Implementation of California State School Competitive Food and Beverage Standards

ABSTRACT

BACKGROUND: Competitive foods and beverages are available on most US school campuses. States and school districts are adopting nutrition standards to regulate these products, but few studies have reported on the extent to which schools are able to adhere to competitive regulations. The purpose of this study was to describe the extent to which schools in disadvantaged communities were able to implement California competitive food and beverage standards.

METHODS: Data on the competitive foods (n = 1019) and beverages (n = 572) offered for sale on 19 school campuses were collected in 2005 and 2008. Descriptive statistics were generated on overall adherence rates to school nutrition standards and adherence rates by venue and school level. Logistic regression models tested predictors of adherence by continuous and categorical variables (eg, venue, item selling price).

RESULTS: Data show an increase from 2005 to 2008 in average adherence to the California standards. Several predictors had statistically significant associations with adherence or nonadherence. Adherence was higher for competitive foods sold in school stores than foods sold in vending machines. Higher selling price was associated with lower adherence. Competitive foods classified as entrees were more likely to adhere than snack items, and larger total size (in fluid ounces) beverages were associated with higher adherence.

CONCLUSIONS: Schools have begun to implement competitive food and beverage policies. However, school environments, particularly in secondary schools, are not 100% compliant with school nutrition standards. These findings can inform policymakers and school officials about the feasibility of implementing competitive food standards in schools.

Keywords: chronic diseases; health policy; nutrition and diet; school food service.


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Competitive foods and beverages—products sold as individual items outside of the school meal programs—are found in many US elementary schools and the majority of US middle and high schools. Competitive foods greatly increase the availability of snacks and sweetened drinks on school campuses. Several studies have shown that the most commonly sold foods and beverages in schools are high in calories, fat, and sugar. The availability of these items in schools has also been linked to a decrease in students’ consumption of fruits, vegetables, and other nutrients.

Although foods and beverages available through the US Department of Agriculture school breakfast and lunch programs must meet nutrition standards to receive federal subsidies, the same is not true for competitive foods. To fill the regulatory gap left by the federal government, states and school districts across the country are adopting nutrition standards for competitive foods and beverages in an effort to create a more healthful eating environment at school. As of 2007, 30 states (including the District of Columbia) adopted school competitive food/beverage standards, with 12 states setting comprehensive nutrition standards covering all grades for the entire school day and campus.

School competitive food policies present a promising obesity prevention strategy by addressing an environment in which children spend a considerable amount of time and consume a significant portion of their food intake. Lower calorie intakes were reported in school environments with limited access to competitive foods, particularly when policies were in place to limit access to sweetened beverages. Although inconsistencies in policy quality exist across states and school districts, adoption of school policies has changed the school food environment.

Concerns remain regarding the extent to which schools will be able to adhere to competitive food and beverage regulations, particularly in socioeconomically disadvantaged schools. This study was undertaken to examine the implementation of California’s state competitive food and beverage standards in schools participating in the Healthy Eating, Active Communities program (HEAC). This statewide initiative, composed of 6 low-income communities, conducted school interventions in 11 school districts, potentially exposing 885,000 elementary, middle, and high school students to changes in nutrition and physical activity environments. Competitive food and beverage environments in these schools were assessed to answer the following questions:

- Were the schools able to implement the California competitive food and beverage standards?
- How did adherence to the standards change over time (2005 to 2008)?
- What factors were associated with the adherence of foods and beverages to the state standards?

Findings from this study will contribute to the growing pool of evidence illustrating the effectiveness of school competitive food standards on changing the school food environment and can inform schools, districts, state, and the federal government about the continuing feasibility of implementing competitive food standards.

**METHOD**

**Subjects**

In 2004, the California Endowment selected 6 low-income communities from across California through a competitive solicitation process to participate in a program to prevent obesity by improving the nutrition and physical activity environments available to children and their families. A description of the HEAC program and its nonrandomized study design can be found elsewhere. Because children consume a significant portion of their daily food while at school, engaging school districts was considered critical to HEAC’s success. Each of the 6 HEAC communities included at least one school district, with schools at all grade levels, kindergarten through 12th grade. A convenience sample of one school at each grade level (elementary grades K-5, middle grades 6 to 8, and high school grades 9 to 12) was selected for data collection purposes in each of the 6 communities. In addition, one large district included a K-12 school, yielding a sample of 19 schools for this study. The school districts and school principals consented to the schools’ participation in the study. The demographics of the school populations varied to some degree, but across study communities the schools’ students were Hispanic (74.9%), African American (9.3%), Asian (8.6%), Caucasian (5.7%), and other or mixed ethnicity (1.5%). Over 72% of students qualified for free or reduced-price lunches through the National School Lunch Program (NSLP).

