



Original article

To What Extent Have High Schools in California Been Able to Implement State-Mandated Nutrition Standards?

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Abstract

Purpose: To determine extent and factors associated with implementation of California's school nutrition standards 1 year after standards became active.

Methods: Information on competitive foods and beverages available in schools was collected from a representative sample of 56 public high schools in California. Adherence to nutrition standards was calculated for each item and summarized for each school by venue. The association between schools' sociodemographic characteristics and adherence to standards was determined by multivariate analysis.

Results: The majority of schools were adhering to the required beverage standards. None of the schools selling competitive foods were 100% adherent to the food standards. Adherence to both standards tended to be highest in food service venues. In univariate analyses, percent nonwhite enrollment, population density, percent free/reduced-price (FRP) meal eligibility, and school size were significantly correlated with the beverage adherence rate. Percent nonwhite enrollment and population density remained significant in the multivariate regression model. Percent nonwhite enrollment and percent FRP meal eligibility were significantly correlated with the food adherence rate in univariate analysis, but neither remained significant in the multiple regression model.

Conclusions: California high schools are making progress toward implementation of the state nutrition standards. Beverage standards appear easier to achieve than nutrient-based food standards. Additional support is needed to provide schools with resources to implement and monitor these policies. Simpler standards and/or a reduction in the foods and beverages sold could better enable schools to achieve and monitor adherence. © 2009 Society for Adolescent Medicine. All rights reserved.

Keywords:

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During the last three decades the prevalence of obesity among children in the United States has risen dramatically [1]. Easy access to unhealthy foods at school may contribute to current rates of childhood obesity [2,3]. Although foods and beverages available through the U.S. Department of Agriculture (USDA) federally reimbursable school breakfast and lunch programs must meet nutrition standards for schools to receive federal subsidies, the same is not true for

competitive foods that are available in vending machines, student stores, and à la carte in cafeterias. Competitive foods represent a considerable portion of the foods students purchase while on campus [4] and often are high in calories, fat, and sugar and low in nutrient density [4–9]. (It should be noted that the USDA regulations state that Foods of Minimal Nutritional Value [FMNV] cannot be sold where USDA school meals are served or eaten [i.e., cafeterias] during meal periods. FMNV include carbonated beverages, water ices [without any amount of fruit/fruit juice], certain candies, and chewing gum. [Foods of Minimal Nutritional Value. fns.usda.gov. Accessed 4/18/008]).

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Health and education leaders have agreed that a crucial step to improving children's eating habits is to establish policies and programs that increase access to healthy foods and beverages at school [10,11], while at the same time limiting access to unhealthy foods and beverages. School interventions that change the school food environment by increasing the availability of healthy foods can have a significant impact on student food choices [4–7,12–14]. One school intervention to improve foods and beverages in 10 schools in the Mid-Atlantic region of the United States reported a 50% reduction in the incidence of overweight compared with control schools [8].

Realizing the potential impact that improving school food environments can have on children's health, states and school districts across the country are developing and implementing school nutrition standards that set standards for competitive foods sold on school campuses [15]. As of November 2007, 30 states (including the District of Columbia) had adopted school competitive food standards [16], and 12 of these states had set comprehensive nutrition standards covering all grades for the entire school day and all areas of the school campus [16].

In 2005, California passed Senate Bills 12 and 965 calling for the implementation of nutrition standards to regulate competitive foods and beverages in all K-12 schools. California's legislation is among the most stringent, comprehensive, and specific plan in the nation aimed at changing the school food and beverage environment. The laws regulate the amount of fat, sugar, and calories contained in competitive foods (SB 12) and phase out the sale of sodas and other sweetened beverages (SB 965) (Table 1). Food standards at high schools were to be fully implemented by summer 2007, whereas the implementation target for beverage standards was 50% adherence by summer 2007. Beverages are

slated for full adherence by July 2009. Concerns exist, however, regarding the extent to which schools will be able to adhere to the new regulations, the financial impact on school programs, and the student and adult stakeholder responses to these mandated changes [17]. Questions relate to the capacity of school personnel to manage enforcement of standards based upon detailed knowledge of the nutrient content of a myriad and constantly evolving array of food products. Competing demands upon personnel time may also limit schools' ability to implement complex new standards.

