Wide Availability of High-Calorie Beverages in US Elementary Schools

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Objective: To examine the availability of beverages for sale in elementary schools.

Design: Nationally representative mail-back survey.


Participants: Survey respondents at elementary schools.

Main Outcome Measure: Availability of beverages offered in competitive venues and school lunches.

Results: Public elementary school students’ access to beverages for sale in any competitive venue on campus (vending machines, stores, snack bars, and/or à la carte) increased from 49.0% in 2006-2007 to 61.3% in 2008-2009 (P < .01). The percentage of public school students with access to only beverages allowed by the Institute of Medicine guidelines for competitive beverages (ie, water, 100% juice, and 1% or nonfat milk) increased from 10.0% to 16.1% (P < .01). Access to higher-fat milk (2% or whole milk) in school lunches decreased from 77.9% of public school students in 2006-2007 to 68.3% in 2008-2009 (P < .001). Flavored milk was available at lunch on most days for 92.1% of public school students.

Conclusions: As of the 2008-2009 school year, high-calorie beverages and beverages not allowed by national guidelines were still widely available in elementary schools.


The prevalence of obesity among elementary-aged children—those age 6 to 11 years—more than quadrupled from 4% of children in the late 1970s to nearly 20% in 2007-2008. This increase has behavioral underpinnings associated with unhealthy eating and physical inactivity. Because children spend many hours in school, changes are needed to make the school environment healthier by limiting the availability of high-calorie beverages.

Two key aspects of the food and beverage environment in schools are (1) the US Department of Agriculture (USDA) school meals programs and (2) competitive foods and beverages (ie, products sold or served to students outside of the USDA school meals programs). Different regulations address meals and competitive foods.

BEVERAGES IN SCHOOL LUNCHES

The USDA National School Lunch Program (NSLP) has a broad reach, serving meals to more than 31 million students in 2008. Currently, meals must meet requirements based on the 1995 Dietary Guidelines for Americans. The USDA is considering revisions to the meal standards, and a recent report by the Institute of Medicine aims to bring standards into agreement with the 2005 Dietary Guidelines for Americans, recommending that schools offer only unflavored 1% or nonfat milk and flavored nonfat milk. Previously, higher-fat milk had been widely available in schools. During the 2004-2005 school year, the third School Nutrition and Dietary Assessment Study found that 57% of lunch menus at public elementary schools offered 2% milk and that 30% of lunch menus at public elementary schools offered whole milk.

BEVERAGES IN COMPETITIVE VENUES

Competitive beverages include products sold à la carte in the cafeteria during lunch, in vending machines or school stores, and through fund-raisers and products given to students as rewards or during class parties and other activities. Competitive items are widely available in schools; the third School Nutrition and Dietary Assessment Study found that, during the 2004-2005 school year, 73% of public elementary schools offered 1 or more sources of competitive foods.
or beverages. Furthermore, access to competitive items was associated with consumption of unhealthy foods and beverages and increased caloric intake.\textsuperscript{15,16} Sugar-sweetened beverages (such as soda, sports drinks, and fruit-flavored beverages) are associated with obesity and other negative health consequences,\textsuperscript{17,18} yet they are often available at school. The Centers for Disease Control and Prevention found that, in 2006, à la carte options included regular soda, sports drinks, and sweetened iced teas in 10.9%, 12.8%, and 10.3% of elementary schools, respectively.\textsuperscript{19} Soda and/or sweetened beverages were available in vending machines or stores at 16.4% of elementary schools.\textsuperscript{19}

