

## State Laws are Associated with School Lunch Duration and Promotion Practices

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#### AUTHOR CONTRIBUTIONS

CM, NB, EP and JFC collected and coded the data. JL conducted the statistical analyses. LT wrote the first draft with contributions from JL, EP, and MBS. All authors reviewed and commented on subsequent drafts of the manuscript.

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Keywords: lunch; school; promotion; participation; policy

## Research Snapshot

Research Question: Are school practices that support student participation in school lunch programs more common in states where laws encourage or require such practices?

Key Findings: Among a nationally representative sample of 414 public schools, state laws pertaining to the duration and the promotion of school meals were associated with corresponding school-level practices.

## Abstract

**Background.** The changes in school meal programs stemming from the Healthy, Hunger-Free Kids Act of 2010 have expanded interest in strategies that increase student participation in school lunch and reduce plate waste. However, it remains unclear what factors are associated with schools' use of such strategies.

**Objective.** This study examines whether state laws are associated with two types of school meal-related practices: (a) using promotional strategies (i.e., taste tests, using posters or announcements), and (b) duration of lunch periods.

**Design.** This cross-sectional study utilized the nationally representative 2014 School Health Policies and Practices Study, combined with corresponding state laws gathered by the National Wellness Policy Study. School data were available from 414 public schools in 43 states.

**Main outcome measures.** Outcome measures included 16 strategies to promote school meals, and the amount of time students had to eat lunch after being seated.

**Statistical analyses performed.** Multivariate logistic regression and Poisson regression was used to examine associations between state laws and school practices, after accounting for school demographic characteristics.

**Results.** Compared to schools in states with no law about engaging stakeholders in meal programs, schools in states with a law were more likely to conduct taste tests (64% vs 44%,  $P=0.016$ ), collect suggestions from students (67% vs 50%,  $P=0.017$ ), and invite family members to a school meal (71% vs 53%,  $P=0.015$ ). Schools used more promotion strategies in states with a law than in states without a law (Mean =10.4 vs 8.8,  $P=0.003$ ). Schools were more likely to provide students at least 30 minutes to eat lunch after being seated, in states with laws that addressed a minimum amount of time for lunch duration (43% vs 27%,  $P=0.042$ ).

**Conclusions.** State-level policy provisions are associated with school practices. Policy development in more states may support school practices that promote lunch participation and consumption.

The past decade has brought considerable attention to the topic of school nutrition, including the school meal programs administered by the United States Department of Agriculture (USDA), and aspects of the school food and beverage environment outside the meal programs. As a result of language in the Healthy, Hunger-Free Kids Act of 2010, the USDA updated the nutrition standards and meal patterns for the National School Lunch Program, with changes implemented by the start of the 2012-13 school year.<sup>1</sup> There is evidence that the types of foods and beverages in school lunches have improved since the revised standards took effect.<sup>2-4</sup> Policies such as national standards and state laws can support school-level nutrition practices that increase student access to healthful options, which then yield important benefits for students, such as healthy dietary behaviors<sup>5</sup> and improved weight outcomes.<sup>6</sup>

The USDA's strategic goals include maintaining high levels of student participation in school meal programs,<sup>7</sup> and ensuring that students actually consume those meals.<sup>8</sup> Several strategies may help to accomplish this goal. For example, the issue of lunch duration has been increasingly of interest, as it relates to the issue of plate waste. Although there have been suggestions that plate waste has increased in recent years, plate waste has always been problematic,<sup>8,9</sup> and several studies show that it has not worsened as a result of revised nutrition standards.<sup>10,11</sup> Even prior to the past decade, research indicated that shorter lunch periods were problematic for students because they do not allow sufficient time for students to consume adequate nourishment, leading to substantial amounts of food and milk being discarded.<sup>12</sup> Several organizations recommend that students should have at least 20 minutes to eat lunch.<sup>13-15</sup> Importantly, this pertains to the time that students are able to eat—beginning from the time they are seated—not the amount of time scheduled for lunch, which also includes time spent waiting in the lunch line. Thus, longer scheduled lunch periods may be necessary for students to have

sufficient time to eat. The advocacy position in favor of providing students at least 20 minutes for lunch is supported by research showing that elementary and middle school students consume significantly less of their milk, entrees, and vegetables when provided fewer than 20 minutes for lunch.<sup>16,17</sup> Furthermore, elementary students consume more foods with important nutrients such as calcium and Vitamin A when they have 30 minutes for lunch, instead of 20 minutes.<sup>12</sup>