To date, no study has been published regarding the evaluation of the impact of the new comprehensive nutrition standards at the high school level [18]. This study evaluated the effect of new food and beverage standards in California during the first year of implementation, and correlates program adherence with demographic characteristics of school populations including percent nonwhite enrollment, population density of the community, percent free/reduced-price meal eligibility, and school size.

Methods

Data collection

A total of 56 schools participated in the study. Of these schools, 50 were selected from a randomized list of all public high schools in California that met the following criteria: had at least 35 students enrolled in each of the four grade levels 9–12, had no enrollment in any other grade levels, offered reimbursable meals to students, and had conducted the California Healthy Kids Survey in the 2005–2006 school year. Charter, continuation, and college preparatory schools were excluded. Two additional schools were randomly selected from a list of

Table 1
California legislation: SB 12 (food standards) and SB 965 (beverage standards)

California Senate Bill 965 expands previous legislation describing the type of beverages that can be sold in elementary and middle schools to include all K-12 pupils. The following describes SB 965 as it applies to high schools. Elementary middle schools were required to obtain 100% compliance by July 1, 2007.

- Starting July 1, 2007, 50% of the beverages sold to pupils from one-half hour before the start of the school day until one-half hour after the school day must be from the following list:
 - Fruit-based and vegetable-based drinks that are at least 50% fruit juice without added sweeteners
 - Drinking water without added sweeteners
 - Milk products (including 2% fat, 1% fat, nonfat, soy, rice, and other similar nondairy milk)
 - Electrolyte replacement beverages (containing no more than 42 grams of added sweetener per 20-oz serving)
- Starting July 1, 2009, ALL beverages sold to pupils from one-half hour before the start of the school day until one-half hour after the school day must be from the above list.

California Senate Bill 12 requires that all public schools in California implement the following food standards as of July 1, 2007:

- An individually sold snack may have no more than:
 - 35% of its calories from fat (excluding legumes, nuts, nut butters, seeds, eggs, vegetables that have not been deep-fried, and cheese packaged for individual sale)
 - 10% of its calories from saturated fat (excluding eggs and cheese packaged for individual sale)
 - 35% sugar by weight (excluding fruits and vegetables)
 - 175 calories (elementary schools); and 250 calories (middle and high schools)
 - in an individually sold entree, no more than 36% of its calories from fat; 400 calories, and must qualify under the federal meal program.
- Nutrition standards apply only to the sale of items to pupils and do not apply to foods brought from home.

all high schools in the Central Valley counties, and six others were randomly selected from a comprehensive list of high schools with less than 30% enrollment in the Free and Reduced Price lunch program (FRP) to increase representation of schools with these characteristics. The same exclusion criteria applied to these schools. A total of 71 schools that met our criteria were contacted. Of these, 19 declined to participate, one school declined to participate after recruitment, and one school did not meet study criteria after selection, leaving 56 participating high schools.

School-level data on FRP enrollment and open/closed campus status were collected by a questionnaire administered to the school food service directors for the 2006–2007 school year. Other school level sociodemographic data (student ethnicity, school enrollment, and urban/rural categorization) were obtained from the California Department of Education Web site for the 2007–2008 school year. (It should be noted that large and mid-size cities are central cities of a Consolidated Metropolitan Statistical Area [CMSA] or Metropolitan Statistical Area [MSA], with a population $\geq 250,000$ and $< 250,000$, respectively. Areas that are near large or mid-size cities [i.e., urban fringe] are any incorporated place, Census Designated Place, or nonplace territory within a CMSA or MSA of a large or mid-size city and defined as “urban” by the Census Bureau. A small town is an incorporated place or a Census Designated Place with a population less than 25,000 but greater than 2500, and located outside of a CMSA/MSA. A rural area is any incorporated place, Census Designated Place or nonplace territory defined as rural by the Census Bureau [<http://www.cde.ca.gov/ds/si/ds/fspubschls.asp>]).

