

# Lessons Learned From Evaluations of California's Statewide School Nutrition Standards

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The current obesity epidemic in the United States has been associated with environmental factors such as the proliferation of unhealthy foods in schools and neighborhoods, as well as promotion of unhealthy foods in media environments.<sup>1-4</sup> An effective way to support children in being active and eating healthfully is to change institutional practices within schools by improving physical education and the nutritional value and quality of foods served.<sup>5,6</sup>

Schools participating in the federally reimbursed National School Lunch Program and School Breakfast Program serve meals that must meet federal nutrition guidelines. However, foods that are not part of the meal programs are only subject to minimal federal regulation, and these "competitive" foods have become increasingly widespread in schools over the last 40 years.<sup>7</sup> Sold throughout schools in vending machines, school stores, snack bars, and at fundraisers, competitive foods and beverages are of lower nutritional quality and are typically high in added sugars, salt, and fat. Common examples of competitive foods include soft drinks and other sweetened beverages, potato chips, candy, cookies, and pastries.<sup>8-11</sup>

In an effort to combat childhood obesity, state and local policymakers have recently begun to regulate competitive school food offerings by enacting stricter school nutrition standards.<sup>12</sup> These efforts were reinforced by provisions in the Child Nutrition and WIC Reauthorization Act of 2004, which required school districts receiving federal meal program funding to enact wellness policies—including guidelines for all foods and beverages served—by the 2006–2007 school year.<sup>13</sup>

The wellness policies of 92 out of 100 large school districts polled by the School Nutrition Association in 2007 included nutrition standards limiting times or offerings of competitive foods and beverages in school à la carte services, stores, and vending machines.<sup>14</sup> Although the effects of state and local

**Objectives.** We assessed the impact of legislation that established nutrition standards for foods and beverages that compete with reimbursable school meals in California.

**Methods.** We used documentation of available foods and beverages, sales accounts, and surveys of and interviews with students and food service workers to conduct 3 studies measuring pre- and postlegislation food and beverage availability, sales, and student consumption at 99 schools.

**Results.** Availability of nutrition standard-compliant foods and beverages increased. Availability of noncompliant items decreased, with the biggest reductions in sodas and other sweetened beverages, regular chips, and candy. At-school consumption of some noncompliant foods dropped; at-home consumption of selected noncompliant foods did not increase. Food and beverage sales decreased at most venues, and food service à la carte revenue losses were usually offset by increased meal program participation. Increased food service expenditures outpaced revenue increases.

**Conclusions.** Regulation of competitive foods improved school food environments and student nutritional intake. Improvements were modest, partly because many compliant items are fat- and sugar-modified products of low nutritional value. Additional policies and actions are needed to achieve more substantive improvements in school nutrition environments and student nutrition and health. (*Am J Public Health.* 2010;100:2137–2145. doi:10.2105/AJPH.2010.193490)

regulations of competitive foods are only beginning to be evaluated,<sup>15</sup> emerging evidence suggests that school policies that decrease access to competitive foods of limited nutritional value are associated with less frequent student consumption of these foods during the school day.<sup>16,17</sup>

In California, Senate Bill 12 (SB 12), which applied nutrition standards to competitive foods sold in K–12 schools, took effect in July 2007. The law imposed the following limits on foods in secondary schools<sup>18</sup>:

Individually sold snacks must contain no more than:

- 35% of calories from fat (with some exceptions, such as legumes, nuts, and eggs);
- 10% of calories from saturated fat (excluding eggs and cheese);
- 35% sugar by weight (excluding fruits and vegetables); and
- a total of 250 calories.

Individually sold entrées must contain no more than 36% of calories from fat and 400 calories per entrée.

At elementary schools, the only competitive foods allowed are individually sold portions of nuts, nut butters, seeds, eggs, cheese packaged for individual sale, fruit, vegetables that have not been deep-fried, legumes, and dairy or whole-grain foods that meet the nutrient limits described previously and contain no more than 175 calories.