Promoting students' consumption of a variety of fruits and vegetables (FV) in school meals can be challenging. Environmental factors shape children's food preferences,<sup>18</sup> and the school food environment impacts children's acceptance and consumption of FV. Merely making FV available is likely insufficient to substantially impact dietary intake, without adjunctive strategies to increase students' liking of—and consumption of—these foods. Strategies such as taste tests are effective for improving children's liking for FV.<sup>19,20</sup> For example, a study of a “tasting challenge” involving jicama and edamame in four elementary schools in Colorado demonstrated the feasibility and utility of this strategy for promoting students' willingness to try new foods.<sup>21</sup> Importantly, interviews with food service personnel indicated that promotional strategies to increase student consumption and decrease plate waste were deemed to be important, but were rarely used because of limited staff time and budgets.<sup>21</sup> A larger study among 2,945 elementary students in New Jersey found that taste tests paired with nutrition education lessons resulted in increased liking of foods (e.g., squash, zucchini, chick peas, spinach) and willingness to eat those foods.<sup>20</sup>

Other research has found that intervention strategies such as providing enhanced training and materials for cafeteria staff can increase the availability of food categories such as whole grains,<sup>22</sup> and involving a chef in preparing and promoting school foods increased students' selection and consumption of whole grains and vegetables.<sup>23</sup> In addition, relatively simple

strategies such as adding a promotional banner around the bottom of a salad bar increased salad bar participation and selection of vegetables among elementary students, and this effect was magnified further when combined with brief promotional video segments on televisions in the cafeteria during lunchtime.<sup>24</sup> Such efforts that apply the principles of behavioral economics are low-cost, evidence-supported practices that are increasingly common across the country.<sup>24,25</sup>

Overall, while existing work documents the importance of school practices in promoting students' consumption of school lunches, less is known about how to support schools in implementing these practices. State-level policy provisions such as state laws might be one avenue, but no studies document the association between state laws and these school practices. This study examined the association between state laws governing: (1) promotional practices, and (2) lunch duration, with concomitant school-level practices.

## **METHOD**

This study linked data on school practices gathered through the School Health Policies and Practices Study (SHPPS) with state-level legal data compiled as part of the National Wellness Policy Study.

### **School-Level Data**

SHPPS is a national survey periodically conducted by the Centers for Disease Control and Prevention to assess school health policies and practices at state, district, school, and classroom levels. The current study used school-level data gathered between February and June 2014. A brief description of SHPPS methods is provided here, with extensive details available elsewhere.<sup>26</sup> SHPPS was reviewed by an institutional review board at the Centers for Disease Control and Prevention and determined to be exempt research under federal regulation 45 CFR 46.101 (b).<sup>26</sup> A two-stage sample design was used to generate a nationally representative sample

of elementary, middle, and high schools. All public, private, and state-administered schools in the United States (US), containing kindergarten through grade 12, were eligible for sampling. In each school, the principal or other school contact identified the most knowledgeable respondent for each questionnaire. Trained interviewers visited each school to conduct computer-assisted personal interviews. Seven school-level questionnaires were administered via face-to-face interviews; the current analyses utilized data gathered from the Nutrition Services questionnaire.<sup>27</sup> The participation rate for the questionnaire was 69% and it was most frequently completed by a food service manager (69%) or other school nutrition services staff (12%). A list of 16 items addressed specific practices used to promote school meals during the 12 months before the study and respondents were asked to reply “Yes” or “No” for each topic. Regarding duration of lunch, respondents were asked: “How long do students usually have to eat lunch once they are seated?” with an open response as number of minutes. Two variables were calculated, based on prior research and recommendations for students, whereby 20 minutes can be considered a minimum acceptable amount of time, but 30 minutes is preferable. Therefore the two variables were: (a) whether students were provided at least 20 minutes to eat lunch (yes/no); and (b) whether students were provided at least 30 minutes to eat lunch (yes/no).