Information on the competitive foods and beverages offered at each high school was obtained in the spring of 2008 using the Food and Beverage Environmental Assessment and Monitoring System (Food BEAMS) developed and validated by Samuels & Associates, Inc. Food BEAMS is a computer-based data collection tool used for auditing the types of competitive foods and beverages provided on school campuses, and contains a nutrient composition database of more than 4700 foods and beverages that had been compiled from assessments in over 45 school districts in California. Trained staff recorded the location and accessibility of all competitive food venues on campus and recorded the brand name, flavor, total size, and price for all items at these venues. This information was entered into Food BEAMS, where product information was linked to nutrient profiles in the nutrient composition database. Nutrient profiles for the foods and beverages not contained in the database were obtained from food packages, USDA nutrient databanks, manufacturers’ product information Web sites and school district food service departments. Only school foods and beverages accessible to students during the school day were included in the analysis. In addition, one food item and 17 beverages were excluded because of insufficient information to determine adherence to the standards (Table 1).

Data analysis

Data entered in Food BEAMS was transferred to SPSS 14.0 for analysis (SPSS Inc., Chicago, IL). The percentages of items that adhered to the new standards at the school and venue level were then calculated. Adherence is expressed as two measures: as a continuous variable (the percentage of beverage and food items that were adherent) and as a binary variable (whether or not the school or venue had reached the mandated summer 2007 level of adherence of 50% of beverage items and 100% of food items).

Each school’s percent adherence was correlated with the school sociodemographic characteristics using SAS 9.1 for the Windows operating system (SAS Institute, Cary, NC). Means and standard deviations (SD) or frequencies were calculated for each variable, as applicable. Pearson’s correlation coefficient (r) was used to measure the strength of the linear relationship between school characteristics and each type of adherence rating. Multivariate linear regression analysis was used to model the relationship between school characteristics and the dependent variables (the percentage of beverage and food items that were adherent), via two separate models. The school characteristics that correlated with beverage or food adherence rates in univariate analysis below a marginal significance level (i.e., $p < .2$) were considered relevant and were entered simultaneously into the regression models.

Results

School characteristics

Various characteristics of the 56 schools included in this study are shown in Table 2. The average student enrollment was 1959 students, with a range of 196–4331 students. On average, 62% of students enrolled were students of color (nonwhite), and 38% were eligible for free or reduced price meals. More than half (57%) of the schools were in or near large cities, 21% in or near medium-sized cities, and 21%

Table 2
Sociodemographic characteristics of schools (n = 56)

Characteristic	Value
	Mean % \pm SD, range
% Nonwhite student enrollment*	62 \pm 27, 14–100
No. schools by urban-rural classification*	n (%)
Rural and small towns	12 (21)
Mid-size city and urban fringe of mid-size city	12 (21)
Large city and urban fringe of large city	32 (57)
% Students eligible for free/reduced-price meals**	Mean % \pm SD, range
	38 \pm 27, 1–91
No. schools by open-/closed-campus status**	n (%)
Open campus	31 (55)
Closed campus	25 (45)
School size by enrollment*	Mean \pm SD, range
	1959 \pm 991, 196–4331

* For 2007–2008 school year.

** For 2006–2007 school year.

in small towns or rural areas. Of the schools, 45% had a closed-campus policy that restricted off-campus access at lunchtime.

High school food and beverage environment

All 56 schools sold competitive beverages, and 53 (94.6%) of the schools sold competitive foods. The average number of unique competitive beverage items per school was 33.0 (range 5–88), and the average number of unique competitive food items per school was 57.2 (range 0–144).

Competitive beverage and food sales were observed in varied venues throughout the study school campuses including vending machines, school stores, school food service, coffee carts, and taco trucks. The average number of different types of venues per school was 2.1, with a range of 1–3. Across the study, a total of 376 beverage and 96 food vending machines accessible to students were observed, and the average number of accessible beverage vending machines per school was 7.2 (range 0–17), and the average number of accessible food vending machines per school was 2.7 (range 0–8).

Adherence to SB 12 and SB 965 standards across all schools and by venue

At the time of the endpoint data collection, high schools were required by the legislation to have 50% of their competitive beverages adhering to the SB 965 standards. As shown in Table 3, the majority of schools assessed (85.7%) met the mandated 50% SB 965 implementation standard. Adherence to this requirement varied by venue and was highest in food service (91.1%), followed by school stores (73.7%), and vending machines (68.6%).