Currently, student access to competitive products is virtually exempt from federal regulation; USDA regulations only prohibit the sale of foods of minimal nutritional value (including soda) in the cafeteria during meals. However, these products may be sold elsewhere in the school during lunch.\textsuperscript{20} The Institute of Medicine recommends that competitive beverages in elementary schools be limited to water, 100% juice (4-oz serving), and nonfat or 1% flavored or unflavored milk (8-oz serving).\textsuperscript{21} Federal legislation required all school districts participating in the NSLP or other nutrition programs to establish and implement a wellness policy by the first day of the 2006-2007 school year and for such policies to establish guidelines pertaining to competitive foods and beverages; however, a comprehensive national study found that, although most public elementary school students were covered by a district wellness policy during the 2006-2007 and 2007-2008 school years, these policies often lacked strong provisions restricting competitive foods and beverages on campus.\textsuperscript{22}

In May 2006, the Alliance for a Healthier Generation reached an agreement with the American Beverage Association and several major beverage companies to limit portion sizes and energy content of all beverages offered to students during the regular and extended school day. These requirements\textsuperscript{23} are consistent with the Institute of Medicine recommendations for beverages sold in competitive venues,\textsuperscript{24} allowing elementary students access to bottled water, 100% fruit juice, and nonfat or 1% milk. An evaluation released by the American Beverage Association in March 2010 reported that 99% of school districts with a beverage distribution contract were in compliance with the voluntary guidelines and that shipments of all beverages to schools decreased by 72% from 2004 to 2009. The analysis relied on bottler-supplied reports of beverage shipments to schools, most of which had exclusive distribution contracts in place. Our prior work found that, whenever beverage vending machines were present at elementary schools, fewer than half were covered by an exclusive contract;\textsuperscript{25} thus, many beverages are sourced outside formal contracts. Furthermore, beverages sold in school stores and à la carte may be obtained outside formal contracts with beverage suppliers; thus, the American Beverage Association analysis may underestimate the contribution of such venues in making higher-calorie beverages available to elementary school students.

Nationwide data on availability of beverages in schools have not been gathered since the Centers for Disease Control and Prevention conducted the School Health Policies and Programs survey in 2006, which was also the year of the Alliance beverage agreement with the American Beverage Association and the start of the federal wellness policy requirement. Our data, collected during the 2006-2007, 2007-2008, and 2008-2009 school years, provide the most up-to-date information on the availability of beverages in a nationally representative sample of elementary schools in the United States.

**METHODS**

**DATA COLLECTION**

Data were collected by use of mail-back school surveys, which were conducted during the 2006-2007, 2007-2008, and 2008-2009 school years. Data collection occurred primarily during the period from February through June of each school year. Our 2-part survey was mailed to the school principal with a request that the second section (from which these data were obtained) be completed by food service personnel; approximately half of the surveys were completed by food service personnel, with the rest completed by administrators, teachers, or other staff members. A $100 incentive was offered for completing and returning the survey. Surveys were processed and double-entered for quality assurance. Response rates were calculated by use of the American Association for Public Opinion Research method 2,\textsuperscript{26} which counts partial responses as complete. Response rates and number of responding cases were as follows across the 3 years, respectively. For public schools, the response rate and number of responding cases were as follows for the 2006-2007, 2007-2008, and 2008-2009 school years: 58.4% (578 schools), 70.6% (748 schools), and 61.8% (694 schools), respectively. For private schools, the response rate and number of responding cases were as follows for the 2006-2007, 2007-2008, and 2008-2009 school years: 66.2% (259 schools), 84.4% (336 schools), and 76.2% (297 schools), respectively. The survey protocol was approved by the University of Illinois at Chicago institutional review board.

**MEASURES**

We asked respondents to indicate whether beverages were sold in each of 3 competitive venues: vending machines, school stores or snack bars, and à la carte during lunchtime. For each venue present, we asked which types of beverages were available. For vending machines and stores, response options were yes or no. For à la carte, response options were (1) never, (2) some days, or (3) most or every day, and the latter 2 options were considered yes responses. We asked respondents to indicate which beverages were served at lunch, and for analyses reported herein, we selected only schools that participated in the NSLP (more than 95% of public schools participated). For competitive beverage analyses, beverages were grouped according to the Alliance elementary school guidelines, without regard to portion size for juice or milk.

**SAMPLING AND WEIGHTING**

Our nationally representative samples were developed at the Institute for Survey Research at the University of Michigan, using sampling frames based on data sets from the National Center for Education Statistics. Schools from all coterminous US states (excluding Alaska and Hawaii) were eligible for sampling; however, the final sample did not include any schools in Wyoming because of its low population density and, therefore, low probability of selection. Because elementary schools vary in grade composition (eg, Kindergarten-third grade, second-fifth grade), we selected third grade as a proxy for sampling and weighting. All schools included a third grade, and our student-level weights were developed on the basis of the enrollment of third-grade students. These weights
provide inference to the percentage of elementary students affected by each school-level practice. Weights were adjusted for potential nonresponse bias by modeling every school’s propensity to respond. The variables used to model these adjustments included student enrollment; percentage of black, white, and Latino students; percentage of students eligible for a free or reduced-price lunch (public schools only); US census region; and urbanicity.

**ANALYSES**

Public schools were clustered within school districts, with an average of 1.5 schools responding per district. We conducted analyses with Stata version 10.0 statistical software (StataCorp LP, College Station, Texas), using the survey command to adjust for the clustering of schools within districts. We obtained demographic information on each school from the National Center for Education Statistics public-use data sets, and we used this information to control for school characteristics in regression analyses. School characteristics included (1) total student enrollment at each school; (2) urbanicity, defined as city, suburb, town, or rural, which was coded as 3 dummy variables with suburb as the reference category; (3) US census region (including West, Midwest, South, and Northeast), which was coded as 3 dummy variables with Northeast as the reference category; (4) percentage of white students; and (5) percentage of students eligible for a free or reduced-price lunch, which was used as a proxy to indicate socioeconomic status.

**RESULTS**

**MILK IN SCHOOL LUNCHES: PUBLIC SCHOOLS ONLY**

Because so few private schools participated in the NSLP (32% during all 3 years), we examined lunch milk options at only public schools participating in the program. During all 3 years of our study, a majority of public school students had access to higher-fat milk at lunch (77.9% of students in the 2006-2007 school year, 79.7% in the 2007-2008 school year, and 68.3% in the 2008-2009 school year); however, this percentage decreased significantly during the 2008-2009 school year, compared with the 2006-2007 and 2007-2008 school years (P < .001). In other words, during the 2008-2009 school year, 31.7% of students had access to only lower-fat milk in the school lunch.

Beginning with the 2008-2009 school year, we separated items pertaining to flavored milk from items pertaining to unflavored milk. During the 2008-2009 school year, 92.1% of public elementary school students at schools participating in the NSLP could select flavored milk at lunchtime on most days; nearly all students (98.4%) could select flavored milk on some, most, or all days.

**BEVERAGES IN COMPETITIVE VENUES**

Table 1 and Table 2 present data on the availability of competitive beverages at schools by venue, for public and private elementary students. The statistical significance of the changes over time were evaluated in multivariate models that also controlled for school and student characteristics. For public school students, access to vending machines remained stable during the 3 years of our study, but access to stores or snack bars and à la carte lines increased significantly. By the 2008-2009 school year, more than 60% of public school students could purchase beverages from at least 1 competitive venue at school, an increase from nearly
50% just 2 years prior. Concurrent with an overall increase in student access to competitive beverage venues was an increase in the availability of certain beverages, particularly higher-fat milk. As a result, the percentage of students with access to any beverage not allowed by the guidelines increased significantly over time, driven primarily by the availability of higher-fat milk rather than by increases in the availability of sugar-sweetened and low-calorie beverages. Low-fat milk and bottled water were the most commonly available products, but as of the 2008-2009 school year, 14.1% of public school students could purchase sugar-sweetened beverages at school. Although, during the 2008-2009 school year, 16.1% of students had access to only beverages allowed by the guidelines in competitive venues on campus, 44.7% were able to purchase beverages that were not allowed by the guidelines, which suggests that much progress is yet to be made in attaining compliance with the Institute of Medicine and Alliance guidelines.

Results for private school students showed a similar pattern, with increases in access to beverages in competitive venues at school largely because of an increase in à la carte sales; by the 2008-2009 school year, nearly 70% of private school students could purchase beverages from at least 1 competitive venue at school. Private school students had significantly greater access to competitive beverages in vending machines and school stores or snack bars than did public school students (P < .001).

As noted previously, changes over time in the availability of competitive venues and specific beverages were tested using multivariate logistic regression models. In these models, we noted a consistent pattern of significant differences by US geographic region. Table 3 presents data on the availability of competitive beverages during the 2008-2009 school year by region. These analyses are presented for public school students only, because the private school sample was not large enough to yield stable estimates at the regional level.

Students attending public elementary schools in the Northeast and South had much greater access to beverages in competitive venues (68.1% and 72.9%, respectively) than did public school students in the Midwest and West (48.5% and 50.2%, respectively) (P < .001). Public school students in the South had greater access to bottled water and low-fat milk, but also to sugar-sweetened beverages, no-calorie or low-calorie beverages, and higher-fat milk. However, this was likely the result of the higher overall availability of competitive venues at public schools in the South. Among only those public school students with access to at least 1 competitive beverage venue, those in the South, compared with those in the West, were significantly less likely to have only healthy beverages available (24.9% vs 38.8%; P < .01) and significantly more likely to have higher-fat milk available (60.2% vs 41.1%; P < .01).

**Table 2. Percentage of Students in US Private Elementary Schools With Access to Competitive Beverages in School During 3 Different School Years, Stratified by Venue**

<table>
<thead>
<tr>
<th></th>
<th>Any Venue</th>
<th>Vending Machines</th>
<th>Stores or Snack Bars</th>
<th>À La Carte</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of students with access to venue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006-2007</td>
<td>62.6%</td>
<td>71.0%</td>
<td>68.7%</td>
<td>30.4%</td>
</tr>
<tr>
<td>2008-2009</td>
<td>67.0%</td>
<td>79.1%</td>
<td>75.4%</td>
<td>34.5%</td>
</tr>
<tr>
<td>2009-2010</td>
<td>68.3%</td>
<td>82.3%</td>
<td>77.9%</td>
<td>35.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beverages allowed by national guidelines</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any healthy beverage</td>
<td>59.2%</td>
<td>68.5%</td>
<td>64.1%</td>
<td>26.5%</td>
</tr>
<tr>
<td>Bottled water</td>
<td>52.3%</td>
<td>54.0%</td>
<td>53.7%</td>
<td>25.7%</td>
</tr>
<tr>
<td>100% fruit juice</td>
<td>36.3%</td>
<td>39.6%</td>
<td>37.9%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Low-fat milk</td>
<td>40.5%</td>
<td>52.2%</td>
<td>37.7%</td>
<td>9.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Beverages not allowed by national guidelines</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any sugar-sweetened beverage</td>
<td>40.5%</td>
<td>40.6%</td>
<td>38.4%</td>
<td>25.7%</td>
</tr>
<tr>
<td>Soda</td>
<td>20.9%</td>
<td>20.8%</td>
<td>19.1%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Fruit drinks (not 100% juice)</td>
<td>20.2%</td>
<td>18.7%</td>
<td>14.6%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Sports drinks</td>
<td>24.4%</td>
<td>29.0%</td>
<td>27.5%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Any low-calorie beverage</td>
<td>38.9%</td>
<td>39.8%</td>
<td>33.7%</td>
<td>23.9%</td>
</tr>
<tr>
<td>Diet soda</td>
<td>22.7%</td>
<td>21.0%</td>
<td>19.1%</td>
<td>18.2%</td>
</tr>
<tr>
<td>“Light” juices</td>
<td>18.2%</td>
<td>22.7%</td>
<td>15.5%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Other low-calorie or no-calorie beverages</td>
<td>25.0%</td>
<td>23.7%</td>
<td>23.2%</td>
<td>15.5%</td>
</tr>
<tr>
<td>Any sugar-sweetened or low-calorie beverage</td>
<td>47.2%</td>
<td>42.0%</td>
<td>44.5%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Higher-fat (2% or whole) milk</td>
<td>37.1%</td>
<td>47.2%</td>
<td>39.1%</td>
<td>10.6%</td>
</tr>
</tbody>
</table>

**Note:** Significance change from the 2007-2008 school year (P < .05) in multivariate logistic regression analyses, controlling for school characteristics such as total student enrollment, percentage of white students, urbanicity, and US census region. Unlike Table 1, data on the percentage of students eligible for a free or reduced-price lunch were not included in these models, because they were unavailable for private schools.

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It is perhaps not surprising that students’ access to competitive venues increased over time; competitive food and beverage sales—particularly those in à la carte lines—can generate significant revenues to cover shortfalls in food service operating costs.20,30 and given recent economic pressures on school budgets, many schools and districts are seeking additional sources of revenue. However, schools can replace less-healthy items with healthier items without loss of revenue,29 and adding healthier competitive products may increase student participation in the lunch program.32,33 Providing healthier beverages would reinforce nutrition education and bring schools into compliance with nutritional recommendations, while at the same time providing a source of needed revenue for schools.

Our results about school milk yielded some interesting and unexpected information. Although, at public schools, the availability of higher-calorie milk in school lunches decreased from the 2006-2007 school year to the 2008-2009 school year, during that same time, we saw an increase in the availability of these products in à la carte lines, which suggests that rather than being removed entirely from schools, these products were switched from the lunch line to the à la carte line. Higher-fat milk provides unnecessary calories and dietary fat, and switching from whole milk to nonfat milk would result in approximately 60 fewer calories consumed per school-size carton serving. Serving only lower-fat milk in both the lunch line and the à la carte service—as well as other competitive venues—would bring school practices into alignment with current nutrition recommendations. As with any survey that relies on reported rather than observed data, it is possible that our estimates were affected

### Table 3. Regional Differences in Availability of Competitive Beverages During the 2008-2009 School Year for Students in US Public Schools

<table>
<thead>
<tr>
<th>Beverage Type</th>
<th>Northeast</th>
<th>Midwest</th>
<th>South</th>
<th>West</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Elementary School Students With Access to Beverages in the Following Venues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vending machines</td>
<td>21.6</td>
<td>8.6</td>
<td>16.5</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>Stores or snack bars</td>
<td>11.1</td>
<td>11.9</td>
<td>23.8</td>
<td>15.8</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>À la carte</td>
<td>53.8</td>
<td>41.6</td>
<td>63.5</td>
<td>40.1</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Any venue</td>
<td>68.1</td>
<td>48.5</td>
<td>72.9</td>
<td>50.2</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

### Percentage of Elementary School Students With Access to the Following Beverages in Any Competitive Venue

<table>
<thead>
<tr>
<th>Beverage Type</th>
<th>Percentage of Students</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowed by national guidelines</td>
<td>12.4</td>
<td>.001</td>
</tr>
<tr>
<td>Water</td>
<td>50.8</td>
<td>.001</td>
</tr>
<tr>
<td>Lower-fat milk</td>
<td>57.1</td>
<td>.001</td>
</tr>
<tr>
<td>Sugar-sweetened beverages</td>
<td>13.9</td>
<td>.001</td>
</tr>
<tr>
<td>Low-calorie or no-calorie beverages</td>
<td>20.9</td>
<td>.001</td>
</tr>
<tr>
<td>Higher-fat milk</td>
<td>39.4</td>
<td>.001</td>
</tr>
</tbody>
</table>

### Percentage of Elementary School Students With Access to Beverages in the Following Venues

- **Northeast**: PA, NY, NJ, CT, RI, MA, VT, NH, and ME.
- **Midwest**: ND, SD, MN, WI, MI, NE, KS, IA, MO, IL, IN, and OH.
- **South**: TX, OK, AR, LA, MS, AL, TN, KY, WV, DC, MD, DE, VA, NC, SC, GA, and FL.
- **West**: WA, OR, ID, MT, CA, NV, UT, CO, AZ, and NM.

