Original Investigation

Association Between District and State Policies and US Public Elementary School Competitive Food and Beverage Environments

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IMPORTANCE Given the importance of developing healthy eating patterns during early childhood, policies to improve the elementary school food and beverage environments are critical.

OBJECTIVE To examine the association between district and state policy and/or law requirements regarding competitive food and beverages and public elementary school availability of foods and beverages high in fats, sugars, and/or sodium.

DESIGN AND SETTING Multivariate, pooled, cross-sectional analysis of data gathered annually during elementary school years 2008-2009 through 2010-2011 in the United States.

PARTICIPANTS Survey respondents at 1814 elementary schools (1485 unique) in 957 districts in 45 states (food analysis) and 1830 elementary schools (1497 unique) in 962 districts and 45 states (beverage analysis).

EXPOSURES Competitive food and beverage policy restrictions at the state and/or district levels.

MAIN OUTCOME AND MEASURE Competitive food and beverage availability.

RESULTS Sweets were 11.2 percentage points less likely to be available (32.3% vs 43.5%) when both the district and state limited sugar content, respectively. Regular-fat baked goods were less available when the state law, alone and in combination with district policy, limited fat content. Regular-fat ice cream was less available when any policy (district, state law, or both) limited competitive food fat content. Sugar-sweetened beverages were 9.5 percentage points less likely to be available when prohibited by district policy (3.6% vs 13.1%). Higher-fat milks (2% or whole milk) were less available when prohibited by district policy or state law, with either jurisdiction's policy or law associated with an approximately 15 percentage point reduction in availability.

CONCLUSIONS Both district and state policies and/or laws have the potential to reduce in-school availability of high-sugar, high-fat foods and beverages. Given the need to reduce empty calories in children's diets, governmental policies at all levels may be an effective tool.

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Today's children are the first generation to be enrolled in school at a time when policymakers and educators are focused on reducing the prevalence of childhood obesity. These concerns are justified, given that 32.6% of children aged 6 to 11 years were overweight or obese in 2009-2010.[1]

Consumption of solid fats and added sugars is a major contributor to obesity.[2] In 2005 through 2008, 16% of children's daily caloric intake came from added sugar, with 59% of that from foods and 41% from beverages.[3] Soda and fruit drinks (ie, sugar-sweetened beverages [SSBs]) and whole milk are 3 of the top 6 products contributing to empty calories in children's diets,[4] whereas the top food source of energy for 2- to 18-year-olds are grain-based desserts containing solid fats and added sugars, including cakes, cookies, donuts, and pies.[4]

Government decision makers have been experimenting with policy approaches to prevent obesity. Changing the school beverage and food environments has been a primary strategy given that children spend most of the year at school and at least 35% of a child's caloric intake occurs at school.[5] Approximately half of the elementary school students have access to foods sold outside the school meal program (ie, competitive foods), and 55% have access to competitive beverages through at least one school venue (ie, vending machines, school stores, and/or à la carte lines).[6,7] More than 44% of public elementary school students had access to high-fat and/or sugary foods, such as cakes, cookies, and candy, in competitive food venues in 2009-2010.[6] In 2010-2011, 12% could purchase SSBs and 25% could purchase high-fat (ie, 2% or whole) milks.[7]

Currently, federal restrictions on competitive foods and beverages are limited to prohibitions on the sale of foods of minimal nutritional value (eg, sodas and certain candies) in places where meals are served, although, for the first time, in 2010 the US Congress gave the US Department of Agriculture (USDA) the authority to develop nationwide competitive food and beverage regulations.[8,9] Thus, to date, most school food-related policies have been at the state and/or district levels and have focused on restricting access to unhealthy competitive foods and beverages.[10-18] District policies have largely resulted from a federal mandate that requires school districts participating in federal child nutrition programs to adopt and implement a wellness policy that included nutrition guidelines for competitive foods by the first day of the 2006-2007 school year.[9,19] Although almost all districts have a wellness policy, they are weak; for school year 2009-2010 only 21% and 35% of all districts nationwide imposed specific and required limits on the amounts of fats and sugars in competitive foods, respectively, and only 14% and 9% of districts prohibited SSBs and high-fat milks, respectively.[18,20]

In states in which strong laws have been implemented (eg, Arkansas, California, and Texas) and in districts with strong policies located in other states nationwide, such policies have reduced in-school access to and/or consumption of high-fat and high-sugar foods and SSBs and high-fat milks.[21-38] Yet, we are unaware of any studies examining the nationwide association between these policies and elementary school competitive food and beverage access. Given the importance of developing healthy eating patterns during early childhood, policies to improve the elementary school food and beverage environments are critical.[39,40]

To our knowledge, this is the first study to examine the association between state laws and/or district policies and the availability of competitive foods and beverages high in fats, sugars, and/or sodium in elementary schools nationwide between 2008-2009 and 2010-2011.

Methods

Since 2006-2007, Bridging the Gap, a research program supported by the Robert Wood Johnson Foundation, has annually collected data on state laws, district policies, and elementary school-level practices related to competitive foods and beverages. The current analyses use data from the 2008-2009 through 2010-2011 school years. Separate analyses were conducted for the competitive food policies and outcomes and the competitive beverage policies and outcomes. All research protocols and survey materials were approved by the University of Illinois at Chicago institutional review board.

Sampling and Data Sources

Nationally representative samples of public elementary schools and districts were developed at the University of Michigan's Institute for Survey Research using sampling frames based on the National Center for Education Statistics' Common Core of Data (CCD) files. Schools and districts from all contiguous states were eligible for sampling. Because elementary school grade composition varies (eg, grades kindergarten to 3 or 2 to 5), third grade was selected as a proxy for sampling and weighting, and all schools included a third grade. The sampling procedure yielded 2 overlapping, nationally representative samples each year: a set of public elementary schools and a set of districts where the schools were located. School-level survey responses rates (using the American Association for Public Opinion Research method 2[41]) averaged 62%; district-level policy collection rates averaged 96%. Laws were obtained for all states.

Elementary School Practices

Elementary school practices were assessed using mail-back school surveys collected between February and June of each school year. The 2-part survey was mailed to the principal with a request that the second section (from which these data were obtained) be completed by food service personnel. A $100 incentive was offered. A total of 1919 respondent schools were in the pooled, 3-year cross-section, including 1582 unique schools.

District Policies

"On-the-books" district policies were gathered through Internet research with telephone and electronic mail follow-up.[17,42] District policies were defined broadly to include the following: the district-approved wellness policy; any associated district administrative regulations, rules, procedures, or guidelines issued by the district superintendent; any policies, regulations, or rules embedded by reference in the wellness policy, rules, or regulations (eg, competitive food or food service policies); and any state laws or model policies embedded by reference. A total of 1023 unique districts were in the pooled, 3-year cross-section.

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Table 1. Public Elementary Schools in a District and/or State With Policy Restrictions on the Sale of Selected Competitive Food and Beverage Items, School Years 2008-2009 Through 2010-2011[a]

Policy Category (Independent Variables)	Schools Subject to Policy by Jurisdiction, %			
	Both District and State Policy	State Policy Only	District Policy Only	No Policy
Food restrictions (n = 1814 schools)				
Sugar limits	23.5	10.5	8.0	58.0
Candy prohibited	12.7	4.2	6.5	76.7
Fat limits	33.6	11.2	9.5	45.7
Sodium limits	8.2	5.5	8.3	78.1
Beverage bans (n = 1830 schools)				
SSBs	11.8	6.5	6.7	75.1
Soda	40.3	9.9	13.2	36.6
Regular or whole milk	7.6	6.2	8.1	78.1

Abbreviation: SSBs, sugar-sweetened beverages.

[a] Data are weighted to account for the percentage of public schools nationwide located in a district and/or state with each type of policy restriction (ie, none, district policy only, state law only, or district policy and state law).

State Laws

State laws, effective beginning in September of each school year, were compiled through natural language and Boolean keyword searches of the full text, tables of contents, and indices of codified state statutory and administrative (regulatory) laws commercially available from subscription-based legal research providers, Westlaw and Lexis-Nexis. Codified state statutory laws include legislation enacted by the state legislatures, whereas codified administrative laws include all rules and regulations promulgated by state boards of education. For this study, all those legislative laws and rules or regulations that were formally codified were included for this analysis. Any informal policies adopted by state boards of education, for example, that were not codified into a rule or regulation, were excluded from this study. Most such rules and regulations are codified into law and are included herein. The codified state laws (including regulations) were validated against publicly available secondary sources, including the National Conference of State Legislatures, the National Association of State Boards of Education, and the National Cancer Institute's Classification of Laws about School Students.[43-45] Forty-seven states were included in the 3-year file.

Policy Predictors

All state laws and district policies were simultaneously coded by 2 trained coders using a reliable and valid coding scheme originally developed by Schwartz et al[46] and revised by Bridging the Gap researchers.[17] Coding agreement was high (88%-100%, depending on the item), and discrepancies were resolved through discussion among the coders and the lead author (J.F.C.). This analysis focused on 8 specific policy categories: (1) limits on sugar in foods, (2) limits on fats in foods, (3) limits on sodium in foods, (4) candy ban, (5) SSB ban, (6) regular soda ban, and (7) high-fat (2% or whole) milk ban. To be considered for this analysis, the state law and/or district policy had to require the limits or require the ban. In addition, with the exception of the fat restrictions in à la carte lines, the limits or bans had to apply consistently across 3 locations of sale: vending machines, school stores, and à la carte lines in the cafeteria.

To determine which jurisdiction's (state and/or district) policy was most strongly associated with reduced availability of foods and/or beverages in schools, for each policy dimension, the state and district variables were cross-tabulated to create a variable with 4 mutually exclusive and exhaustive categories (**Table 1**) to indicate policy jurisdiction: none (neither district nor state), district only, state only, or both district and state. For all analyses except the soda analysis, a set of 3 dummy variables compared the last 3 categories against none (referent). For the soda analysis, there were 249 schools in which only the district policy (but not the state law) banned soda, but none of those schools offered soda. These cases would have been dropped from models with the policy predictor coded as noted above; therefore, for soda analyses only, 2 dummy variables were used: one for district policy (1 = yes, 0 = no) and one for state law (1 = yes, 0 = no). Thus, in the regression models the term for district policy essentially represents the effect of state law plus district policy and is interpreted as such.

School-Level Outcome Measures

Respondents were asked to indicate whether foods and beverages were sold in each of 3 venues (vending machines, school stores or snack bars, and à la carte lines) and, if so, which foods or beverages were available in that venue. For vending machines and school stores, response options were yes or no. For à la carte lines, response options were never, some days, or most/every day. The last 2 responses were collapsed to yes. For this analysis, 9 dichotomous (yes or no) variables were computed (**Table 2**) for each of the following competitive food and beverage categories based on availability within any of the 3 venues, unless otherwise noted: (1) candy, (2) any sweet product (eg, candy, ice cream whether low fat or not, and cookies, cakes, or baked goods whether low fat or not), (3) regular-fat baked goods (eg, cookies and cakes), (4) regular-fat ice cream, (5) any salty product (eg, chips) whether regular fat or low fat, (6) regular soda, (7) SSBs (eg, soda, sports drinks, and other sweetened fruit drinks not 100% juice), and (8) high-fat milks (2% or whole).

School-Level Contextual Covariates

School-level demographic and socioeconomic status (SES) information was obtained from the CCD for the corresponding year (for 2010-2011, CCD data were used from 2009-2010 because the 2010-2011 CCD files were unavailable at the time of analysis). For each school, data were obtained on the total number of students (school size, collapsed as <451, 451-621, or >621 students [referent]), US Census region (South vs non-South [ref-

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erent]), and locale (city [referent], suburb, township, or rural). The percentage of students eligible for free or reduced-price lunch was used as a proxy for SES, divided into 3 groups: higher SES (<33% eligible [referent]), medium SES (33%-66% eligible), or lower SES (>66% eligible). School racial/ethnic composition was coded as 1 of 4 exhaustive and mutually exclusive categories: majority (≥66%) white (referent), majority (≥50%) Hispanic, majority (≥50%) black, and diverse (no majority). Two dummy variables were coded to compare each of the last 2 years against baseline (2008-2009). State obesity prevalence for 10- to 17-year-olds (using the 2007 National Survey of Children's Health[47]) was included given the possible confounding effect of state-level obesity prevalence.

Statistical Analysis

Analyses were conducted using the survey (SVY) command in STATA/SE statistical software (release 12.1; StataCorp LP).[48] The initial 3-year, pooled, cross-sectional sample contained 1919 public elementary schools (1582 unique schools) in 1023 districts and 47 states. For the food analysis, the sample was reduced to 1814 schools (1485 unique) in 957 districts and 45 states after removing schools that were missing district data (n = 38), demographics (n = 13), or responses to the food items (n = 54). For the beverage analysis, the sample was reduced to 1830 schools (1497 unique) in 962 districts and 45 states after removing schools that were missing district data (n = 38), demographics (n = 13), or responses to the beverage items (n = 38).

All models accounted for the survey design and nesting of schools within districts and were clustered on state. Data were weighted to represent public elementary schools nationwide (weights were adjusted for nonresponse bias). Multivariate logistic regression models (**Table 3** and **Table 4**) were used to compute adjusted odds ratios. In addition, to ease interpretation, predicted margins and marginal effects were computed. The predicted margins equal the adjusted prevalence of schools that allowed the given item of interest (eg, candy) within each policy category (ie, no policy, district only, state only, and both district and state), controlling for covariates. The marginal effects represent the mean difference in the proportion of schools selling the food or beverage item of interest that is associated with the state and/or district policy restrictions.

Finally, to examine the characteristics of schools not operating in concordance with state laws relative to the sale of SSBs and soda (as noted in Table 4), **Table 5** presents the percentage of schools that do and do not sell SSBs and soda in any venue at school, among the schools in which state law prohibited their sale in vending machines, school stores, and à la carte lines in the cafeteria. These breakdowns compare the percentage of schools with school-level restrictions, within demographic subgroups.

Results

Table 1 gives the percentage of public elementary schools nationwide located in a district and/or state with each policy of interest. For the food items, limits on fats were the most prevalent, followed by limits on sugars, candy, and sodium. For the beverage items, soda bans far outweighed bans on SSBs or high-fat milks. Policies also varied by jurisdiction, with some more likely at the district level only (candy, sodium limits, and high-fat milk bans) and others at the state level only (sugar and fat limits). For all of the food items and the soda and SSB bans, it was more common for schools to be located in states and districts where both had policies than where either alone had a policy.

As noted in Table 2, sweets and salty snacks were the most likely to be available followed by regular-fat baked goods, regular-fat ice cream, and candy. High-fat milks were available in almost 30% of all schools, and few schools (only 2.2%) offered regular soda during the 2008-2009 through 2010-2011 school years. The **Figure** illustrates the unadjusted prevalence of the food and beverage items in schools by policy status. The schools were well distributed by region, locale, and school size and also represented a wide range of student characteristics (eg, race/ethnicity and SES). The mean 10- to 17-year-old state-level obesity prevalence was 16.2%.

Table 2. Characteristics of the Study Sample, School Years 2008-2009 Through 2010-2011[a]

Characteristic	Sample Schools, %	
	Food (n = 1814)	Beverage (n = 1830)
Availability of Competitive Item in Any Venue (Dependent Variables)		
Regular soda	NA	2.2
Other SSBs	NA	12.8
High-fat milk (2% or whole milk)	NA	29.7
Candy	4.6	NA
Sweets	39.6	NA
Salty snacks	33.6	NA
Cookies	18.1	NA
Regular fat ice-cream	15.1	NA
Contextual Factors (Control Variables)		
Southern region	35.1	35.1
Locale		
City (reference)	31.5	31.6
Suburb	30.4	30.7
Town	11.9	11.8
Rural	26.3	25.9
Race/ethnicity of students		
Majority (≥66%) white (reference)	47.4	47.1
Majority (≥50%) black	11.2	11.2
Majority (≥50%) Hispanic	16.7	16.7
Diverse (no majority population)	24.8	25.0
Free or reduced-price lunch eligibility		
Lowest (<33% students eligible [reference])	26.7	26.8
Medium (33%-66% students eligible)	37.1	37.0
Highest (>66% students eligible)	36.2	36.2
School size		
Large (>621 students [reference])	20.4	20.4
Medium (451-621 students)	31.1	31.3
Small (<451 students)	48.5	48.3
State-level obesity prevalence (10-17 years)	16.2	16.2

Abbreviations: NA, not applicable; SSBs, sugar-sweetened beverages.

[a] Data are weighted to account for the percentage of public elementary schools nationwide.

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Table 3. Association Between District Policy and/or State Law Competitive Food Restrictions and Public Elementary Schools Selling Competitive Foods, School Years 2008-2009 Through 2010-2011

Policy Predictor	Adjusted OR (95% CI)[a]	Adjusted Prevalence of Item Sold, %[b]	Marginal Effects[c]
Sweets			
Sugar limits			
None	1 [Reference]	43.5	
District only	0.7 (0.4-1.4)	37.2	−0.064
State only	0.7 (0.4-1.1)	35.5	−0.080
District and state	**0.6 (0.4-0.8)**	32.3	**−0.112**
Candy			
Candy ban			
None	1 [Reference]	5.5	
District only	0.3 (0.1-1.4)	1.8	**−0.037**
State only	0.6 (0.2-1.6)	3.3	−0.022
District and state	0.4 (0.1-1.0)	2.2	**−0.033**
Regular-Fat Baked Goods			
Fat limits			
None	1 [Reference]	25.2	
District only	0.5 (0.3-1.0)	15.5	**−0.097**
State only	**0.5 (0.3-0.9)**	15.7	**−0.095**
District and state	**0.4 (0.2-0.6)**	11.6	**−0.136**
Regular-Fat Ice Cream			
Fat limits			
None	1 [Reference]	21.3	
District only	**0.5 (0.2-0.9)**	11.6	**−0.097**
State only	**0.5 (0.2-0.9)**	11.9	**−0.094**
District and state	**0.4 (0.3-0.6)**	10.3	**−0.109**
Salty Snacks			
Sodium limits			
None	1 [Reference]	33.9	
District only	0.9 (0.5-1.6)	31.5	−0.023
State only	1.0 (0.5-1.9)	33.3	−0.006
District and state	1.0 (0.6-1.7)	33.4	−0.005

Abbreviation: OR, odds ratio.

[a] n = 1814 public elementary schools for all models and are weighted to reflect public elementary schools nationwide. All models controlled for year (reference, 2008-2009), region (South; reference, all other regions), racial/ethnic composition (reference, majority white), free or reduced-price lunch eligibility (reference, lowest), locale (reference, city), school size (reference, large), and state-level 10- to 17-year-old obesity rate.

[b] Adjusted prevalence based on predictive margins.

[c] Marginal effects indicate the probability of a school selling the outcome of interest given the policy in place. For example, the probability of a school selling sweets (eg, cookies) is 11.2 percentage points lower when the district has a policy that requires limits on sugar content of competitive foods compared with being in a district with no policy. Bolded items are significant at the $P < .05$ level or lower.

Table 3 summarizes the results of the multivariate logistic regression analyses for the food items. Policy restrictions were associated with lower availability of sweets, regular-fat baked goods, and regular-fat ice cream. Notably, sweets were less available when both the state and district had sugar limits in place (32.3% vs 43.5% with no policy). Regular-fat baked goods and regular-fat ice cream were less available when any fat limits were in place, regardless of the policy jurisdiction. Although the odds of schools offering candy and salty snacks all were lower in states and/or districts with laws and/or policies (compared with no policies), such differences were not statistically significant when controlling for the contextual factors.

The relationship between state laws and district policies and school availability was more mixed for beverages (Table 4). The SSBs were less available when the district banned them (3.6% vs 13.1% with no policy), but SSB availability was not influenced by state policies (either alone or in combination with district policies). High-fat milks were less available when any policies were in place (district only, state only, or both) but were significantly less likely to be available when either the district (17.8% vs 32.3% with no policy) or the state (17.1% vs 32.3% with no policy) banned them. Soda policies were not associated with soda availability, which was somewhat expected given that only 2.2% of the schools included in the study offered soda.

Given the positive relationship between school-level availability of SSBs and soda and being in a state with a law banning such items (Table 4), we examined the characteristics of schools in which such items were sold even though the state prohibited their sale (Table 5). Although the sale of SSBs and soda within states with bans did not vary at the $P < .05$ level across any of the school-level characteristics, there were some noteworthy associations even with this very restricted sample size (n = 121 schools). In particular, schools in the South were the only ones (compared with all other regions) to sell SSBs in school even though their state laws prohibited such sale, with 24.9% of the schools located in the South allowing such sale. Only 3.6% of the schools with a majority white student population allowed SSBs when the state law prohibited them compared with more than 20% of the racial/ethnical majority or diverse schools. Relatedly, almost one-quarter of the low-SES schools (high free or reduced-price lunch eligibility) sold SSBs in schools when the state law prohibited such sale compared with only 10.4% and 4.5% in the mid- and high-SES schools. The availability of soda

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Table 4. Association Between District Policy and/or State Law Competitive Beverage Restrictions and Public Elementary Schools Selling Competitive Beverage Items, School Years 2008-2009 Through 2010-2011

Policy Predictor	Adjusted OR (95% CI)[a]	Adjusted Prevalence of Item Sold, %[b]	Marginal Effects[c]
SSBs			
SSB ban			
None	1 [Reference]	13.1	
District only	**0.2 (0.7-0.9)**	3.6	**−0.095**
State only	1.2 (0.6-2.6)	15.5	0.023
District and state	1.0 (0.6-1.8)	13.3	0.002
Regular Soda			
Soda ban[d,e]			
None	1 [Reference]	2.7	
State only	1.8 (0.6-5.5)	4.7	0.012
District and state	0.7 (0.2-2.1)	1.8	−0.008
High-Fat Milk			
High-fat milk ban			
None	1 [Reference]	32.3	
District only	**0.4 (0.2-0.8)**	17.8	**−0.145**
State only	**0.4 (0.2-0.7)**	17.1	**−0.152**
District and state	0.7 (0.4-1.2)	25.4	−0.070

Abbreviations: OR, odds ratio; SSBs, sugar-sweetened beverages.

[a] n = 1830 public elementary schools for all models and are weighted to reflect public elementary schools nationwide. All models controlled for year (reference, 2008-2009), region (South; reference, all other regions), racial/ethnic composition (reference, majority white), free or reduced-price lunch eligibility (reference, lowest), locale (reference, city), school size (reference, large), and state-level 10- to 17-year-old obesity rate.

[b] Adjusted prevalence based on predictive margins.

[c] Marginal effects indicate the probability of a school selling the outcome of interest given the policy in place. For example, the probability of a school selling SSBs is 9.5 percentage points lower when the district has a policy banning SSBs compared with being in a district with no policy.

[d] No schools were located in a district where the district prohibited soda and where the school allowed soda to be sold so the district-only predictor could not be modeled.

[e] The adjusted proportion for soda could not be computed because of small cell sizes, so the unadjusted proportions are presented herein for the soda item only. Bolded items are significant at the $P < .05$ level or lower.

did not vary by school characteristics, likely because of the small proportion of schools that sold soda.

Discussion

Our results illustrate the potential of policies and laws for changing school practices, specifically, for improving the school food and beverage environments. Given the emphasis on policy strategies focused on changing the school food and beverage environments,[9,19,49,50] this study provides unique insight into the association between state laws and district policies and the elementary school competitive food and beverage environments, particularly for the availability of sweets, regular-fat baked goods and ice cream, SSBs, and high-fat milks.

The different pattern of results by food and beverage item is intriguing and suggests that for milk-fat, sweets, and regular-fat baked goods and ice cream, policies at both levels may have an effect; that is, policies at both levels seem to be working together to reinforce each other. For SSBs, however, district policies alone may be sufficient to promote change, given the finding that district policies were associated with SSB prevalence, but state laws were not associated with SSB prevalence, particularly when only the state banned their sale. Variation in SSB availability within the states that banned such sale was centered on regional differences (with the South being the only region where SSBs were sold when the state prohibited such sales), racial/ethnic majority student populations (nonwhite majority schools were more likely than majority white schools), and SES (lowest-SES schools most likely to sell SSBs when the state law prohibited such sale). Although the exact reason for such differences is unknown, some possibilities include regional variations in enforcement of policies,[6] better effectiveness of certain states at conveying policy information to the school level, reluctance of school officials to remove SSBs because of revenue generation concerns (particularly for low-resource schools), or unawareness of the state law by the school staff in this area.

From an implementation perspective, policies that prohibit specific items, such as soda or high-fat milks, are easier for schools to implement and less subject to school-level interpretation. Other policies, such as a range of SSBs (but not all) or limits on fats, sugars, and/or sodium in foods, require more effort on the part of the school and their vendors to ensure adherence and, therefore, may be more difficult for schools to fully implement or it may take longer for such implementation to occur. Yet, given the large contribution of added fats and sugars to empty calories in children's diets,[2,4] it is important to continue efforts to reduce the availability of high-fat and sugary products in schools.

This study adds to the growing body of research to examine factors that influence elementary school junk food availability.[6,7,51,52] Thus far, most research about the influence of policies has been based on secondary schools and older adolescents.[27,28,31,33,53-55] However, not only is the prevalence

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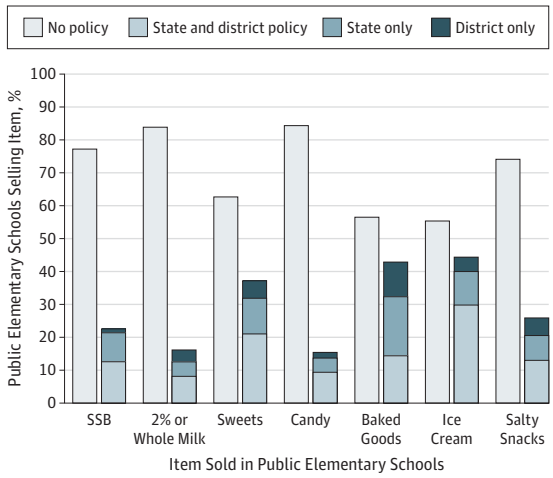
Table 5. Schools With School-Level Restrictions on SSBs and Soda by School Demographic Characteristics for Schools Where Such Items Are Prohibited Exclusively by State Law

Characteristic	Schools in States With Laws Prohibiting Item, %					
	SSBs (n = 121 Schools)			Soda (n = 900 Schools)		
	Item Sold in School (n = 22)	Item Not Sold in School (n = 99)	χ^2 *P* Value	Item Sold in School (n = 20)	Item Not Sold in School (n = 880)	χ^2 *P* Value
Region						
South	24.9	75.1	.07	3.1	96.9	.38
Northeast	0.0	100.0		0.0	100.0	
Midwest	0.0	100.0		4.1	95.9	
West	0.0	100.0		1.2	98.8	
Locale						
City	20.8	79.2	.52	2.0	98.0	.35
Suburb	16.7	83.3		2.1	97.9	
Town	0.0	100.0		0.0	100.0	
Rural	20.1	79.9		4.3	95.7	
Race/ethnicity of students						
Majority (≥66%) white	3.6	96.4	.09	1.8	98.2	.62
Majority (≥50%) black	28.6	71.4		4.8	95.2	
Majority (≥50%) Hispanic	20.1	79.9		2.3	97.7	
Diverse	22.2	77.8		2.2	97.8	
Student eligibility for free or reduced-price lunch						
Lowest (≤33% eligible)	4.5	95.5	.06	1.0	99.0	.27
Medium (>33% to ≤66% eligible)	10.4	89.6		2.0	98.0	
Highest (>66% eligible)	24.5	75.5		3.3	96.7	
School size, students						
Small (<451)	15.7	84.3	.73	3.0	97.0	.26
Medium (451-621)	15.7	84.3		1.0	99.0	
Large (>621)	22.1	77.8		3.1	96.9	

Abbreviation: SSBs, sugar-sweetened beverages.

Figure. Prevalence of Competitive Beverage and Food Items by Policy Status



SSB indicates sugar-sweetened beverage. Data were weighted to the percentages of public elementary schools nationwide (unadjusted for demographic covariates). The unadjusted, overall prevalence of each food or beverage item (regardless of policy status) is presented in Table 2. The comparison of soda prevalence by policy status is not presented because only 2.2% of public elementary schools sold soda.

of competitive venues different across grade levels,[52,56,57] but for beverages at least, the Institute of Medicine beverage recommendations[58] differ by grade level, allowing diet sodas and sports drinks for secondary-grade students but not primary-grade students, and district and state policies also vary greatly by grade level.[18] The current work further extends the knowledge base by showing that in elementary schools, policies at both the district and state level are associated with school practices.

Unlike Kubik et al,[21] who concluded that district policies were not associated with junk food availability, we found that both district policies and state laws are associated with the elementary-level food and beverage availability. Several methodological reasons could account for the contrasting findings. First, Kubik et al used self-reported state and district policy data from the School Health Policies and Practices Study, whereas we used objectively measured policies collected through primary legal research. Second, they used 2006 data, mostly gathered before the required wellness policy implementation date. Thus, a longer time lag may have been needed to assess the district policy to school practice relationship. Third, their study modeled district and state policies separately rather than evaluating different combinations of policies by jurisdiction (ie, district only, state only, or both). Fourth, the School Health Policies and Practices Study does not allow

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the same level of policy coding as used herein (ie, separately coding for nutritional standards for sugar, fat, and sodium), so they were unable to compare "apples to apples" as easily. Fifth, their sample size was much smaller than that used herein (ie, 563 schools across elementary and secondary levels compared with 1830 elementary schools included herein). Sixth, increasing awareness of the obesity epidemic over time may have led to additional policies (and implementation) in this area, which may have been less prevalent before the beginning of the 2006-2007 school year. Thus, the present study not only expands our knowledge about the association between district policies and state laws and elementary-level junk food and beverage availability but also provides an important methodological contribution when examining district and state policy contributions to school food environments.

This study's large, nationally representative sample is a strength; however, the results should be interpreted with the following limitations in mind. First, this was a pooled, cross-sectional study based on 3 years of data; thus, it was impossible to examine the longitudinal influence of policies on school practices. Second, because food and beverage availability was based on self-reported rather than observed data, it is possible that the estimates were affected by reporting biases; however, other research that used observational data to validate principal reports of competitive venue prevalence documented good accuracy for principal reports.[59] Third, our survey did not measure student-level competitive food and beverage purchasing or consumption; thus, we are unable to assess the relationship between district policies and state laws on dietary intake. Fourth, the policy measures focused on limiting availability of foods and/or beverages high in fat, sugar, or sodium rather than increasing the availability of healthier options (eg, low-fat or nonfat baked goods, low-sodium chips or pretzels, or fresh fruits or vegetables). Future research should examine policies aimed at increasing the availability of healthier options and their influence on the availability and consumption of such items in elementary schools. Fifth, we evaluated the association between "on-the-books" policies rather than policies in practice, which may differ from written policies and laws; however, given that the outcome essentially measured policy implementation, if anything, we would expect even higher correlation between policies in practice and school implementation.

In summary, district and state efforts to improve the elementary school competitive food and beverage environments are associated with improvements in many aspects of competitive food and beverage availability. Clearly, policies have the potential to change school practices for both foods and beverages, and no one policy strategy alone will improve elementary school competitive food and beverage environments. It is likely that in the cases where having both a district policy and state law was associated with less competitive food and/or beverage availability, policies from both jurisdictions reinforced each other and were most likely to be implemented. More work is still needed because we found no statistical association between policies and availability of soda, candy, or salty snacks. The sodium finding is particularly noteworthy given the Institute of Medicine's recommended strategies for governments to help reduce population-level sodium intake.[60]

Finally, equally important as district policies and state laws that restrict competitive foods and beverages are the expected forthcoming nationwide competitive food standards to be issued by the USDA as required by the *Healthy, Hunger-Free Kids Act of 2010*.[9] The findings from this study can inform USDA's efforts in developing nationwide competitive food and beverage standards to better understand areas where district policies and state laws are lacking and where they are associated with improved elementary-level competitive food and beverage environments. It is expected that USDA regulations may set a baseline standard and that district and state governments will still be able to go beyond the federal standards and further regulate the competitive food environment. This study indicates that such policy efforts may help to improve the school food and beverage environments.

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