The average percent adherence of all beverage items observed across all venues was 71.0%, with a range among schools of 30.6–100%. The average percentage of beverages adhering to the SB 965 standards by venue was highest in food service (78.5%), followed by school stores (73.9%)

Table 3
SB 965 (beverages) and SB 12 (foods) policy implementation

Venue	% Schools 50% adherent to SB 965	Average adherence rates across schools (range)
Overall	85.7% (48/56)	71.0% (30.6–100%)
Food service	91.1% (41/45)	78.5% (30.6–100%)
Vending	68.6% (35/51)	66.0% (14.3–100%)
School stores	73.7% (14/19)	73.9% (33.3–100%)
	% Schools 100% adherent to SB 12	Average adherence rates across schools (range)
Overall	0% (0/53)	63.7% (32.1–90.0%)
Food service	6.7% (3/45)	66.7% (32.1–100%)
Vending	6.1% (2/33)	64.4% (25.0–100%)
School stores	0% (0/20)	68.6% (41.5–90.9%)

In this table, schools missing venues do not receive a 100% adherence score for that venue.

and vending machines (66.0%). Table 4 lists the most frequently observed adherent and nonadherent beverages.

All schools were required by legislation to have 100% of the competitive foods in all venues adherent to SB 12 nutrition standards. None of the schools selling competitive foods were adherent to the required 100% implementation at the time of endpoint data collection (Table 3). However, three schools did not sell any competitive foods at all (not included in Table 3) and were thereby 100% adherent to SB 12 regulations. These three schools eliminated competitive foods sales after the legislation went into effect, suggesting that their decision to eliminate these sales was prompted, at least in part, by the legislation. Very few individual venues met the 100% SB 12 implementation requirement; the highest percentage of 100% adherent venues for the food standards were food service venues (6.7%), followed by vending machines (6.1%).

The average percent adherence to SB 12 standards for all food items sold across all venues was 63.7%, and the overall adherence rate for all food items at individual schools ranged from 32.1% to 90%. The average percent of foods adhering to SB 12 per school was highest in school stores (68.6%), followed by food service (66.7%) and vending (64.4%). Table 4 lists the most frequently observed adherent and nonadherent foods.

School and community characteristics associated with adherence to the nutrition standards

In univariate analyses, school beverage adherence rates were significantly associated with school and community characteristics: student race/ethnicity ($p < .0001$), percent enrolled in the free/reduced price meal program ($p < .02$), population density of the community ($p < .0001$), and school size ($p < .05$). School beverage adherence rates were not associated with closed versus open campus ($p < .08$) (Table 5). Thus, schools were more likely to have beverages meeting state standards when they had a higher proportion of nonwhite students, a higher proportion of students eligible for the free and reduced price meal program, were located in communities with higher population density (more urban) and had higher school enrollment.

In the multiple regression model of beverage adherence, percent nonwhite enrollment remained highly significant, and population density approached significance (Table 6). Thus, for every 1% increase in nonwhite enrollment, the total beverage adherence rate was estimated to increase by .5% (all other variables held constant). For every one-unit increase in the population density category (rural and small town, near or in mid-size city, near or in large city), the school beverage adherence rate was estimated to increase by 5.9%. Overall, 46.7% of the variability in the beverage adherence rate can be accounted for by these school and community characteristics.

In univariate analyses, percentage of nonwhite enrollment ($p < .05$) and percentage of students eligible for free and

Table 4
Top 10 Frequently Found Food and Beverage Items that Adhere to SB 12 or SB 965 and Do Not Adhere to SB 12 or SB 965