Data were also gathered on school characteristics, which were used as contextual covariates in the analyses. Region was coded by the researchers based on the US census region<sup>28</sup> of the state where each school was located. Additional demographic variables were sourced from extant data collected by Market Data Retrieval<sup>29</sup> and linked to the SHPPS dataset, including locale, school size, student race/ethnicity, locale, and socioeconomic composition. Locale included four categories (urban, suburban, township, and rural). Total student enrollment was categorized in three levels to indicate school size. Due to differences in size by school level,

elementary and middle schools had the same cutoffs (small:  $\leq 300$ ; medium: 301 to 500; large:  $> 500$ ), and high schools had slightly different cutoffs (small:  $\leq 350$ ; medium: 351 to 800; large:  $> 800$ ). This was done to achieve comparable frequencies of small, medium, and large schools across grade levels. Race/ethnicity of each school's student population was collapsed into four mutually-exclusive and exhaustive categories: predominantly ( $\geq 66\%$ ) non-Hispanic white; majority ( $\geq 50\%$ ) non-Hispanic black; majority ( $\geq 50\%$ ) Hispanic; and diverse composition or a majority of Asian or American Indian students. Socioeconomic composition was based on the percentage of students eligible for free or reduced-priced meals, and was categorized into three groups ( $\leq 40\%$ ;  $> 40\%$  to  $< 75\%$ ;  $\geq 75\%$ ). The 40% cutoff for free/reduced-price lunch eligibility was chosen to align with the school-level threshold for the Community Eligibility Provision,<sup>30</sup> and the 75% cutoff was chosen to be consistent with how the National Center for Education Statistics identifies high poverty schools.<sup>31</sup>

Because the state laws considered in this study only apply to public school districts, analyses were restricted to public schools. This reduced the sample from 554 to 453. Among the 453 schools, 39 were missing data for all of the outcome variables of interest or for school demographic characteristics, leaving a sample of 414 for these analyses.

### **State Level Data**

The National Wellness Policy Study is the largest nationwide evaluation of congressionally-mandated school district wellness policies and all concomitant state laws for each of the 50 states and the District of Columbia (collectively referred to as "states" below).<sup>32</sup> A comprehensive set of topics is examined for each state; the current analyses used several state law variables relevant to school lunches, as described below.

**Data Collection Strategy.** Codified state statutes and administrative regulations for each state were compiled using subscription-based services, Lexis Advance (LexisNexis) and Westlaw (Thomson Reuters). Boolean keyword searches and reviews of the indices and/or tables of contents of the codified laws for each state were conducted by trained attorneys and legal researchers using the state law databases from each commercial provider. “State laws” were defined to include the codified laws as well as any state health or nutrition education standards incorporated by reference into the codified law (the text of specific laws is available from the authors upon request). Laws were deemed relevant if they were effective as of the day after Labor Day (September 2, 2013), which served as a proxy for the beginning of the 2013-14 school year. The existence of state laws was verified against publicly available secondary sources when possible.<sup>33-35</sup> All relevant state laws were reviewed and verified by two members of the National Wellness Policy Study team.

**Policy Coding.** For this analysis, state laws were evaluated on two topics: methods to solicit stakeholder input in ways that promote school nutrition, and the duration of lunch. State laws that provided methods to solicit input contained provisions that encouraged contributions from stakeholders, including specific methods such as student input on the menu, taste testing promotions for new foods, and parent discussions with food service directors during open house. Weak laws suggested such methods, while strong laws required specific methods to be used. State laws ensuring adequate time to eat lunch were coded as weak if they included provisions addressing the amount of time to eat lunch that either recommended a number of minutes, or provided a vague requirement that ensured “adequate time” without detailing how many minutes was considered adequate. Strong provisions required that students be provided at least 20 minutes to eat lunch.

## **Statistical Analyses**

The state law and SHPPS data were linked using state names. State laws were first examined in all states, and then in the states for which linkable school data were available. The school-level dataset did not include any schools in six states (Alaska, Delaware, New Hampshire, New Mexico, South Carolina, Vermont), nor in the District of Columbia, and cases in Oregon were excluded based on school type and missing data. Therefore, linked analyses do not include these states.

Descriptive statistics for demographic variables were computed to examine characteristics of the school sample (Table 1). Frequencies of the meal promotion outcome variables were examined, and logistic regression models were computed to examine each survey item as a separate outcome (Table 2), while accounting for contextual covariates (school characteristics). Psychometric analyses were conducted to confirm that the 16 promotion items could be combined as a scale, and then a final multivariate regression model (Table 3) was computed to examine whether state laws regarding promotion strategies were associated with the number of promotion strategies used at each school. Another multivariate regression model (Table 3) was computed to examine whether state laws regarding adequate time for lunch were associated with students being provided at least 30 minutes for lunch. Analyses were conducted in Stata<sup>36</sup> using the *svy* command to account for the sample design and apply weights.

