Electronic Media and Beverage Intake Among United States High School Students—2010
Zewditu Demissie, PhD1,2; Richard Lowry, MD2; Danice K. Eaton, PhD2; Sohyun Park, PhD3; Laura Kann, PhD2

ABSTRACT
Objective: To describe electronic media exposure and its associations with beverage intake among United States high school students.
Methods: School-based survey data from a nationally representative sample of 9th- through 12th-grade students from the National Youth Physical Activity and Nutrition Study were analyzed using chi-square and multivariate logistic analyses.
Results: On an average school day, 23.5% of students used a computer or played video/computer games ≥3 h/d, 28.3% watched television (TV) ≥3 h/d, 79.9% had ≥3 TVs in the home, 70.2% had a TV in their bedroom, and 41.0% most of the time or always had a TV on while eating dinner at home. Students with high media exposure were more likely to drink sugar-sweetened beverages ≥3 times per day and less likely to drink water ≥3 times per day and drink ≥2 glasses of milk per day.
Conclusions and Implications: Efforts to reduce sugar-sweetened beverage intake among adolescents may include limiting exposure to electronic media.
Key Words: adolescent, beverages, mass media (J Nutr Educ Behav. 2013;45:756-760.)

INTRODUCTION
Adolescents are exposed to a significant amount of media such as television (TV), computers, and video games.1 Television is the most used form of media1 and TV watching is the most common overall leisure time activity among adolescents.2 Exposure to electronic media may affect overall diet quality3 and specific dietary behaviors,4 which influence chronic disease risk factors throughout childhood into adulthood.5

The 2010 Dietary Guidelines for Americans are the standard of United States (US) nutrition policy, and recommend that individuals reduce their intake of calories from added sugars.6 Approximately 70% of male adolescents and more than 80% of female adolescents exceed the maximum energy allowance for added sugars.7 Sugar-sweetened beverages (SSBs) are the largest single source of added sugars for adolescents.8 Sugar-sweetened beverages contain added sugars and supply calories but few or no essential nutrients.6 Sugar-sweetened beverage intake among adolescents is associated with excess caloric intake, poorer nutritional quality, obesity, lower bone mineral density, anxiety, withdrawal, poor quality or reduced sleep, tooth decay, and risk factors for diabetes.9 More healthful alternatives to SSBs include water and low-fat or fat-free milk.

Research has shown that sedentary behaviors (such as media use) and SSB intake may be associated with weight status.10,11 However, the mechanisms by which media use contributes to weight status have not been firmly established. One hypothesis is that increased energy intake, with SSB intake as a potential contributor, is a mediator between the media use and obesity association.12 Therefore, the association between media use and SSB is an important association to investigate. Previous studies have found significant associations showing that higher media use is associated with higher SSB intake,10,13-16 but most studies have focused on TV watching or total screen time.4 This study expands on previous research by examining other media exposure variables. To describe electronic media exposure and its associations with beverage intake among US high school students, the authors analyzed data from the National Youth Physical Activity and Nutrition Study (NYPANS), a nationally representative, cross-sectional, school-based study.

METHODS
The NYPANS Study assessed physical activity and dietary behaviors and determinants of these behaviors, such as aspects of the home environment. A 3-stage cluster sample design that oversampled African-American/black and Hispanic/Latino students was...
used to obtain cross-sectional data representative of US public and private school students in grades 9–12. The target population consisted of all public, Catholic, and other private school students in grades 9–12. In each participating school, 1 or 2 classrooms in each grade from either a required subject (eg, English) or a required period (eg, second period) were randomly selected. All students in selected classes were eligible to participate.

Students completed an anonymous, self-administered questionnaire in their classrooms during a regular class period during spring, 2010. Participation in the survey was voluntary. Local parental permission procedures were followed. The questionnaire contained 120 items and took an estimated 45 minutes to complete. Items developed specifically for this study were subjected to cognitive testing, which resulted in the revision or deletion of problematic questions. A number of the NYPANS questions were based on questions from the Youth Risk Behavior Study; psychometrics have been published elsewhere. The NYPANS questionnaire is available online. The study contractor’s (ICF Macro, Calverton, MD) institutional review board approved the study.

Data from 11,429 students were available for analysis (29 questionnaires failed quality control and were excluded). A weighting factor was applied to each student record to adjust for nonresponse and oversampling of black and Hispanic students. The school-level response rate was 82%, the student-level response rate was 88%, and the overall response rate was 73%. Overall response rate = (number of participating schools/number of eligible sampled schools) × (number of usable questionnaires/number of eligible students sampled). Analytic variables were missing data from approximately ≤ 5% of questionnaires from the original, unweighted dataset.