	Foods	Beverages
Top 10 Frequently Found Adherent Items	pretzels-roid gold-classic style-tiny twists corn nuts-ranch baked chips-baked lay's-barbecue corn nuts-barbeque granola bar-nature valley-crunchy-oats 'n honey snack mix-general mills-chex mix-traditional baked chips-baked lay's-sour cream & onion baked chips-baked ruffles-cheddar & sour cream crackers-sunshine-cheez-it-reduced fat baked chips-baked cheetos-crunchy-flamin' hot	gatorade fruit punch gatorade lemon-lime gatorade orange aquafina water gatorade cool blue dasani water powerade - fruit punch powerade - mountain blast dole 100% orange juice dole 100% apple juice
Top 10 Frequently Found Non-Adherent Items	snack mix-frito lay-munchies-flamin' hot cookies-nabisco-oreo-100 calorie pack cereal bar-kellogg's-nutrigrain-raspberry granola bar-nature valley-strawberry yogurt cookies-general-gourmet treats-chocolate chip crackers-sunshine-cheez-it-original crackers-nabisco-wheat thins-original cookies -gourmet treats-chocolate chocolate cereal bar-kellogg's-nutrigrain-blueberry chips-sunchips-french onion	glaceau vitamin water- revive glaceau vitamin water- focus glaceau vitamin water - power-c glaceau vitamin water - essential propel fitness water berry lipton brisk iced tea - lemon flavored tropicana pink lemonade tropicana strawberry melon aquafina flavor splash - raspberry glaceau vitamin water - xxx

reduced priced meals ($p < .01$) were positively correlated with school food adherence rates. In multiple regression analyses, parameter estimates of .09 and .13 were found for percent nonwhite enrollment and free and reduced price meals, respectively, but neither correlation was statistically significant ($p > .05$, data not shown).

Discussion

The adoption of school nutrition policies is an important step, yet preliminary studies have shown that the actual implementation of state and district nutrition policies varies greatly from school to school [15,19–21]. This study found similar results, with percentage of items adhering to beverage standards ranging from 30.6% to 100% and percentage of items adhering to food standards ranging from 32.1% to 90%.

Table 5
Correlation of school characteristics with beverage and food adherence rates*

	Beverage adherence (n = 56)		Food adherence (n = 56)	
	r	p Value	R	p Value
% Nonwhite enrollment	.62919	<.0001	.33514	.0116
Population density (ordinal variable, three categories)	.49918	<.0001	.12657	.3526
% Free/reduced-price meal eligible students	.33849	.0107	.34852	.0085
School size (rank ordered by enrollment)	.28040	.0363	.05988	.6611
Closed campus (0 = no, 1 = yes)	.24093	.0737	-.00188	.9890

* Univariate analysis using Pearson correlation coefficient.

Although schools in this study exhibited a broad range of adherence rates to the new California standards, more schools were fully adherent to the beverage standards (85.7%) than to the food standards (0%). Part of the difference between school adherence to beverage and food standards is no doubt caused by the legislative provision that only 50% of the beverages were required to adhere to the standards at the time of the study, whereas 100% of the foods were required to adhere to the standards by July 2007. Indeed, additional data should be collected and analyzed after July 2009 when 100% adherence is required for both foods and beverages in all schools. However, it is interesting to note that if schools were required to meet the July 2009 requirement of 100% adherence to the beverage standards at the time of this study, the percentage of adherent schools would drop dramatically to 19.6% (data not shown). Although the difference between

Table 6
Simultaneous regression model: Correlation of total food and beverage adherence rates with school and community sociodemographic characteristics

Variable	Parameter estimate	Standard error	Pr> t
Beverages (adjusted R ² = .4665)			
% Nonwhite enrollment	.49378	.13108	.0004
Population density (ordinal variable, three categories)	5.94363	2.99482	.0527
% Free/reduced-price meal eligible students	-.15464	.12601	.2255
Closed campus (0 = no, 1 = yes)	6.05509	4.04372	.1406
School size (rank ordered by enrollment)	1.86429	7.80849	.8123
Foods (adjusted R ² = .1005)			
% Nonwhite enrollment	.09179	.10828	.4004
% Free or reduced price meal eligible students	.12586	.11135	.2634

school adherence to food and beverage standards narrows when the requirement for beverages increases, schools still had higher adherence to beverage standards than to food standards. This indicates that distinguishing factors other than the required percent adherence were also influential.