A second law, SB 965, limited the competitive beverages that could be offered during the school day.<sup>18</sup> The limits went into full effect in July 2007 for elementary and middle schools; at high schools, 50% of beverages had to comply by July 2007, and 100% of beverages had to comply by July 2009. The law limits competitive beverages to the following:

- fruit-based and vegetable-based drinks that are at least 50% fruit juice without added sweeteners;
- drinking water without added sweeteners;
- milk products and nondairy milks that have no more than 2% fat and 28 g of total sugars per 8 oz; and
- electrolyte replacement beverages with no caffeine and no more than 42 g of added sweetener per 20 oz (not allowed at elementary schools).

Three studies—the Healthy Eating, Active Communities study (HEAC), the High School Study (HSS), and the School Wellness Study (SWS), all conducted by the authors of this article, assessed different aspects of the implementation and impact of California’s school nutrition standards in diverse settings (Table 1).

Each study examined unique aspects of the legislation while also using some measures that were common to all 3 studies. The combined results of the 3 studies, presented here, provide a more complete picture of the effectiveness and limitations of current nutrition standards and answer the following research questions:

- To what extent did schools comply with nutrition standards?
- What changes did schools make in foods and beverages offered?
- What was the impact on student dietary intake?
- What was the impact on food and beverage sales?
- What were the benefits of and challenges to implementation?

**METHODS**

The HEAC study was part of a larger evaluation of a place-based initiative to prevent obesity through environmental and policy changes in multiple sectors (school, after-school programs, health care, media environments, and neighborhoods) of the same community.<sup>19</sup> Study schools were selected from those participating in the initiative in each of 6 California communities. The schools received technical assistance for various aspects of the project, including implementation of the nutrition standards. The HSS was solely intended to evaluate the implementation and impact of California’s legislated school nutrition standards in a random sample of high schools, and it did not include any financial or technical support to the schools.<sup>20</sup> The SWS was part of a 3-state (Pennsylvania,

**TABLE 1—Summary of Study Methodologies: Healthy Eating, Active Communities Study (HEAC), High School Study (HSS), and School Wellness Study (SWS), California, 2004–2009**

Data Collection Methodology	Purpose	Studies Included	No.	Data Collection Dates	
				Prelegislation	Postlegislation <sup>a</sup>
On-site observations: One-day site visits were made to each school. Information on all competitive foods and beverages available for sale was documented by trained staff who used standardized forms. We determined the nutrient profile of each item by using a validated nutrient composition database or information obtained from packaging, recipes, or manufacturer Web sites.	To assess changes made to foods and beverages offered and to quantify change in degree of compliance with the nutrition standards.	HEAC	6 elementary schools, 6 middle schools, 6 high schools, 1 K-12 school	Spring 2005	Spring 2008
		HSS	56 high schools	Spring 2007	Spring 2008
		SWS	8 elementary schools, 8 middle schools, 8 high schools	Fall 2007	Spring 2009
Student survey: Paper questionnaires—proctored on-site by trained research staff—were completed by seventh- and ninth-grade students.	To understand the impact on student dietary intake and food and beverage purchases.	HEAC	3527 students prelegislation; 3828 students postlegislation	Spring 2006	Spring 2008
Food and beverage sales: Information was provided by school food service and school administration and entered onto standardized forms.	To determine the financial impact of implementing the nutrition standards.	HEAC	6 elementary schools, 6 middle schools, 6 high schools	2004–2005	2007–2008
Food service survey: Interactive PDF questionnaire was sent electronically and was completed by school food service directors or supervisors (1 per school).	To ascertain the perceived benefits of and challenges to implementation of the standards.	HSS	56 high schools	Spring 2007	Spring 2008
School wellness team interviews: One on-site group interview with school wellness personnel was conducted by trained research staff at each school.	To ascertain the perceived benefits of and challenges to implementation of the standards.	SWS	8 elementary schools, 8 middle schools, 8 high schools	Fall 2007	Spring 2009

<sup>a</sup>HEAC postlegislation data were collected at the midpoint of the project. HEAC endpoint data were collected in spring of 2010 and were not yet available for inclusion in this article at press time.

Iowa, and California) project to evaluate the implementation of federally mandated school wellness policies (including nutrition standards). The California SWS schools applied to participate and received technical assistance and funding for implementation of wellness policies. All participating California SWS schools were included in our study.