**INSTRUMENTS**

Data were collected using the Food and Beverage Environmental Assessment and Monitoring System (FoodBEAMS™), a tool that has been demonstrated in school environments to have high intrarater reliability. FoodBEAMS is a computer-based data collection and analysis tool that can be used to assess the availability of competitive school foods and beverages and determine their adherence to nutrition standards. Data collectors recorded the location and accessibility (to students) of all competitive food and beverage venues on campus and recorded the brand name, flavor, total size, and price for all items sold at these venues. Data were entered into FoodBEAMS.
on-site. Food and beverage item information was linked to a database containing nutrient profiles for school foods and beverages.

Procedure

Competitive foods and beverages data on items offered for sale were collected at each school on a randomly selected day in spring 2005 and 2008. Data were collected from all student-accessible food and beverage venues, including vending machines, school food service, and school stores. Foods and beverages recorded in areas inaccessible to students (such as staff lounges) were excluded from analysis, as were those that were only sporadically present on school campuses.

Data Analysis

Adherence Criteria. Adherence rates to California legislative requirements for foods (SB12) and beverages (SB965) were calculated for all competitive foods and beverages offered for sale on school campuses in 2005 and 2008. Both SB12 and SB965 were passed in 2005, with full implementation required by 2007 and 2009, respectively; however, the study schools agreed to begin working on full implementation of both bills immediately. The data collected at the K-12 school were analyzed using the middle/high school standards, because elementary level students did not have access to competitive foods and beverages. Only school foods and beverages accessible to students during the school day were included. A unique food or beverage item was counted once per venue. Therefore, an item could be counted up to 3 times per school if observed in each of the 3 venue types (vending machines, school food service, and school stores), eliminating duplicate cases systematically.

Food Standard. The California education code states that at elementary schools, “the only food that may be sold to a pupil during the school day are full meals and individually sold portions of nuts, nut butters, seeds, eggs, cheese packaged for individual sale, fruit, vegetables that have not been deep fried, and legumes.” Additionally, dairy and whole grain products that meet “35/10/35” (ie, no more than 35% of its total calories from fat, no more than 10% of its total calories from saturated fat, and no more than 35% of its total weight composed of sugar) are allowed, as long as they are not more than 175 cal. The standards for middle and high schools clearly differentiate between “snacks” and “entrees.” Snack items must be less than 250 total calories and must adhere to the “35/10/35” guidelines. Entrees must have less than 36% of calories from fat and be no more than 400 cal total. From these factors and criteria, binary adherence (ie, 0 = does not adhere, 1 = adheres) for each food item was determined.

Beverage Standard. The current California legislation states that elementary schools may sell products that are 100% juice, milk (sweetened or unsweetened) with ≤2% milk fat, beverages that are ≥50% juice with no added sweeteners, and water. Middle and high school standards not only allow these same products but also allow for electrolyte replacement beverages. Beverage data were classified into 30 categories, and adherence was determined for each.

Statistical Methods

Descriptive statistics were generated for study data on competitive foods and beverages separately, for both the 2005 and 2008 assessments. Data were summarized via online analytical processing (OLAP) cubes to determine overall adherence rates, venue-level adherence rates, and school-level adherence rates.

In order to investigate the factors associated with adherence to state standards, a statistical model was developed that could include multiple factors concurrently. Data were combined across the 2 assessment periods, and a binary time point (2005 = 1, 2008 = 2) variable was defined. Other relevant predictors included venue (represented as 2 indicator variables where vending machines were the reference group), item selling price ($USD), and item size (grams for foods and fluid ounces for beverages and for foods “entree” or “snack” status of the item). Logistic regression models predicting binary adherence to current state standards were fit for both food and beverage data, and relevant categorical (ie, time point, venue, entree vs snack) and continuous (ie, selling price, total size) predictors were entered into the models.

RESULTS

Food Data

In 2005, 614 unique by venue food items were observed on HEAC campuses (n = 608, missing = 6). Three years later in 2008, 602 food items (n = 592, missing = 10) were found. Table 1 summarizes adherence rates to SB12 standards at both the 2005 and 2008 assessments, including overall rates of adherence and adherence rates by each venue type. In 2005, 77.5% of foods adhered to SB12. Adherence within each study community ranged from 51.4% to 81.4%. In 2008, 67% (n = 397) of foods adhered to SB12. Adherence within each study community ranged from 51.4% to 81.4%. School stores had the highest adherence rate, with 77.5% of foods meeting adherence criteria, followed by vending machines (67.1%) and school food service (61.5%).

Adherence rates were analyzed by school level (Figure 1). Analysis revealed consistent increases in
Table 1. Overall and Venue-Level Adherence Rates to SB12 and SB965 for Competitive Foods and Beverages Sold on the 19 Study School Campuses

<table>
<thead>
<tr>
<th></th>
<th>2005 Adherence Rates (Range)*</th>
<th>2008 Adherence Rates (Range)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall food</td>
<td>23.3% (8.8%-62.5%)</td>
<td>67.1% (51.4%-81.4%)</td>
</tr>
<tr>
<td>Vending machine</td>
<td>18.1% (8.7%-48.1%)</td>
<td>67.1% (51.1%-88.6%)</td>
</tr>
<tr>
<td>School food service</td>
<td>25.2% (15.9%-49.2%)</td>
<td>61.5% (44.1%-72.7%)</td>
</tr>
<tr>
<td>School store</td>
<td>26.9% (0.0%-68.1%)</td>
<td>77.5% (46.2%-96.7%)</td>
</tr>
<tr>
<td>Overall beverages</td>
<td>50.3% (32.8%-79.4%)</td>
<td>77.8% (61.7%-100%)</td>
</tr>
<tr>
<td>Vending machine</td>
<td>44.6% (20.7%-69.2%)</td>
<td>87.1% (69.6%-100%)</td>
</tr>
<tr>
<td>School food service</td>
<td>58.7% (27.6%-83.3%)</td>
<td>71.7% (38.1%-100%)</td>
</tr>
<tr>
<td>School store</td>
<td>48.5% (20.0%-85.7%)</td>
<td>75.6% (54.5%-100%)</td>
</tr>
</tbody>
</table>

* Range across the 6 study sites.

Figure 1. Adherence Rates in Study Schools for Competitive Foods 2005 to 2008 by School Level

Note: This includes data from 6 elementary schools, 6 middle schools, 6 high schools, and 1 K-12 school.

adherence rates from the 2005 assessment to the 2008 assessment at all school levels. For the 6 elementary schools, the number of competitive food items observed for sale remained consistent (17 items in 2005, 18 items in 2008), and adherence increased from 0% in 2005 to 61% in 2008. In the 6 middle schools, the number of competitive food items observed for sale increased from 130 to 142 (2005 to 2008), and adherence increased from 30% in 2005 to 63% in 2008. The HEAC high schools sold the largest variety of competitive foods items in 2005 and 2008 as compared with the other school levels. The number of competitive foods observed for sale declined between 2005 (437 items) and 2008 (414 items), and adherence increased during this time period from 22% to 68%. The picture was similar in the K-12 school, and the number of competitive foods observed for sale decreased from 24 items in 2005 to 18 items in 2008 and a concurrent increase in adherence of these items from 50% (2005) to 72% (2008).

Beverage Data

In 2005, 360 unique by venue beverage items were observed in study school campuses (n = 360, missing = 2). At the 2008 assessment, 243 unique beverage items were observed (missing = 0). The overall adherence rates to SB965 standards as well as venue-level adherence rates are summarized in Table 1, with all ranges corresponding to variation across the 6 study communities. Overall adherence for beverages improved over the 3 years of the study, from 50.3% (n = 181) to 77.8% (n = 189), with one study community achieving 100% adherence in 2008. The overall adherence rate ranged from 32.8% to 79.4% in 2005 and 61.7% to 100% in 2008.

By venue in 2005, school food service had the highest rate of adherence to the competitive beverages standard (58.7%), followed by school stores (48.5%) and vending machines (44.6%), although there was considerable variation in these venues across the study sites. In 2008 that result shifted, as vending machines had the highest cross-site SB965 adherence rate (87.1%), followed by school stores (75.6%) and school food service (71.7%).

Competitive beverage data by school level show improvement in SB965 adherence rates for elementary and high schools, but slight decreases in adherence rates for middle schools and the K-12 school (Figure 2). The number of beverage items available for sale in elementary and high school either remained the same or declined while adherence rates increased. In the elementary schools, the number of observed competitive beverage items remained consistent (7 items in 2005, 6 items in 2008), and adherence increased from 57% to 100%. The high schools had 269 competitive beverage items in 2005 which decreased to 146 items in 2008, while adherence rates doubled from 40% to

Figure 2. Adherence Rates in Study Schools for Competitive Beverages 2005 to 2008 by School Level

Note: This includes data from 6 elementary schools, 6 middle schools, 6 high schools, and 1 K-12 school.
Table 2. Predicting Competitive Food Item Adherence (SB12) as a Function of Venue, Item Cost, Item Size, Food Type, and Time Point (n = 1019)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE(B)</th>
<th>p-value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food service vs vending machine</td>
<td>.01</td>
<td>.18</td>
<td>.977</td>
<td>1.01</td>
</tr>
<tr>
<td>School store vs vending machine</td>
<td>.54</td>
<td>.20</td>
<td>.006</td>
<td>1.72</td>
</tr>
<tr>
<td>Item selling price ($USD)</td>
<td>-.74</td>
<td>.23</td>
<td>.001</td>
<td>.48</td>
</tr>
<tr>
<td>Item total size (grams)</td>
<td>.01</td>
<td>.01</td>
<td>.206</td>
<td>1.00</td>
</tr>
<tr>
<td>Type (entrée = 1 vs snack = 2)</td>
<td>-1.19</td>
<td>.26</td>
<td>&lt;.001</td>
<td>.31</td>
</tr>
<tr>
<td>Time point (2005 = 1, 2008 = 2)</td>
<td>1.09</td>
<td>.27</td>
<td>&lt;.001</td>
<td>2.97</td>
</tr>
<tr>
<td>Constant</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>249.63</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>df</td>
<td>6</td>
<td></td>
<td></td>
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</tbody>
</table>

Table 3. Predicting Competitive Beverage Item Adherence (SB965) as a Function of Venue, Item Cost, Item Size, and Time Point (n = 572)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
<th>SE(B)</th>
<th>p-value</th>
<th>OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food service vs vending machine</td>
<td>.27</td>
<td>.22</td>
<td>.213</td>
<td>1.31</td>
</tr>
<tr>
<td>School store vs vending machine</td>
<td>.28</td>
<td>.26</td>
<td>.291</td>
<td>1.32</td>
</tr>
<tr>
<td>Item selling price ($USD)</td>
<td>-3.47</td>
<td>.52</td>
<td>&lt;.001</td>
<td>0.03</td>
</tr>
<tr>
<td>Item total size (fluid ounces)</td>
<td>.20</td>
<td>.03</td>
<td>&lt;.001</td>
<td>1.22</td>
</tr>
<tr>
<td>Time point (2005 = 1, 2008 = 2)</td>
<td>1.85</td>
<td>.24</td>
<td>&lt;.001</td>
<td>6.37</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.86</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>96.70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>5</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

81% during this time period. At the middle schools, although the number of beverage items decreased from 77 in 2005 to 69 items in 2008, adherence decreased slightly from 84% to 81%. Conversely, the K-12 school increased the number of competitive beverage items, from 7 in 2005 to 22 in 2008, while adherence dropped from 57% to 41% over this same time.

Predicting Binary Adherence

A multiple logistic regression model was fit to answer the research question about what factors were associated with binary adherence to SB12 and SB965 standards in 2005 and 2008.

Foods. The sample size for the combined 2005 and 2008 analysis for foods was n = 1019 (Table 2). A significant association was found between SB12 adherence and the venue indicator variable comparing school store to vending machine (odds ratio [OR] = 1.72, p < .05), meaning that the odds of a school store food item adhering to SB12 standards were 1.72 times higher than the odds of a vending machine item adhering, when all other variables in the model are held constant. No significant difference was found between school food service and vending machine foods. Higher selling price of a food item was significantly associated with lower adherence (OR = 0.48, p < .01), and snack items were less likely to adhere to SB12 standards than entrées (OR = 0.31, p < .001). Last, the odds of an item observed at the 2008 assessment adhering to SB12 were nearly 3 times the odds of an item found in 2005 adhering (OR = 2.97, p < .001).

Beverages. Multiple logistic regression from the combined 2005 and 2008 beverage data (n = 572) uncovered results similar to those from the food analysis (Table 3). A higher selling price of a beverage item was significantly associated with lower adherence to SB965 (OR = 0.03, p < .001), and beverage items offered for sale in 2008 were associated with higher adherence than items offered for sale in 2005 (OR = 6.37, p < .001). There was also evidence that beverage items larger in size were more likely to adhere to SB965 (OR = 1.22, p < .001), specifically a 1 fluid ounce increase is associated with the odds of adherence being 1.22 times higher, when all other variables in the model are held constant. No significant differences were observed in adherence rates between venues.

DISCUSSION

Over the course of 3 years, schools in this study increased their adherence to the school nutrition standards. Competitive food adherence increased almost 3-fold, to approximately 67%, and competitive beverages fared even better, with nearly 4 out of every 5 items found to be adherent in 2008. Although many factors can affect the adherence rates on school campuses, evidence exists to suggest that an improvement in the healthfulness of competitive foods and beverages is more likely to occur over time when there is a specific policy in place.21 Several recent studies report that specific policy action led to significant environmental change in schools,12,22 whereas the absence of any policies regulating foods or beverages led to no changes.

Foods found in school stores were more adherent than foods in vending machines, which may reflect the difficulty in finding nutritious foods that can be sold through vending machines.23 Entrees had higher adherence than snacks, possibly because the à la carte entrees sold were often extra portions of the NSLP entrees, subject to NSLP nutrient standards.24 For beverages, a larger total volume was associated with adherence to SB965. This may be a result of the proliferation of sports drinks on campuses after sodas were eliminated, which are adherent to the middle and high school nutrition standards and primarily sold in 20-ounce bottles. Higher selling price was a significant predictor for nonadherence of both foods and beverages. This finding is contrary to studies in the retail food environment, which suggests that healthier items can be more expensive than those deemed unhealthy,25 however, previous research has shown that in schools less healthy, competitive food options tend to sell at higher prices.26 Finally, statistically significant temporal relationships for adherence rates
to both standards were noted. Competitive foods and beverages observed in 2008 were more likely to be adherent than those found in 2005, demonstrating that schools were able to change their competitive food environments over time. This finding was statistically significant.

At both time points, however, many nonadherent foods and beverages were observed in school environments, particularly in secondary schools. Study schools may have experienced difficulty replacing nonadherent items, because vendors or manufacturers may not have updated or reformulated their products to reflect the legislation. These findings indicate that schools struggled to achieve complete adherence to the policy standards, even when given time to implement the policy and support from various school and school district personnel. Studies have noted that school food service staff and school leadership have difficulty interpreting the standards and implementing policies. Potential solutions could be to reduce or remove competitive food and beverage items from school environments. Minimizing the presence of competitive foods and beverages has been shown to decrease sugar-sweetened beverage consumption and reduce plate waste of school meals. Eliminating competitive foods and beverages has been shown to increase sales of school meals, providing schools the financial incentive to take this step.

Limitations

This study has several limitations. Assessments were conducted in a nonrandom sample of public schools in California, thereby limiting the ability to generalize findings to a larger sample of schools. In addition, although the study design does include control schools, these were not assessed in 2005 or 2008 for competitive foods and beverages. Finally, we were unable to conduct significance testing on the changes in adherence rates between 2005 and 2008 at the different school levels (elementary, middle, and high schools). Due to a small sample, statistical power was insufficient to assess school-level changes in adherence.

Strengths

This study has several major strengths. The investigators did not rely on self-reported data, but instead sent trained study staff to the schools to collect observational data. In addition, data were collected at 2 points in time in the same schools, allowing for environmental comparison prior to and following SB12 and SB965 policy implementation.

Conclusions

Schools have begun to implement the California state nutrition standards regulating competitive foods and beverages. However, this study shows that many schools are still struggling to increase adherence of the competitive products offered for sale. To achieve full compliance with the California laws, schools may need additional support. Stronger policies, regular monitoring, and penalties for noncompliance perhaps are also needed. To assure that competitive foods and beverages contribute to schools’ efforts to maximize student health, more research is necessary to understand the complex relationships within schools between competitive product sales, student purchasing patterns, and school finances. As more states and possibly the federal government look to competitive food standards as a key strategy in addressing childhood obesity, it is important to clarify these issues and disseminate the experience of schools that have been early adopters of nutrition standards.

IMPLICATIONS FOR SCHOOLS

School environments are uniquely positioned to reinforce healthy eating behaviors in an effort to prevent childhood obesity. Policy changes, made to improve the nutritional quality of the foods and beverages sold on school campuses, can positively impact this environment in which children spend a significant portion of their time. The experience of implementing current school nutrition policies can inform and strengthen future nutrition policies. More research is needed on school campuses to explore the impact of the policies on the nutrition environment and student behaviors. Given the challenges to implementing the California nutrition policies presented here, schools, districts, and state or federal government should consider stronger policies that provide easily understood guidance to schools and perhaps reduces the availability of competitive foods.

Human Subjects Approval Statement

The instrument and protocol were approved by the University of California, Berkeley institutional review board. This study was deemed exempt from human subjects.

REFERENCES