## **RESULTS**

Ten states and the District of Columbia had laws regarding strategies to promote school meals by soliciting stakeholder input. These laws were strong in three states (Indiana, Kentucky, and Pennsylvania) and the District of Columbia, and were weak in 7 states (Alabama, Florida, Massachusetts, Michigan, Mississippi, South Carolina, and Tennessee). Laws addressing

adequate time for students to eat lunch were more common: 16 states and the District of Columbia had such laws, whereas 34 states did not. These laws were strong in five states (Connecticut, Mississippi, New Mexico, South Carolina, and West Virginia) and the District of Columbia. Laws were coded as weak in eleven states (Alabama, Colorado, Delaware, Florida, Kansas, Kentucky, New Hampshire, New Jersey, Texas, Virginia, and Washington).

Descriptive characteristics for the school sample are shown in Table 1. Schools were located in all regions of the country, with all types of locales ranging from urban to rural. Approximately three in five schools served a student population with moderate poverty levels (more than 40% of students eligible for free/reduced-priced meals), with one in five schools having very high poverty levels (75% or more eligible for free/reduced-priced meals).

With regard to meal promotion, there was wide variation in whether schools were or were not using each type of strategy. As shown in Table 2, some practices such as making menus available to families was nearly universal (done at 96.4% of schools), whereas some strategies such as meeting with a parent organization to discuss meals was fairly uncommon (26.8% of schools). Table 2 also presents summary information from a series of 16 multivariate logistic regression models to examine whether each practice was associated with state laws about stakeholder involvement in promoting school meals. Indeed, several variables were associated with state laws, including collecting suggestions from students about school nutrition programs; conducting taste tests, both with students, and with their families; including nutrition services topics during school announcements; and inviting family members to a school meal. Where state law was significantly associated with these practices (at  $P < .05$ ), the prevalences are shown separately for schools in states with a law, and for schools in states without a law.

After examining policy associations with specific practices, analyses were conducted to examine whether state law was associated with engaging in a greater number of promotion practices. First, a factor analysis was conducted, including all schools with complete data using an iterated principal factors method. The eigenvalue for the first factor was 3.19, with subsequent eigenvalues of 1.25, 1.05, and 0.57, respectively, which confirmed the unidimensionality of the scale. The reliability (KR-20) was 0.76, further supporting the scale's reliability. Due to listwise deletion of cases in the calculation of this score, the number of cases available for this analysis was reduced to 366 cases. A Poisson regression model (for count outcomes) was used to examine associations between predictor variables (school characteristics and state law) and the number of meal promotion strategies utilized at each school (Table 3). The number of strategies used did not vary by school characteristics, but having a state law that addresses the gathering of stakeholder input regarding meals was significantly associated with an 18% increase in the number of meal promotion strategies employed by schools. Adjusted scores were derived from the logistic regression after accounting for all demographic covariates: out of 16 possible strategies, schools averaged 8.8 strategies without a state law, but 10.4 strategies with a supportive law.

The final variable examined was lunchtime duration, which was based on the survey asking how long students have to eat, once they are seated. The unadjusted prevalence of schools providing at least 20 minutes was 82%, and the unadjusted prevalence of providing at least 30 minutes was 32%. In a multivariate model (not shown in tables), none of the school demographic characteristics nor state law were significantly associated with schools offering at least 20 minutes for lunch. However, the minimal variability in this variable limited its utility as an outcome variable. The outcome of 30 minutes for lunch (which had more variability) was

significantly more common where state law recommended or required an adequate lunch duration (Table 3). The prevalence of schools allowing at least 30 minutes (after adjusting for all demographic covariates) was 43.0% at schools in states with a law, and 27.1% in states without a law. This practice was also significantly more common at medium socioeconomic schools compared to higher socioeconomic schools, and at majority Hispanic schools compared to predominantly white schools. A significant association for school level also emerged, with lunch duration of at least 30 minutes being more common at high schools than at elementary schools. Due to this significant grade-level relationship, the association between state law and school practices was examined separately for each grade level (elementary, middle, and high schools) to assess whether the high schools were causing this effect in the overall sample. Among subgroups the sample size was reduced substantially, so formal significance testing was not used, but the magnitude and direction of the odds ratios confirmed a positive relationship between state law and school practice at all levels.