HEAC schools were located in low-income areas with ethnically diverse student populations that were 65% Latino overall. Schools in HSS were representative of the state high schools and were 37% Latino on average. The student populations of SWS schools varied widely in terms of ethnicity (47% Latino on average) and socioeconomic status. Additional detail about sampling methods has been provided previously.<sup>19–23</sup>

A summary of data collection methodologies, study populations, and time frames is provided in Table 1.

The processes and tools we used to collect and analyze data on availability of competitive foods and beverages have been described previously.<sup>20,24</sup> We used the nutrient content information we collected to determine compliance of individual items with nutrition standards both before and after implementation. Percentage compliance refers to the percentage of distinctly different items that met all the applicable nutrition standards. We determined the number of different items offered by summing the number of distinctly different items at each of 4 venue types (food service à la carte, vending, student store, and other; Table 2). We

grouped items into categories, such as chips or soda, and we counted the number of distinct items offered in each category to describe product mix (Figure 1). We employed this methodology for both HEAC and HSS. The SWS methodology used some predetermined food categories, as opposed to recording nutrient content information for each item before categorization.

The student survey consisted of 40 items (138 subitems) in multiple choice and Likert scale formats. The nutrition-related questions asked about the students' intake and purchases of selected foods and beverages (including location and venue) the day prior to the survey. The student survey also asked about students' attitudes and perceptions related to school foods. Completed questionnaires were scanned using a NCS Pearson OpScan Insight 4 scanner and software. To evaluate the relationships between consumption variables and time, we used general linear model methods (SAS v9.13 PROC GENMOD) to analyze data. We evaluated the change over time by testing the significance of the time coefficient from the regression model. This relationship was adjusted for gender, grade, and ethnicity. We also made adjustments for cluster design effects. Details regarding development and administration of the questionnaire have been reported previously.<sup>21,22</sup> (The instrument can be accessed at <http://cwh.berkeley.edu/resource/healthy-eating-active-living-community-health-initiative-evaluation-proposal-student-survey>.)

Food and beverage sales data included detailed monthly breakdowns of meal participation and food and beverage revenues from school food service and a sampling of other sales venues for 1 full year prior to implementation and 1 full year after implementation. All information was entered onto standardized forms adapted from those used in previous studies of food and beverage sales. Yearly meal revenues, food service à la carte revenues, food service profits, and profits from sales by other school-based groups were calculated and then adjusted for annual average daily attendance and total number of operating days.

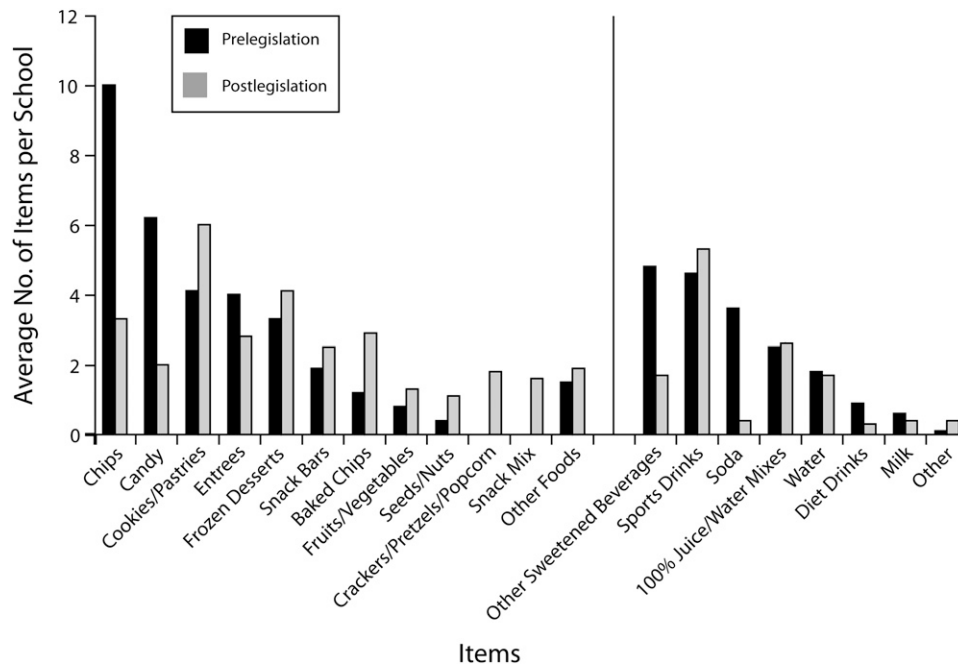
We designed an online food service survey (in an interactive PDF format) for food service directors or supervisors, to elicit detailed information regarding factors influencing implementation of the nutrition standards. Twenty-four items (87 subitems) in multiple choice and Likert scale formats asked about needs, practices, barriers, and perceptions regarding the school meal program, competitive foods, and school wellness policy implementation. (The survey can be accessed at <http://cwh.berkeley.edu/resource/capturing-impact-new-food-and-beverage-standards-california-high-schools>.)