Measures

Electronic media exposure variables were dichotomized into high exposure and low/no exposure categories. To assess electronic media exposure, students were asked (1) how many hours they played video or computer games or used a computer for something that was not schoolwork, and (2) how many hours they watched TV on an average school day. The number of hours was measured in 1-hour increments. Both variables were dichotomized as ≥ 3 h/d vs < 3 h/d. This cut point was chosen based on American Academy of Pediatrics recommendations for media time. Students also were asked (1) how many TVs were in their home (coded as ≥ 3 vs < 3), (2) if they had a TV in their bedroom (yes vs no), and (3) how often a TV was on while eating dinner at home (most of the time/always vs sometimes/rarely/never).

To assess beverage intake, students were asked how many times during the past 7 days they drank regular soda or pop; sports drinks; energy drinks; other SSBs (such as lemonade, sweetened tea or coffee drinks, flavored milk, Snapple, or Sunny Delight, but not including soda or pop, sports drinks, energy drinks, or 100% fruit juice); and plain water (ie, water). Respondents also were asked how many glasses of milk they drank during the past 7 days. For each question, the response options were as follows: “I did not drink [beverage] during the past 7 days,” “1–3 times during the past 7 days,” “4–6 times during the past 7 days,” “1 time per day,” “2 times per day,” “3 times per day,” and “≥ 4 times per day.” For the milk question, “times” was replaced with “glasses.” Response options indicating beverage intake of < 1 time per day (or < 1 glass per day for milk) were divided by 7 to determine daily intake. A summary variable of total SSB intake was created and included regular soda or pop, sports drinks, energy drinks, and other SSBs. To calculate total SSB intake during the past 7 days, responses to these 4 dietary intake variables were summed. The dependent variables for this analysis were total SSB intake (≥ 3 times per day vs < 3 times per day), water intake (≥ 3 times per day vs < 3 times per day), and milk intake (≥ 2 glasses per day vs < 2 glasses per day). The SSB cut point was used based on a study of Americans aged ≥ 2 years, which found that the estimated 90th percentile of energy intake from SSBs on any given day was 450 kcal (equivalent to 3 12-oz cans of soda). Prevalence estimates of individual SSB items using the NYPANS dataset have been published elsewhere.

Data Analyses

Data were weighted to provide national estimates. The statistical software SU-DAAN (Research Triangle Institute, Research Triangle Park, NC) was used for all analyses to account for the complex sample design. Prevalence estimates and 95% confidence intervals were calculated for electronic media exposure. Chi-square analysis was used to test for differences in media exposure by gender, race/ethnicity, and grade. Race/ethnicity data are presented for non-Hispanic white, non-Hispanic black, and Hispanic students (of any race); the number of students from other or multiple-race subgroups was too small for meaningful analysis. P < .05 (2-sided) was considered statistically significant. Multivariable logistic regression adjusting for gender, race/ethnicity, and grade was used to test for associations among the 5 media exposure variables and the 3 beverage intake variables, and to calculate adjusted prevalence ratios (PRs) and confidence intervals.

RESULTS

On an average school day, 23.5% of students in the US used a computer or played video/computer games ≥ 3 h/d and 28.3% watched TV ≥ 3 h/d. Nationwide, 79.9% of students had ≥ 3 TVs in the home, 70.2% had a TV in their bedroom, and 41.0% most of the time or always had a TV on while eating dinner at home (Table 1). The prevalence of having used a computer or played video/computer games for ≥ 3 h/d, having ≥ 3 TVs in the home, and having a TV in the bedroom was higher among male than female students. The prevalence of having watched TV ≥ 3 h/d was higher among female than male students. Significant differences by race/ethnicity were found for all 5 variables, with black students consistently having the highest percentages of high media exposure. Television watching was the only variable that differed by grade, with 11th-grade students...
DISCUSSION

These findings are consistent with previous research indicating that high electronic media exposure is common among high school students, particularly black students. In 2008–2009, the Kaiser Family Foundation conducted a nationally representative study and found that, on average, 15- to 18-year-olds spent > 4 hours watching TV, > 1 hour on the computer, and approximately 1 hour playing video games per day. Among 8- to 18-year-olds, black and Hispanic youth spent more time with media than white youth. Youth reported an average of 3.8 TVs in their home, and 71% had a TV in their bedroom.

In this report, students with high electronic media exposure were more likely to drink SSBs and less likely to drink water and milk. Previously published research has found that higher media exposure is associated with higher SSB intake. Given that increased SSB intake corresponds with decreased levels of water and milk intake, it follows that media exposure would be associated with lower likelihoods of these healthful dietary behaviors.

Media exposure can influence adolescent dietary choices through advertising and marketing. Marketers frequently target adolescents because they have their own money to spend, influence household purchases, and are future adult consumers. The most money was spent on carbonated beverages (eg, soda). Youth heavily purchase and influence the purchase of these beverages. Food and beverage advertising influences preferences, beliefs, purchases, and consumption among children; however, there is less evidence for these associations among adolescents.