## **DISCUSSION**

This study is the first to examine how state laws relate to two types of school practices that have been shown to impact student-level outcomes: promotional strategies designed to engage stakeholder interest in meals, and the duration of school lunch periods. Results show that the use of both of these types of practices is higher at schools in states with laws that recommend or require such strategies, as compared with schools in states with no such laws. In addition, the current data show that in states with laws supporting student engagement, schools use a larger number of different types of promotional strategies. Although prior work has demonstrated that student participation in school lunch and consumption of healthy items is higher at schools that use promotional strategies such as taste tests, gathering input from students, and marketing fruits

and vegetables through posters or banners,<sup>19,21,24</sup> and is also higher at schools that provide more time for students to eat lunch,<sup>12,16,17</sup> the question has remained as to how to actually accomplish the goal of supporting schools in utilizing these types of practices. The current work shows a consistent and positive association between state-level laws and these practices, indicating that state laws could be a promising mechanism to increase the implementation of beneficial practices in more schools. This result is consistent with other nationwide examination of the association between state-level laws and school nutrition practices, such as a higher prevalence of farm to school programs at schools in states with relevant state laws,<sup>37</sup> and reduced prevalence of high-sugar, high-fat foods and beverages at elementary schools in states with laws restricting competitive foods.<sup>38</sup> Nevertheless, both of these prior studies, as well as studies of implementation of laws in specific states such as Texas<sup>39</sup> and California<sup>40</sup> that were early adopters of laws addressing school nutrition, have shown that laws are not always implemented as intended—even when directed by state laws, schools sometimes do not change their practices as directed. Observations of seven elementary schools in Seattle in 2015 found that despite a district policy requiring that students be provided a minimum of 20 minutes to eat lunch, four schools did not provide that much time in the schedule for lunch, and students spent an average of only 12.7 minutes seated and eating lunch.<sup>41</sup>

Given evidence showing that nutrition policies are often not implemented as required, it is worthwhile to consider issues that may be associated with incomplete policy implementation. With regard to lunch duration, there are often complex logistical issues for administrators to resolve when developing school-day schedules, such as limited seating capacity in the cafeteria, and the need to cycle all grades/classes through the cafeteria in an orderly manner.<sup>42</sup> Other considerations include contractual provisions about the duration of required breaks for teachers,

aides, and other school staff.<sup>43</sup> These are complex issues that impact school leaders as they work to implement best-practices for the student lunchtime experience, whether mandated by state law, or not.

On the other hand, facilitating factors might assist with the implementation of state laws; with regard to lunches, a likely facilitator is the availability of technical assistance for school administrators and school food service directors. School administrators might be more likely to implement scheduling changes when they receive encouragement and advice from other school leaders, or from national organizations.<sup>42</sup> Assistance in utilizing strategies to promote school meals is often available through each state's child nutrition agency, and Team Nutrition Training Grants<sup>44</sup> are a key mechanism through which USDA supports state agencies in providing technical assistance to support the implementation of nutrition standards and to meet USDA's strategic goals.<sup>7</sup> In addition, the development and implementation of local wellness policies can be a powerful strategy to provide support at the district level, as can the creation of active district-level or school-level wellness committees.<sup>45</sup>

While it is likely that several intervening factors can support the implementation of the types of state-level laws that were examined here, a detailed examination of the process of policy implementation is beyond the scope of these data, and the cross-sectional nature of the data do not allow for the causal conclusion that policy impacts practice. It is possible that a third-variable scenario might explain both the presence both of state law and greater adoption of school-level practices. Such factors might include strong local coalitions that influence state-level policy and that also provide ground-level support for implementation of best-practices in school. However, it is also possible that the presence of a formal policy (e.g., in the form of a state-level law) can help provide support for stakeholders who seek to facilitate changes at schools. The lack of

school-level data in several states reduced the sample size, and eliminated several states from the analysis; however, for both topics there were at least three states with strong laws plus seven states with weak laws, which provided adequate variation for the statistical models. Additional limits to the current work include those that are inherent with any use of a survey modality. For example, the prevalence estimates could be affected by lack of accurate knowledge among respondents. Biases such as social desirability and response biases often impact survey data. Despite those limitations, these analyses utilize a large, nationally-representative sample from states with varying policy provisions, which is a key strength and unique contribution of this work. There was a good match between the policy topics and the wording of the items used to assess school practices, and this conceptual agreement between policy and practice enhanced the ability to accurately assess the association of such policies with actual school-level practices.