The hour-long, guided school wellness team interview included 19 questions developed by the 3-state project team. Interviewers asked wellness team members about implementation of school wellness policies, including steps taken, areas of challenge, stakeholder involvement and communication, monitoring, and sustainability. Frequencies were

**TABLE 2—Percentages of Items Compliant With Legislation Requiring School Nutritional Standards, and Average Number of Competitive Items Available in Schools, Before and After Implementation of Legislation: Healthy Eating, Active Communities Study (HEAC) and the High School Study (HSS), California, 2005–2008**

	No.	Beverages Compliant, % Prelegislation/ % Postlegislation	Foods Compliant, % Prelegislation/ % Postlegislation	Average No. Competitive Beverages Available Prelegislation/Average No. Available Postlegislation	Average No. Competitive Foods Available Prelegislation/Average No. Available Postlegislation
HEAC elementary schools	6	57/100	0/61	1.4/1.2	6/6
HEAC middle schools	6	84/81	30/63	13/12	22/24
HEAC high schools	6	40/81	22/68	45/29	77/69
HSS schools	56	54/71	37/64	44/33	67/57

Note. Selected data on percentages of items compliant have been previously published.<sup>20,23</sup> HEAC data-collection dates: spring 2005 (prelegislation), spring 2008 (postlegislation). HSS data-collection dates: spring 2007 (prelegislation), spring 2008 (postlegislation).



Note. The study sample (n=19) comprised 1 K-12 school, 6 elementary schools, 6 middle schools, and 6 high schools.

**FIGURE 1—Average numbers of food and beverage items for sale by category, before and after implementation of legislation requiring school nutritional standards: Healthy Eating, Active Communities study, California, 2005–2008.**

generated for answers to the closed-ended questions, and answers to open-ended questions were coded and sorted prior to calculating frequencies.

**RESULTS**

Schools at all grade levels offered a higher percentage of food products meeting the new nutrition standards after the legislation went into effect in 2007 (Table 2). Increases in compliance ranged from 60 additional percentage points at HEAC elementary schools to 27 additional percentage points at HSS schools. On average, each type of school attained similar levels of compliance.

**Changes in Compliance with Nutrition Standards**

Compliance with beverage standards was higher than compliance with food standards. Improvements in beverage adherence were most dramatic at HEAC elementary schools, where fewer items were offered. Beverage compliance rates remained relatively constant at HEAC middle schools, which began with the

highest level of compliance. HEAC high schools started with lower levels of compliance but obtained higher levels of compliance for food and beverages than the HSS high schools, which were randomly sampled.

There was very little prelegislation versus postlegislation change in the number of food and beverage items offered at HEAC elementary and middle schools. High schools (both HSS and HEAC) experienced greater changes: they reduced the number of different types of items offered by 25% to 35% (beverages) and 10% to 15% (food). There were marked increases in the average number of different types of competitive food and beverage items offered with increasing school level (Table 2).

**Changes to Foods and Beverages Offered**

We observed substantial prelegislation versus postlegislation changes in the types of competitive foods offered for sale in HEAC schools (Figure 1). The large decreases in different types of chips and candies offered were most notable. The prelegislation product mix consisted primarily of chips and candy,

with moderate numbers of entrées, frozen desserts, and snack bars, whereas the postlegislation product mix was dominated by cookies or pastries and frozen desserts, followed by a variety of chips, baked chips, entrées, and snack bars. Similar changes in product mix were observed at the HSS schools (data not shown).