Other mechanisms may also have a role in how media exposure influences beverage intake. In addition to advertising, these mechanisms could include the modeling of beverage consumption in the media, snacking during media use, and mindless beverage consumption, or other factors. Although this study was not designed to identify plausible mechanisms, its findings may be useful in encouraging more explanatory research. Future research in this area should also investigate the potential role of weight status. Previous literature indicates that there may be an association between receptivity to advertisements on TV and weight status.

A major strength of this study is that it is based on a large, multi-ethnic, nationally representative sample with a relatively high response having the lowest percentage of watching TV ≥ 3 h/d.

For all 5 media exposure variables, students with high exposure were significantly more likely to drink SSBs ≥ 3 times per day than students with low or no exposure (Table 2). Prevalence ratios ranged from 1.25 (3 TVs in the home) to 1.79 (TV in the bedroom). Students with high media exposure were less likely to drink water and milk (Table 2). For water, significant PRs ranged from 0.89 (watched TV ≥ 3 h/d) to 0.80 (TV on while eating dinner). For milk, significant PRs ranged from 0.83 (used a computer or played video/computer games ≥ 3 h/d) and watched TV ≥ 3 h/d) to 0.73 (TV on while eating dinner).

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>%</th>
<th>95% CI</th>
<th>%</th>
<th>95% CI</th>
<th>%</th>
<th>95% CI</th>
<th>%</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>27.6</td>
<td>25.4–30.0</td>
<td>26.4</td>
<td>24.0–29.0</td>
<td>82.5</td>
<td>80.7–84.3</td>
<td>75.3</td>
<td>71.6–78.6</td>
</tr>
<tr>
<td>Female</td>
<td>19.2</td>
<td>17.4–21.3</td>
<td>30.2</td>
<td>26.9–33.8</td>
<td>77.1</td>
<td>74.2–79.8</td>
<td>65.0</td>
<td>60.9–68.8</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>23.4</td>
<td>19.9–27.3</td>
<td>33.7</td>
<td>31.6–35.9</td>
<td>79.9</td>
<td>76.9–82.7</td>
<td>75.9</td>
<td>73.3–78.3</td>
</tr>
<tr>
<td>Non-Hispanic, white</td>
<td>20.6</td>
<td>18.7–22.6</td>
<td>20.6</td>
<td>18.3–23.2</td>
<td>78.8</td>
<td>76.0–81.3</td>
<td>66.0</td>
<td>61.8–69.9</td>
</tr>
<tr>
<td>Non-Hispanic, black</td>
<td>31.5</td>
<td>28.0–35.3</td>
<td>52.7</td>
<td>50.0–55.5</td>
<td>86.1</td>
<td>83.5–88.4</td>
<td>83.4</td>
<td>80.9–85.7</td>
</tr>
</tbody>
</table>

Table 1. Prevalence Estimates of High School Students (n = 11,429) Who Had High Electronic Media Exposure Overall, and by Gender, Race/Ethnicity, and Grade—NYPANS, 2010

CI indicates confidence interval; TV, television.

*Significant chi-square for difference by gender; **Significant chi-square for difference by race/ethnicity; ***Significant chi-square for difference by grade; *Played video games or computer games or used a computer for something that was not schoolwork on an average school day; **On an average school day; ***Most of the time or always had a TV on while eating dinner at home.

Note: Chi-square test compared differences between groups (gender, race/ethnicity, or grade). Significance was set at P < .05.
rate. This study also expands on previous literature by examining a wider variety of media exposure variables. However, the findings in this report are subject to at least 3 limitations. First, the data are self-reported; students may underreport or overreport their behaviors. Second, these associations are cross-sectional; we cannot determine directionality. Third, these data apply only to youths who attend school, and therefore are not representative of all persons in this age group. Nationwide, in 2009, of persons aged 16–17 years, approximately 4% were not enrolled in a high school program and had not completed high school.28

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

Limiting exposure to and the influence of less healthful dietary messages through electronic media, parents should limit their adolescent’s total entertainment media time to ≤ 2 h/d, as currently recommended by the American Academy of Pediatrics.19 Media literacy education in schools can be used to teach skills to comprehend and defend against less healthful advertising messages. Changes in the content of advertising (to more healthful messages) may also be effective in positively changing adolescent beverage patterns. Future research should evaluate whether interventions targeting reduced media exposure actually result in changes in SSB intake and, as a potential consequence, weight status. Such information could be used to inform recommendations regarding these behaviors.

**ACKNOWLEDGMENT**

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**REFERENCES**


5. Institute of Medicine. *Food Marketing to Children and Youth: Threat or