## **CONCLUSIONS**

Using a diverse sample of public schools from across the US, the current analyses show that state laws regarding school lunch practices are positively associated with the use of several practices at the school level. This is important for enhancing the understanding of mechanisms through which schools may be supported in implementing effective practices to promote school lunch. Strategic revisions to the ways in which school lunches are served—focusing on how meals are served and promoted, and ensuring enough time to eat—could help to improve many aspects of the lunchtime experience for students.

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**Table 1.** Characteristics of a nationally representative sample of schools providing data on school lunch practices in 2014 (n = 414)

Variable	Unweighted	
	n	%
<b>Grade Level</b>		
Elementary school	150	36.2
Middle school	121	29.2
High school	143	34.5
<b>Student race/ethnicity<sup>a</sup></b>		
≥66% non-Hispanic White	159	38.4
≥50% non-Hispanic Black	85	20.5
≥50% Hispanic	92	22.2
Diverse or other majority	78	18.8
<b>Locale<sup>a,b</sup></b>		
Urban	86	20.8
Suburban	143	34.5
Rural	134	32.4
Township	51	12.3
<b>Socioeconomic status (% students eligible for free/reduced-priced meals)<sup>a</sup></b>		
Higher (≤40% eligible)	167	40.3
Medium (>40% to <75% eligible)	167	40.3
Lower (≥75% eligible)	80	19.3
<b>Size<sup>a,c</sup></b>		
Larger	176	42.5
Medium	117	28.3
Smaller	121	29.2
<b>Region<sup>d</sup></b>		
West	78	18.8
Midwest	118	28.5
Northeast	63	15.2
South	155	37.4

<sup>a</sup> Sourced from school descriptor data from Market Data Retrieval ([www.schooldata.com](http://www.schooldata.com)).

<sup>b</sup> Locale is based on metro-centric locale designations made by the National Center for Education Statistics, based on each school's physical address.

<sup>c</sup> Size based on total student enrollment and varies by level: for elementary and middle school, small = ≤300 students; medium = 301 to 500 students; large = >500 students. For high school, small = ≤350 students; medium = 351 to 800 students; large = >800 students.

<sup>d</sup> Region is based on US census regions. West (AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY); Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI); Northeast (CT, ME, MA, NH, NJ, NY, PA, RI, VT); South (AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV).

**Table 2.** Percentage of schools that used strategies to promote school meals in 2013-2014, with different percentages shown by state law status, where significantly different in a multiple regression model to predict use of each strategy<sup>a</sup>

Variable	Overall		% by state law <sup>b</sup>		P value	Total unweighted n schools
	%	Unweighted n schools	In states with no law	In states with a law		
Collected suggestions from students about the school nutrition services program	53.6	242	49.8	67.1	0.017	411
Collected suggestions from students' families about the school nutrition services program	26.7	109			0.56	409
Conducted taste tests with students	48.3	217	44.1	63.5	0.016	413
Conducted taste tests with students' families	11.2	41	9.5	18.7	0.046	411
School has committee with students who provide suggestions for the school nutrition services program	20.4	95			0.38	400
Made menus available to students <sup>c</sup>	97.3	403				414
Made information available to students on the nutrition and caloric content of foods available to them	68.1	285			0.08	410
Placed posters or other materials promoting healthy eating habits on display in cafeteria	94.1	385			0.09	414
Placed posters or other materials promoting healthy eating habits on display in school	48.4	186			0.76	401
Included nutrition services topics during school announcements	53.0	215	48.1	70.4	0.002	405
Included articles about the school nutrition services program in a school newsletter, newspaper, website, or other publication	65.7	274			0.24	406
Made menus available to families	96.4	395			0.17	413
Made information available to families on the nutrition and caloric content of foods available to students	68.9	278			0.279	409
Made information available to families on the school nutrition services program	83.8	345			0.11	410
Met with a parents' organization, such as the PTA <sup>d</sup> , to discuss the school nutrition services program	26.8	103			0.92	402
Invited family members to a school meal	56.5	224	53.1	70.7	0.015	411

<sup>a</sup> *P* values for each outcome are based on significance test for the state law variable in a series of 16 multivariate logistic regressions, where each outcome is regressed on all demographic covariates (school level, size, locale, region, student race/ethnicity, and socioeconomic composition) plus state law status.