The beverage product mix in HEAC schools also changed. Sodas were nearly eliminated, and “other sweetened beverages” (e.g., sweetened juice drinks, sweetened coffees and teas, and vitamin waters) were reduced by more than half. The number of different types of sports drinks offered increased slightly; the number of 100% juice and water mixes and water offerings remained relatively constant. Diet drinks and milk products were not widely prevalent either before or after legislation. In 2005–2006, the HEAC schools primarily offered “other sweetened beverages,” sports drinks and soda, some juice and water, and a very small variety of other choices. By 2007–2008, the HEAC schools primarily offered sports drinks, juice, water, “other sweetened beverages,” and very little of anything else.

As with foods, changes to the competitive beverage product mix were similar but of smaller magnitude at the HSS schools (data not shown).

We examined SWS data for types of food and beverage items responsible for a school's compliance or noncompliance with nutrition standards. Rarely compliant competitive foods were hot entrées, candies, sweetened fruit snacks, trail mix, cookies, and pastries. Foods that were nearly always compliant were baked chips, corn nuts, cereal, yogurt parfaits, fruits, and vegetables. All other item categories (pizza, frozen desserts, meat snacks, crackers and pretzels, popcorn, seeds and nuts, snack mix, and snack bars) exhibited "mixed" compliance, with the percentage of noncompliant foods within a category ranging from 14% to 47%. Many of the compliant items were nutritionally altered versions of previously noncompliant foods. Although the names of certain noncompliant foods gave the illusion of compliance and healthfulness—e.g., Florida's Natural Healthy Treat, Fruitful Banana Frozen Fruit Bar, and Nature Valley Trail Mix Bar—the products themselves did not adhere to the nutritional standards.

Unlike foods, nearly all beverage categories were either 100% compliant or 0% compliant.

Sports drinks generally met the nutrition standards. Milks and smoothies were the only mixed-compliance categories, primarily because of their variable sugar and fat content. "Other sweetened beverages" included many noncompliant products—such as vitamin-enhanced waters and bottled teas—that are marketed as "healthy" but that contain added sugars and do not qualify as electrolyte replacement beverages.

### Impact on Student Dietary Intake

Seventh- and ninth-grade HEAC students reported their consumption of select food and beverage items at school and at home both before and after the legislation went into effect. After legislation, significantly fewer students reported consuming soda and vegetables (which did not include fried potatoes) at school (Figure 2), and significantly more students reported drinking water at school. A trend of decreased student consumption of sports drinks, candy, and chips at school was accompanied by a trend of increased student consumption of milk and fruit, although these changes were not statistically significant. Changes in at-home consumption were only significant for water and were much smaller

than those at school; thus, they do not seem to have compensated for changed intake at school (Figure 2).

### Impact on Food and Beverage Sales

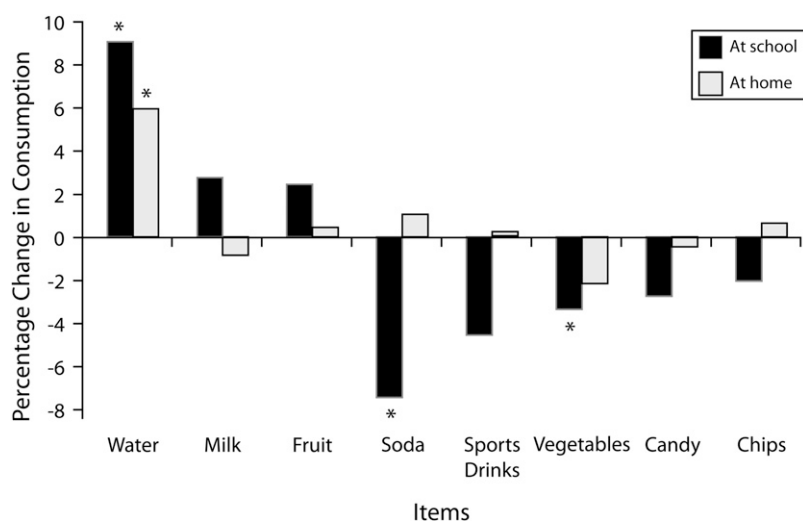
HEAC survey data indicate that after implementation of nutrition standards, fewer students reported purchasing foods from on-campus competitive food and beverage venues (vending machines, snack bars and stores, and school fundraisers; data not shown). Each of these venues was reportedly utilized by 15% to 35% of students the day prior to the survey in 2006; at most venues these proportions dropped by 5 to 10 percentage points in 2008.