The difference between beverage and food adherence rates may be caused in part by the way that the standards are written. The SB 965 beverage standards specify types of beverages that can be sold, whereas the SB 12 food standards are nutrient based and set specific nutrient limits for foods (Table 1). Although adherence to the beverage standards requires the ability to accurately categorize a beverage as a certain type (water, sports drink or percentage of fat contained in milk), adherence to the food standards requires various nutrient calculations to determine the percentage of calories from fat, saturated fat, and percentage of total weight from sugar. Furthermore, food products supplied by the same manufacturer, having similar names, are in some cases adherent and in others are nonadherent, potentially causing confusion for personnel (Table 4). In addition, decisions regarding classification of foods as snacks (175–250-calorie limit) or entrees (400-calorie limit) may be difficult. Nutrient-based standards for foods may impede school personnel's ability to effectively determine adherence. Adherence to competitive food standards could be increased if the standards were written similar to the SB 965 beverage standards and identified specific *categories* of foods that do and do not adhere. Adherence criteria based on categories of food (e.g., chips, fruits without added sugar, whole-grain cereal bars) would be easier for the lay person to interpret, but establishing these criteria would be a more complex task than with beverages. Creating categories of adherent and nonadherent foods would provide more user-friendly guidance about what are healthy foods and would make it possible to include criteria that favor naturally healthy options (i.e., fruit) rather than modified versions of less healthy options (i.e., baked chips).

The adherence to SB 965 may also be higher because schools districts may have been more familiar with implementing the beverage standards. Beverage standards similar to those required by SB 965 had been in effect in elementary and middle schools since July of 2004 (SB 677). Therefore when SB 965 was signed into law in September of 2005, school districts were already in the midst of implementing SB 677 in elementary and middle schools. Because schools district personnel knew that they would soon have to apply the new beverage standards at all school levels, this may have motivated an earlier transition in high schools before it was officially required.

Within the schools studied, food service venues tended to have higher adherence rates than other venues that are often managed by school personnel who have no nutrition background. Food service department personnel may have an easier time implementing food and beverage standards because they are familiar with conducting nutrient analyses to comply with USDA meal program requirements. These findings suggest that placing all food and beverage sales

under the control of the school food service department might improve adherence to the food and beverage standards.

Although tools for assessing school meal programs exist [24,25], very few tools exist for monitoring competitive food environments. The few tools that might be adapted for monitoring the adherence of competitive foods and beverages are limited in their ease of use or suitability for this purpose, are time-intensive, or are not accessible to school personnel. To adhere to the nutrient standards, schools will need a system for assuring adherence that is easy to use and cost-effective. The electronic Food BEAMS tool used in this study may prove to be an effective system for schools to monitor adherence, and the researchers are working toward making Food BEAMS more widely available.

Finally, it is important to note that the only schools with 100% adherence to the food standards were those schools that sold no competitive foods. Previous research [26] has demonstrated that schools that drastically reduce or eliminate a la carte and other competitive foods experience an increase in meal sales to the financial benefit of school food service. Therefore the most viable means to reaching 100% adherence to SB 12 may be the elimination or significant reduction in the sale of competitive foods.

A large portion of the variability in adherence to the beverage standards was explained by sociodemographic characteristics of the schools. Having a larger nonwhite student population and being located in a more densely populated urban area were associated with higher adherence. These findings may be caused in part by the fact that low-income school districts across California, many of which are located in densely populated urban areas and serve a large proportion of ethnic minority students, have benefited from several public and private funding sources to support improvements to the school food and beverage environment, including the federal Food Stamp Nutrition Education Program, The California Endowment's Healthy Eating Active Communities program, and Kaiser Permanente's Healthy Eating Active Living program. This hypothesis will be explored in subsequent analyses. Interestingly, the proportion of students eligible for subsidized meals (a proxy for economic status), and school size did not retain a significant association with beverage adherence upon multivariate analysis, suggesting that the influence of these variables is mediated by the racial/ethnic composition of the student body and school location (urban–rural classification).

Conclusion

This study demonstrates that California high schools are making significant progress toward the implementation of state nutrition standards, as defined in state legislation SB 12 and SB 965. Adherence to beverage standards has been more quickly achieved than adherence to nutrient-based food standards despite the fact that a longer phase-in period was allowed for the beverage standards. Simpler food standards, simplified interpretation of the current standards, or

large reductions in competitive food sales could reduce the effort and resources needed to implement food and beverage regulations. Additional support may be needed from federal, state, and local jurisdictions to provide schools with the resources to implement and monitor new food and beverage policies.

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