**Notes:**
- The regions are defined according to the following US census designations: Northeast (PA, NY, NJ, CT, RI, MA, VT, NH, and ME); Midwest (ND, SD, MN, WI, MI, NE, KS, IA, MO, IL, IN, and OH); South (TX, OK, AR, LA, MS, AL, TN, KY, WV, DC, MD, DE, VA, NC, SC, GA, and FL); and West (WA, OR, ID, MT, CA, NV, UT, CO, AZ, and NM).
- Overall significance determined by use of the χ² test.
- Percentages differ significantly from that in the Northeast.
- Percentages differ significantly from that in the Midwest.
- Percentages differ significantly from that in the West.
- Percentages differ significantly from that in the Midwest.

The Institute of Medicine and Alliance school beverage guidelines increased. Unfortunately, these levels remained far short of the ideal level, and the availability of other beverages—particularly higher-fat milk—also increased, cancelling out gains in other beverage types. Across all competitive beverage venues, the availability of sugar-sweetened beverages neither increased nor decreased over time, and absolute availability of higher-calorie beverages remained high; as of the end of the 2008-2009 school year, 14.1% of all US public elementary school students and 38.4% of all US private elementary school students could purchase sugar-sweetened beverages at school.

Analyses by region showed that students in the South (where rates of childhood obesity are higher than in other regions of the country)26 experienced a generally less-healthy school environment with regard to the availability of competitive beverages (ie, greater availability of high-calorie beverages) than did students in other regions. One in 5 public elementary school students in the South had access to sugar-sweetened beverages in school, a rate that is far too high if substantial progress is to be made in reversing trends in childhood obesity. Prior work shows that substituting water for sugar-sweetened beverages could eliminate an average of 235 calories per day among children,27 far more than the estimated daily 110- to 165-calorie energy excess associated with recent increases in obesity.22 Encouragingly, the rate of availability of bottled water was fairly high overall, and particularly for students in the Northeast and the South. However, simply adding healthy options is not enough. Removing high-calorie beverages from schools is also essential for changing students’ consumption patterns.
by various reporting biases; however, desirability bias would likely lead to decreased reporting of less-healthy options rather than increased reporting. Furthermore, given that more than half of the survey respondents were food service staff who would be familiar with the specific products available at schools, we expect that the information reported to us was accurate. Relative to other data sources, these estimates are based on large numbers of schools, and the nationally representative sample allows us to make inferences about the conditions faced by students all across the country. However, our results only pertain to competitive beverages sold in the most common venues (ie, vending machines, stores, snack bars, and a la carte) and do not include other common sources of competitive beverages in schools (eg, beverages served during parties, given as rewards, or sold at fund-raisers); thus, our findings may underestimate the availability of competitive beverages that are sold and/or served in schools. Our results show that much work remains to be done to reduce the availability of unhealthy beverages in elementary schools in the United States, and we encourage policy makers, school officials, and parents to work together to address this important issue.

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Author Contributions: Dr Turner had full access to the data and takes responsibility for the integrity of the data and the accuracy of the analyses. Study concept and design: Turner and Chaloupka. Acquisition of data: Turner. Analysis and interpretation of data: Turner. Drafting of the manuscript: Turner. Critical revision of the manuscript for important intellectual content: Turner and Chaloupka. Statistical analysis: Turner. Obtained funding: Chaloupka. Administrative, technical, and material support: Turner and Chaloupka. Study supervision: Turner.

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REFERENCES