<sup>b</sup> Adjusted percentage is the percentage of schools using each practice, after accounting for school demographic characteristics (school level, size, locale, region, student race/ethnicity, and socioeconomic composition). Percentages in states with or without laws are shown only where the difference is statistically significant at  $P < .05$  or better.

<sup>c</sup> This model could not be computed to assess whether prevalence was associated with state law, due to the very high prevalence (limited variability) of this outcome.

<sup>d</sup> PTA = parent teacher association.

**Table 3.** Results of multivariate Poisson regression to predict number of lunch promotion strategies used (n = 366 schools) and logistic regression to predict whether school provides students with lunch period of at least 30 minutes (n = 407 schools)

	Number of lunch promotion strategies			At least 30 minutes lunch duration		
	IRR <sup>a</sup>	95% CI <sup>b</sup>	P value	Odds Ratio	95% CI <sup>b</sup>	P value
<b>State Law<sup>c</sup></b>						
No law	Ref <sup>d</sup>			Ref		
Any law	1.18	1.06-1.32	0.003	2.26	1.03-4.95	0.042
<b>Level</b>						
Elementary school	Ref			Ref		
Middle school	1.02	0.94-1.10	0.67	1.07	0.62-1.84	0.82
High school	1.01	0.94-1.10	0.74	2.43	1.32-4.47	0.005
<b>Student race/ethnicity<sup>c</sup></b>						
≥66% non-Hispanic White	Ref			Ref		
≥50% non-Hispanic Black	0.93	0.83-1.04	0.21	2.10	0.97-4.57	0.06
≥50% Hispanic	0.95	0.83-1.09	0.46	3.11	1.29-7.48	0.012
Diverse or other majority	0.93	0.80-1.07	0.28	1.27	0.60-2.65	0.53
<b>Locale<sup>e,f</sup></b>						
Urban	Ref			Ref		
Suburban	0.91	0.77-1.08	0.28	1.57	0.69-3.55	0.28
Rural	0.97	0.85-1.10	0.61	0.67	0.26-1.74	0.41
Township	1.00	0.84-1.18	0.96	0.65	0.21-1.96	0.44
<b>Socioeconomic composition (based on % of students eligible for free/reduced-priced lunch)<sup>c</sup></b>						
Higher (≤40%)	Ref			Ref		
Medium (>40% to <75%)	0.97	0.88-1.07	0.53	2.42	1.30-4.48	0.005
Lower (≥75%)	0.93	0.80-1.08	0.34	1.83	0.73-4.58	0.20
<b>Size<sup>e,g</sup></b>						
Larger	Ref			Ref		
Medium	0.94	0.84-1.05	0.24	1.42	0.67-2.99	0.36
Smaller	1.02	0.91-1.14	0.76	1.37	0.62-3.04	0.44
<b>Region<sup>h</sup></b>						
West	Ref			Ref		
Midwest	0.95	0.80-1.12	0.51	0.44	0.16-1.18	0.10
Northeast	0.97	0.82-1.14	0.70	0.60	0.22-1.64	0.32
South	0.96	0.82-1.13	0.66	0.51	0.19-1.39	0.19

<sup>a</sup> IRR = incidence rate ratio.

<sup>b</sup> CI = confidence interval.

<sup>c</sup> Analyses linked state laws regarding strategies to promote school meals by soliciting stakeholder input (for number of lunch promotion strategies), and state laws regarding adequate time for lunch duration (for the model to predict at least 30 minutes of seated time for students to eat lunch).

<sup>d</sup> Ref = referent category.

<sup>e</sup> Sourced from school descriptor data from Market Data Retrieval ([www.schooldata.com](http://www.schooldata.com)).

<sup>f</sup> Locale is based on metro-centric locale designations made by the National Center for Education Statistics, based on each school's physical address.

<sup>g</sup> Size based on total student enrollment and varies by level: for elementary and middle school, small =  $\leq 300$  students; medium = 301 to 500 students; large =  $> 500$  students. For high school, small =  $\leq 350$  students; medium = 351 to 800 students; large =  $> 800$  students.

<sup>h</sup> Region is based on US census regions. West (AK, AZ, CA, CO, HI, ID, MT, NV, NM, OR, UT, WA, WY); Midwest (IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI); Northeast (CT, ME, MA, NH, NJ, NY, PA, RI, VT); South (AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV).