
| Yes | 18.2% (289) |
| No | 81.8% (1301) |
| Usual Source of Care | |
| Emergency Department | 13.5% (215) |
| Primary Care Doctor | 52.3% (833) |
| School Clinic or Nurse | 18.2% (289) |
| Walk-in Clinic | 4.5% (72) |
| Unknown | 11.4% (181) |
| Gender | |
| Male | 46.5% (739) |
| Female | 53.5% (851) |
| Race/Ethnicity | |
| Hispanic | 46.5% (740) |
| Black | 37.2% (591) |
| White/other | 16.3% (259) |
| Age (years) | 12.4 (1.4) |
| Lunch Eligibility | |
| Free or Reduced Price | 83.5% (1327) |
| Full pay | 16.5% (263) |
| Diagnoses | |
| Asthma | 24% (382) |
| Diabetes | 2% (32) |
| BMI Percentile | 71.9 (28.2) |
| **AAP Recommended Behaviors** | **Mean (SD)** |
| 1. Fruits and Vegetables Yesterday Sum (0–3 scale)[a] | 1.7 (1.0) |
| 2a. Energy Dense Foods Yesterday Sum (0–3 scale)[b] | 2.0 (1.5) |
| 2b. Fast Foods (# days/week) | 1.6 (1.7) |
| 3. Sugar-Sweetened Beverages Yesterday (0–6 Scale)[c] | 1.9 (1.6) |
| 4a. Screen Time Hours on School Days | 3.5 (1.3) |
| 4b. Screen Time Hours on Weekend Days4.0 (1.4) | |
| 5. Physical Activity at Least 60 Minutes (# days/week) | 3.7 (1.3) |

Notes:

[a]Fruits and Vegetables Yesterday Sum = green salad, fruits, vegetables.

[b]Energy Dense Foods Yesterday = ice cream, french fries, fried chicken.

[c]Sugar-Sweetened Beverages Yesterday = number of types of SSB consumed yesterday.

**Table 2**

PREDICTORS OF PEDIATRIC EMERGENCY DEPARTMENT USE (N=1590)

| Control Characteristics | Odds Ratio (95% CI) |
|---|---|
| Gender | 1.11 (0.86–1.45) |
| Race/Ethnicity | |
| Hispanic | 1.67 (0.99–2.82) |
| Black | 1.82 (1.00–3.31)* |
| Age (years) | 0.98 (0.87–1.11) |
| Lunch Eligibility | 1.31 (0.94–1.83) |
| Diagnoses | |
| Asthma | 1.74 (1.39–2.19)* |
| Diabetes | 4.23 (2.02–8.45)* |
| BMI Percentile | 1.0 (1.0–1.0) |
| AAP Recommended Behaviors | |
| 1. Fruits and Vegetables Yesterday Sum (0–3 scale)[a] | 0.96 (0.85–1.08) |
| 2a. Energy Dense Foods Yesterday Sum (0–3 scale)[b] | 1.20 (1.06–1.37)* |
| 2b. Fast Foods (# days/week) | 1.07 (1.00–1.14)* |
| 3. Sugar-Sweetened Beverages Yesterday (0–6 Scale)[c] | 1.24 (1.14–1.35)* |
| 4a. Screen Time Hours on School Days | 1.09 (0.94–1.28) |
| 4b. Screen Time Hours on Weekend Days | 0.94 (0.84–1.06) |
| 5. Physical Activity at Least 60 Minutes (# days/week) | 0.99 (0.92–1.07) |

Notes:

*$p \leq .05$

[a]Fruits and Vegetables Yesterday Sum = green salad, fruits, vegetables.

[b]Energy Dense Foods Yesterday = ice cream, french fries, fried chicken.

[c]Sugar-Sweetened Beverages Yesterday = number of types of SSB consumed yesterday.