Sales data confirm the HEAC students' reports: at the 5 schools that provided data for non-food service sales of competitive foods and beverages, 4 venues experienced a decrease in revenue of more than 5%, and 1 venue experienced an increase of 1 cent per student per day (Table 3). Similarly, food service à la carte sales decreased at 60% of the schools. However, meal sales increased at all schools, and these increases were large enough to compensate for the reduction in à la carte sales, such that all schools experienced an increase in total revenues. Nevertheless, the school food service bottom line deteriorated by an average of 18 cents per student per day during this time period, indicating that increases in food service expenses outpaced revenue increases.

Interviews with HEAC school food service directors indicated that the increased expenses largely resulted from rising food and beverage prices, though the higher cost of providing healthier meal options also contributed. Food service directors at the SWS schools also reported large increases in expenses, especially for foods and beverages, but most did not think these increased costs were attributable to their wellness policy efforts.

### Benefits of and Challenges to Implementation

HSS food service questionnaire responses highlighted several benefits that resulted from nutrition policy changes, including increased student acceptance of healthier options and improved communication with parents and community members. Food service directors



Note. Asterisks indicate a statistically significant change in reported consumption ( $P < .01$ ). In 2006, the sample size was  $n = 3527$ ; in 2008, it was  $n = 3828$ .

**FIGURE 2—Percentages of students reporting consumption of select items at school and at home the day prior to the survey, before and after implementation of legislation requiring school nutritional standards: Healthy Eating, Active Communities study, California, 2006–2008.**

**TABLE 3—Changes in Food and Beverage Sales Revenues After Implementation of Legislation Requiring School Nutritional Standards Among Middle and High Schools (n = 11): Healthy Eating, Active Communities (HEAC) Study, California, 2004–2005 to 2007–2008**

	No.	Mean Change per Student per Day, \$ <sup>a</sup>	No. of Schools with Increases ≥ 5%	No. of Schools with Decreases ≥ 5%
Total food service revenues	11 <sup>b</sup>	.37	10	0
Meal revenues	11 <sup>b</sup>	.43	10	0
À la carte revenues	10 <sup>c</sup>	-.09	3	6
Net food service revenues (profits)	8 <sup>d</sup>	-.18	2	6
Non-food service competitive food and beverage venue net revenues	5 <sup>e</sup>	-.02	1	4

<sup>a</sup>Based on average daily attendance.

<sup>b</sup>One of the 12 HEAC schools did not provide any usable financial data.

<sup>c</sup>One of the 11 schools that did provide usable financial data could not provide separate data for à la carte revenues; total revenue may include revenues from sources other than meals or à la carte.

<sup>d</sup>Expenditure data were only available from 8 of the 11 schools.

<sup>e</sup>Data are only given for 5 schools because 3 schools removed all vending machines, 1 school did not have non-food service sales at either time point, and 3 schools did not provide usable data.

reported that if they are to improve school foods, they “very much need” the following items: less expensive options (59%), better tasting options (43%), more variety (34%), healthier options (25%), and more appealing packaging (23%). Barriers to providing healthy options focused on resource limitations: 61% identified food and beverage costs as a major barrier, and 48% cited labor costs. Student preferences and opposition to change were identified as a major barrier by only 21% and 7% of respondents, respectively. Lack of district or school support and lack of parent or community support were identified as major barriers by less than 10% of respondents.

SWS findings demonstrated that the nutrition standards were among the first and most thoroughly implemented of the wellness policy goals. Sixty-eight percent of the schools reported that they had already fully implemented the nutrition standards by fall of 2007, whereas fewer than a third had implemented most of the other goals by the same time. Eighty-six percent said state or federal law was the reason for focusing on the nutrition standards. Only 13% of the SWS schools reported that it was very challenging to implement nutrition standards; 17% found implementation somewhat challenging. No school in any of the studies reported experiencing

resistance from students. Implementation of standards was considered challenging primarily because of financial concerns, lack of buy-in from school personnel who benefited financially from sales of competitive foods and beverages, and competition with other school priorities.

## DISCUSSION

The results of these and other studies<sup>15,25,26</sup> suggest that legislation has been effective in spurring changes in students’ nutrition environments and behaviors. Participating schools implemented nutrition standards before other aspects of their wellness policies, and school personnel reported that changes in state law facilitated this prioritization. Although schools greatly increased their rates of compliance with the nutrition standards during the period studied, they did not achieve the 100% compliance required by law, nor did they greatly reduce the number of competitive food and beverage offerings. Secondary school students, in particular, continued to be exposed to a wide selection of both compliant and noncompliant snack foods and beverages at school.

It appears that schools’ efforts to comply with the legislation were stymied by the

difficulty of determining compliance, especially for apparently similar foods and beverages.<sup>20</sup> For example, 2 snack bars of the same brand but different flavors may have slightly different compositions, making 1 compliant and 1 non-compliant. This would explain why schools offered both compliant and noncompliant foods within a given category. The marketing of some noncompliant foods as “healthy” has also likely contributed to the confusion in compliance classification.<sup>27</sup> The relatively higher compliance with the beverage standards likely reflects the fact that it is easier to interpret the beverage standards, which are categorical in nature (rather than nutrient-based) and thus more straightforward.<sup>20,28</sup>

Despite these challenges, and consistent with findings from other studies,<sup>7,17</sup> the availability of many of the least healthy items—such as soda, candy, and regular chips—was reduced. Cookies and pastries, frozen desserts, chips, and sports drinks remained among the most prevalent competitive items sold. Although compliant foods and beverages tended to be lower in fat, sugar, and calories than noncompliant items, many compliant foods were merely modified versions of highly processed foods that were previously noncompliant (e.g., baked chips). Thus, compliance with the current standards is a less-than-satisfactory measure of the healthfulness of a given food or beverage.

Modest changes in product mix appear to have had a favorable, albeit modest, impact on student dietary intake. Consistent with findings from other studies,<sup>16,17,29–34</sup> intake of some of the least healthy items decreased, and intake of some healthy items increased. Contrary to expectations that students might compensate for implementation of the standards by consuming more noncompliant foods and beverages at home,<sup>17,35,36</sup> no such increases were observed; rather, changes in home intake were smaller than but similar to those observed in the school setting. The intake of some healthy foods also declined, which suggests that schools’ efforts likely focused on complying with the law, not on increasing the provision of fresh, healthy alternatives.

Despite concerns regarding financial impact, and consistent with findings from other studies,<sup>30,37,38</sup> food service benefited from increased meal sales when à la carte sales decreased. Other

venues experienced losses that were small on a per student basis. Most schools reported only minor resistance, if any, from stakeholders. Apart from resource constraints, respondents identified relatively few barriers to implementing the standards.

Our findings demonstrate the need to develop an effective strategy for ensuring that school food and beverage offerings are compliant with nutrition standards. Some state government and local education agencies in California already monitor compliance (see <http://cwh.berkeley.edu/resource/key-lessons-california-schools-working-change-school-food-environments> for examples of these efforts), but their efforts are hampered by constraints on time and other resources. Although no funds are currently allocated specifically for this purpose, it is possible that sales of competitive products could generate funds to support a very limited monitoring system. Various entities—including some school districts, the US Department of Agriculture, and at least 1 research firm<sup>24</sup>—have either developed or are in the process of developing databases of compliant items; however, the continuous stream of new and reformulated products makes the maintenance of such lists challenging. Alternatively, the food and beverage industry could be required to provide only compliant products to schools. Still, this system would require some level of state or national monitoring, and an effective monitoring system may not be practical unless the complexity of the school competitive food environment is reduced.

Our findings indicate that monitoring alone may increase compliance but would not guarantee a healthy product mix unless standards were also improved. The Institute of Medicine has developed scientifically based standards that are more restrictive than the California standards and that are both food- and nutrient-based.<sup>28</sup> Implementation of these standards could ease a number of the concerns that have been presented here; if adopted in their strictest form, these standards would likely promote healthier school food environments. However, even with improved standards, monitoring and enforcement remain challenging, and the degree to which nutrition standards can support better nutrition choices remains an important question.

Policies that support greater reductions in the quantity of competitive foods and encourage students to eat balanced meals instead may be the best option.<sup>29,32–34,37,39–42</sup> This would reduce the need for time-intensive monitoring and has a greater potential to affect student intake. Opposition to such policies would likely come from any entities that benefit financially from school-site sale of snack foods and sweetened beverages, including manufacturers, vendors, and school-based groups such as student groups and parent-led fundraisers.<sup>33,37</sup> Nonfood fundraising has been successfully employed in many schools,<sup>29</sup> and school food service would likely benefit from the decreased competition,<sup>7,20</sup> but our findings suggest that this benefit would not be great enough to compensate for rising expenses. Therefore, additional funding would likely be needed to support substantive improvements to school meal offerings, kitchen facilities, and dining environments.<sup>15,43–47</sup>

Our findings indicate that legislation to regulate competitive foods was an effective first step in improving student nutritional intake in California. For greater impact, however, a comprehensive approach to improving all aspects of the food environment—including strong policy changes to ensure that students are provided with genuinely healthy foods in all settings at school—is warranted. This approach would likely be most effective if complemented by high-quality nutrition education and promotion.<sup>15,48,49</sup> Most school-based programs that have demonstrated effectiveness in improving student dietary intake or adiposity have taken a comprehensive approach, including quality nutrition education and promotion, improved meal facilities, or improved physical education and physical activity environments, in addition to healthier food offerings throughout the campus.<sup>6,45,50–59</sup> Keys to success have included policy change, family and student involvement, staff training at all levels, varied social marketing strategies, and community partnerships.

A great deal of momentum currently exists to create and support healthy school environments.<sup>15</sup> In light of the experiences reported here, it is clear that legislative efforts can be effective and that such efforts are critical in sustaining this momentum. However, to

successfully reverse the obesity epidemic, there is a need for a more comprehensive and systematically enforced set of strong school nutrition and wellness policies. ■

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This article was accepted August 3, 2010.

### Contributors

G. Woodward-Lopez led the writing of the article and played a key role in study design, instrument design, and supervision and training for data collection for all 3 studies reported on here. She also supervised data analysis and interpretation of findings. W. Gosliner played a key role in study and instrument design and development for HEAC; supervised data collection, analysis, and interpretation of findings; and reviewed and wrote portions of the article. S. Samuels supervised all stages of the HEAC and HSS studies, and she participated in reviewing and editing the article. L. Craypo played a key role in study and instrument design for the HEAC and HSS studies, supervised data collection, helped with interpreting findings, and participated in reviewing and editing the article. J. Kao assisted with instrument design, coordinated and conducted data collection for all 3 studies, coordinated data analysis, helped to interpret findings, and participated in reviewing and editing the article. P. B. Crawford supervised and performed quality assurance for all stages of all 3 studies; played the lead role in study design, data analysis, and interpretation of findings; and participated in reviewing, editing, and writing the article.

### Acknowledgments

The 3 studies reported on in this article were funded by The California Endowment (awards 20042960 & 20042808) through a subcontract with Samuels and Associates, the Robert Wood Johnson Foundation (award 57926), and a Team Nutrition grant from the US Department of Agriculture through a subcontract with the California Department of Education Nutrition Services Division (award CN077297).

The authors want to thank the funders for their leadership in this area; the many students, teachers, administrators, and school nutrition staff who willingly shared their expertise to help us better understand the many facets of statewide nutrition standards implementation; and Peg Farrell and Sheila Stern for their assistance with editing and preparing this article. The School Wellness Study instruments were jointly developed by researchers at the University of California, Berkeley, Pennsylvania State University, Iowa State University, and the National Food Service Management Institute.

**Note.** The contents of this publication do not necessarily reflect the views or policies of the US Department of Agriculture, nor does mention of trade names, commercial products, or organizations imply endorsement by the US government.

### Human Participant Protection

All study protocols were approved by the University of California, Berkeley's Committee for the Protection of Human Subjects.

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