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Evidence-based Policies on School Nutrition and Physical Education: Associations with State-Level Collaboration, Obesity, and Socio-Economic Indicators

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ABSTRACT

Despite calls for more cross-sector collaboration on obesity prevention, little is known about the role of collaborative partnerships, or groups of organizations from different sectors working together toward a shared goal, in state policy activities. This study examined associations between competitive food/beverage and physical education policies and state-level collaboration and state characteristics (obesity, socioeconomic indicators, public health funding levels) for all 50 states and the District of Columbia, USA, in 2012. We examined cross-sectional associations between evidence-based competitive food/beverage and physical education policies from the Classification of Laws Associated with School Students and state characteristics from the School Health Policies and Practices Study and other national data sources using prevalence ratios and generalized linear models. Analyses were conducted in 2016. Cross-sector collaboration (i.e., state staff reports of working together on school nutrition or physical education activities) between state-level nutrition and physical education staff and ten types of organizations was not significantly associated with having state policies. Childhood obesity (RR=1.78, 95% CI[1.11,2.85]), high-school non-completion (RR=2.35, 95% CI[1.36,4.06]), poverty (RR=1.89, 95% CI[1.16,3.09]) and proportion non-white or Hispanic residents (RR=1.75, 95% CI[1.07, 2.85]) were positively associated with the presence of elementary school competitive food/beverage policies. Fewer indicators were associated with policies for middle and high schools. The large investment of time and resources required for cross-sector collaboration demands greater research evidence on how to structure and manage collaborative partnerships for the greatest impact.

²Abbreviations: CF Competitive foods/beverages; PE Physical Education; SHPPS School Health Policies and Practices Study; SHAPE Society of Health and Physical Educators

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Conflict of Interest

The authors declare there is no conflict of interest.

Keywords

policy; community networks; schools; nutrition policy; physical education

INTRODUCTION

A primary goal of public health collaborative partnerships is to develop and support policies that improve population health, yet not all policies are equally effective in achieving this goal. There is increasing evidence that specific environmental strategies and policies, particularly in school settings, may lead to improvements in diet, physical activity, and weight. State policies mandating specific nutrition standards for competitive foods/beverages (CF) in various school venues have been linked to reduced availability of prohibited items, reduced in-school consumption of prohibited items, and healthier in-school dietary intake, though evidence has been mixed on their relationship to obesity.^{1,2} In addition, state policies that require a specific, minimum amount of time spent in physical education (PE) may increase schools' provision of PE,³ increase PE attendance and activity,⁴ and reduce obesity risk.⁵

However, little is known about state-level factors associated with enactment of the above evidence-based policies. Nearly all studies examining correlates of state policy do not distinguish between stronger policies with specific, mandated standards, such as those above, and weaker policies that contain only recommendations or vague wording,^{6–10} which have generally not been shown to be effective.^{4,11} Only one study examined correlates of specific, mandated state-level PE policies, and found that states with higher poverty rates and other markers of socioeconomic disadvantage were more likely to enact such policies compared to more advantaged states.¹²

Another factor that could influence states' policy environment is the work of collaborative partnerships, or groups of organizations from different sectors working together toward a shared goal. Despite calls from the National Academy of Medicine and other leading scientific authorities for more cross-sector collaboration on obesity prevention,¹³ no studies to date have examined whether features of state-level collaborative partnerships are associated with the presence of empirically supported obesity prevention policies. Theory and practice of collaborative partnerships suggest that several structural and functional features of partnerships impact their effectiveness.^{14,15} For example, partnerships that include organizational members with advocacy-oriented missions and expertise may be able to engage in a wider range of direct advocacy and lobbying activities than partnerships without this representation. Conversely, some obesity prevention leaders have expressed concerns about engaging members of the food and beverage industry as partners in nutrition- and obesity-related collaboration in light of potential financial conflicts of interest the industry may have in reducing consumption of some products.¹³ Recent research has likewise found that non-profit organizations and public health agencies are the most trusted by other members of community health partnerships, while employer and business groups are less trusted.¹⁶

Only one prior study has evaluated the relationship between statewide obesity prevention partnerships and state policy change. Hersey et al. found that states receiving funding from the Centers for Disease Control and Prevention (CDC)'s Nutrition, Physical Activity, and Obesity program enacted more obesity-related state legislation than states without funding.⁹ Furthermore, states with high partnership involvement implemented four times as many local policies as states with low partnership involvement.¹⁷ Other research has found that the number of organization types collaborating on physical education activities at the state level increased over the past decade, and greater collaboration was positively associated with childhood obesity, poverty and public health funding.¹⁸

The aim of this study was to examine associations between the presence of evidence-based CF and PE state policies and statewide collaboration on school nutrition and PE activities with specific types of organizations measured on a national survey (state-level school health staff, health-focused non-profit organizations, businesses, and state departments of parks/recreation), state-level childhood obesity prevalence, socioeconomic indicators, and public health funding levels in 2012. Collaboration with more types of state-level school health staff and non-profit organizations was hypothesized to be positively associated with enacted evidence-based CF and PE policies in 2012, while collaboration with businesses was hypothesized to be negatively associated with these policies. Greater childhood obesity prevalence, socio-economic disadvantage, political party in power in state government, and public health funding were also hypothesized to be positively associated with CF and PE policies. This study contributes to the literature on collaborative partnerships for obesity prevention policy in two ways: it is the first study to examine the association between collaboration with specific types of organizational partners and state policy outcomes, and it is among the first to examine state-level correlates of specific policies associated with child behavior and weight.

METHODS

Policy Scores

The Classification of Laws Associated with School Students is a scoring system developed by the National Cancer Institute that evaluates how closely state laws align with national standards and recommendations for school nutrition and PE.¹⁹ A score of 0 indicates no codified law; 1 indicates a law that recommends but does not require any action; 2 indicates mandated action with nonspecific requirements (e.g., "healthy" foods/beverages); and scores greater than 2 indicate mandated, specific actions. Scores reflect codified laws in effect as of December 31, 2012 for all 50 states and the District of Columbia (hereafter referred to as "states"). This study used updated scores for 2012 laws, which include revised methodology for scoring some variables, released in January 2016.²⁰

Consistent with prior literature,^{2,21} scores from six policy areas (nutrition standards for a la carte foods and beverages, respectively, in cafeterias, foods and beverages in vending machines, and foods and beverages in school stores and canteens) were averaged into one CF score for each grade level (elementary, middle, and high school). These six scores had high internal consistency (Cronbach's $\alpha=0.98$), reflecting that most states had a common set of standards across all in-school locations. States' PE score reflected one policy measure

on mandated minimum time requirements for PE at elementary, middle, and high school. The primary outcome was whether a state had codified laws with specific, mandated requirements (average CF or PE score >2 , hereafter, “strong policies”) at each grade level.

Collaboration Measures

State-level collaboration was measured using data from the nutrition services and physical activity questionnaires in the School Health Policies and Practices Study (SHPPS), a national survey administered to officials in all states by the CDC in 2012.²² Respondents to the nutrition services questionnaire were state-level directors, commissioners, or consultants for school nutrition services. Respondents to the physical activity questionnaire were state-level directors, specialists, or consultants for health and PE.

A series of questions asked whether state-level child nutrition or food service staff worked on various school food service or nutrition activities during the past 12 months with staff or members from different types of organizations. A similar series in the physical activity questionnaire asked whether state-level PE staff worked on PE activities during the past 12 months with various organization types. Response options were yes, no, or no state level staff in this area (for state-level staff questions only). Representatives from six states did not answer at least one question in the series, resulting in missing data for those questions. Responses were coded 1=yes and 0=no/no state level staff/no answer because lack of staff precluded collaboration with that sector and non-response suggested that the respondent was unsure or unaware of collaboration with that organization type.

This study examines collaboration with five types of state-level school health staff; staff or members from five types of health-focused non-profit and professional organizations; staff or members of businesses; and staff or members of the state department of parks or recreation (asked on physical activity questionnaire only).

Organization types with conceptually similar roles were combined into two summary measures. School health staff included health education, health services, mental health or social services, and either PE or school nutrition staff, for a theoretical maximum score of four for either school nutrition or PE activities (school nutrition staff reported collaboration with PE staff on nutrition activities and PE staff reported collaboration with school nutrition staff on PE activities). Health-focused non-profit organizations included a state-level health organization, such as the American Heart Association or the American Cancer Society; Action for Healthy Kids; a state-level school nurses’ association; a state-level physician’s organization, such as the American Academy of Pediatrics; and the Governor’s Council on Physical Fitness and Sports (on the physical activity questionnaire only), for a theoretical maximum score of four for school nutrition activities and five for PE activities. Collaboration with businesses and parks/recreation departments were examined individually as dichotomous variables because they represent distinct non-health related sectors and interests.

Participants were asked about the following additional organizational types on the survey, but these were not included in this analysis because over 85% of states collaborated with them in 2012: academic institutions, food commodity organizations, state departments of

agriculture, school nutrition associations, and state-level chapters of the American Association of Health, Physical Education, Recreation and Dance (now known as SHAPE America).

State Characteristics

The following state characteristics were included in the analysis as potential confounders of the collaboration-policy relationship based on previous studies: childhood obesity prevalence (National Survey of Children's Health, 2011–2012);^{11,23,24} high school non-completion rate,⁷ poverty rate,¹² proportion non-white or Hispanic residents^{8,10} (American Community Survey, 3-year estimates from 2011–2013);²⁵ total CDC funding and state public health budget (Trust for America's Health, FY 2011–12),^{9,26} and political party in control of the governor's office and state legislature (Council of State Governments, 2012).^{7,27}

Statistical Analyses

The proportion of states with a strong CF or PE policy in 2012 was calculated for each grade level. Proportions were also calculated for each category of collaboration measures and state characteristics (dichotomized at the median). Prevalence ratios were estimated to examine associations between state characteristics and policy outcomes. For each grade-specific policy outcome, generalized linear models with a log link and binomial family were used to predict the probability of having a strong policy in 2012 as a function of each measure of collaboration in 2012. Separate models were estimated for each measure. Summative scores of collaboration with school health staff and non-profit organizations were modeled as continuous independent variables; collaboration with businesses and state departments of parks/recreation were included as dichotomous independent variables.

State-level obesity and socioeconomic indicators were hypothesized to be potential confounders of the association between collaboration and presence of policies, but the small number of observations precluded estimation of fully adjusted models. Thus, the presence of confounding was assessed by examining partially adjusted models that controlled for each potential confounder separately.

RESULTS

Strong CF and PE policies were more common in elementary schools compared to middle and high schools (Table 1). In all grade levels, the prevalence of strong PE policies was lower than the prevalence of CF policies.

Associations between Collaboration and Policies

State-level child nutrition and PE staff were similarly likely to collaborate with other organizations in 2012 (Table 2, left column). For example, child nutrition and PE staff in 67% of states each reported collaborating with school health staff from 3–4 organizations. Seventy-one percent of states in which child nutrition staff collaborated with 3–4 types of school health staff had strong CF policies in elementary schools compared to no more than half of states that collaborated with <3 types of school health staff (Table 2). Less consistent

relationships were observed for collaboration with nonprofit organizations and businesses. There were also inconsistent associations between collaboration with different organization types and prevalence of strong PE policies.

Consistent with these descriptive results, the association between collaboration with school health staff and strong CF policies in unadjusted regression models was the only measure that was consistent across grade levels (prevalence ratios [PR]=1.17–1.20) (Table 3). However, none of the collaboration measures was statistically significantly associated with having strong CF or PE policies in the unadjusted regression models. Adjusted regressions controlling for potential confounders (state-level obesity and socioeconomic characteristics) in separate models yielded inconsistent evidence of confounding and results similar to the unadjusted models (results not shown).

Associations between State Characteristics and Policies

Strong CF policies in elementary schools were more common in states with the following characteristics above the national median (vs. below the median): childhood obesity prevalence (PR=1.78, 95% CI: 1.11, 2.85), high school non-completion rate (PR=2.35, 95% CI: 1.36, 4.06), poverty rate (PR=1.89, 95% CI: 1.16, 3.09), and proportion of non-white or Hispanic residents (PR=1.75, 95% CI: 1.07, 2.85) (Table 4). In addition, 72% of states with CDC funding and state public health budgets above the median had strong CF policies in elementary schools, compared to 50% of states with funding below the median, though this difference was not statistically significant (PR=1.44, 95% CI: 0.91, 2.27). Associations at the middle school level were similar to the elementary school level for childhood obesity prevalence (PR=1.80, 95% CI: 1.02, 3.17) and state public health budgets (PR=1.42, 95% CI: 0.82, 2.46) and more modest for other characteristics. States with a Democratic governor were more likely to have strong CF policies, though this association was only significant in high schools (PR=2.25, 95% CI: 1.13, 4.50). States with Democratic control of both legislative houses were significantly more likely to have strong CF policies in middle schools (PR=1.93, 95% CI: 1.04, 3.58) and high schools (PR=2.90, 95% CI: 1.27, 6.61).

There were fewer clear relationships between state characteristics and having strong PE policies (Table 4). Many of the estimates had low precision (wide confidence intervals) resulting from sparse data, especially for high school policies. At the elementary school level, strong PE policies were more common in states with the following characteristics above the national median: childhood obesity, high-school non-completion, poverty, proportion of non-white or Hispanic residents, CDC funding, and state public health budgets. However, only higher high-school non-completion (RR=2.88, 95% CI: 1.07, 7.76) and a greater proportion of non-white or Hispanic residents (RR=2.88, 95% CI: 1.07, 7.76) were statistically significant.

Associations were generally more modest for middle and high school PE policies, and there were no significant associations between state characteristics and strong PE policies at these grade levels.

DISCUSSION

Previous studies have found evidence that collaborative partnerships contribute to state and local policy change,^{9,14,17} however, this study found no clear associations between cross-sector collaboration and strong CF and PE policies in cross-sectional analyses of 2012 data. One reason for these findings may be the lack of specificity in the collaboration measures on the SHPPS. The survey refers to general collaboration on school nutrition and PE activities, which likely addressed a wide range of topics, including but not limited to development and implementation of state CF and PE policies. For example, collaborative activities among state agencies during the period measured by this study likely included preparations for implementing upcoming federal rules for school meals programs and competitive foods.²⁸ More specific measures of the goals, strategies, and management of collaborative partnerships are needed to evaluate the role of partnerships in policy development and enactment, including whether collaborative processes may result in weaker policies in an effort to reach consensus among all participants.

This study confirms prior research findings that more disadvantaged states—those that are most in need of effective obesity prevention efforts—were more likely to have strong state policies for elementary schools.^{8,12} This conclusion provides additional evidence in support of the assertion that higher childhood obesity prevalence could be motivating states to adopt stronger obesity-related policies.^{10,11,24} However, this conclusion applies only to younger grade levels. High schools were least likely of all grade levels to be regulated by strong CF or PE policies, and policies targeting high schools were not correlated with any state characteristics. Other research has also documented differences in policy strength across grade levels at the school district level.^{29,30} This finding is troubling because poor health behaviors, such as fast food intake and low physical activity, begin to increase in adolescence and continue tracking into young adulthood.^{31,32} High school environments that encourage and facilitate healthy dietary behaviors and regular physical activity are needed to keep students on track to become healthy adults.

It is unclear whether enactment of evidence-based CF and PE policies in more disadvantaged states can contribute to reducing disparities in obesity prevalence within and across states. Disparities in obesity prevalence by race and socio-economic status persist, and may be getting worse in some areas.^{33,34} States, communities, and schools should seek to develop policies and environmental changes that are effective for children facing the highest burden of obesity, and evaluations should be designed to measure the impact of these strategies on reducing disparities.

The relationship between federal and state public health funding and state PE policies targeting elementary and middle schools was generally positive, but failed to reach statistical significance, providing inconclusive evidence of whether greater funding availability supports states' efforts to enact or implement some policies. Unlike the study by Hersey et al.,⁹ the funding measures used here were not specific to obesity prevention activities. CDC funds included all funds awarded to state and local health departments, universities, and public and private agencies in each state. State public health budgets included all health funding except health insurance and direct service programs such as Medicaid and the

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).²⁶ Further research is needed to understand whether overall public health funding levels or specific funding mechanisms are most important in affecting states' ability to enact and implement health-promoting policies for obesity prevention and other chronic diseases. Funding from non-public sources may also play a role in obesity policy enactment: A recent study documented a 50% increase in bill enactment in states receiving grants from the Voices for Healthy Kids campaign (a joint initiative of the Robert Wood Johnson Foundation and the American Heart Association to encourage evidence-based regulatory and legislative activity on childhood obesity) after the first year of funding.³⁵

Study Limitations and Strengths

The cross-sectional design of this study prevents conclusions about the temporality of the relationships between collaboration and policy strength. Many states had already enacted a strong policy before the period in which collaboration was measured. In addition, the definition of strong policies used in this study included policies with requirements that are lower than nationally mandated standards by Smart Snacks (for CF policies)³⁶ and nationally recommended guidelines by SHAPE America (for PE policies).³⁷ This was done because so few states had policies in 2012 that met national recommendations and because previous research using the same definition has found strong policies to be associated with improved student behaviors and, in some cases, weight status.^{1–5}

Relatedly, having a policy codified in law does not necessarily mean it is implemented fully, or even partially. It is likely that states vary with regard to the degree of policy implementation, even if they have similar codified policies. Nevertheless, state policies provide a minimum floor for schools to strive for in practice, and previous research has found that having state policies requiring minimum nutrition standards for CF and minimum PE time requirements is positively associated with school practices and environments and student behavior.^{3,4,38}

The small number of observations (N=51) prevented analysis of fully adjusted models controlling for multiple state characteristics simultaneously and examination of possible effect modification, for example, whether collaboration was associated with policy strength only in more disadvantaged states.

There is also the possibility of measurement error in the exposure variables. Collaboration was measured by survey questions answered by “the most knowledgeable state official” on school nutrition or PE in each state, who may or may not be aware of all collaborative activities occurring. The study was also limited to examining collaboration with organization types included on the SHPPS survey. State characteristics were dichotomized based on estimates from the National Survey of Children's Health and the American Community Survey, which have margins of error that could result in states being misclassified as below/above the median. Funding variables were computed by the Trust for America's Health based on review of publicly available documents (e.g., state appropriations bills), which could be incomplete or outdated. Any measurement error that exists in these variables is likely non-differential with respect to the policy outcomes (since these were measured through a scoring system and process that was independent of the assessment of the

exposure measures), and therefore any resulting bias would be expected to be in the direction toward the null.

Despite these limitations, this analysis is the first to examine the association between collaborative partnerships and evidence-based obesity prevention policies nationally. It is also among the first to examine state-level correlates of evidence-based policies, which have been shown to be effective in changing student behaviors and weight outcomes.

CONCLUSION

In theory, cross-sector collaboration contributes to the adoption and implementation of health promoting policies, yet this study found that having evidence-based CF and PE state policies was not associated with cross-sector collaboration between state agency staff and other organization types. It is not known whether the collaborative partnerships measured by this study were unsuccessful in reaching policy adoption or implementation goals or, alternatively, whether their goals and activities were chosen independently of state policy. As foundations, federal funding agencies, and national experts urge more collaboration on obesity prevention, more research is needed on the role of collaborative partnerships in state policy activities and the factors that contribute to successful partnerships. The large investment of time and resources required for a collaborative approach to obesity prevention demands greater research evidence on how to structure and manage collaborative partnerships for the greatest efficiency and effectiveness.

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Highlights

- Obesity-related state policies were not associated with cross-sector collaboration
- Nutrition policies were more common in socioeconomically disadvantaged states
- Higher childhood obesity rates were positively associated with nutrition policies
- Most significant associations were found for elementary school policies

Table 1

Number and Proportion of States with Strong State Policy on Competitive Foods and Physical Education Time Requirements, Classification of Laws Associated with School Students, 2012 (50 states and DC, n=51)

Policy Domain	N (%)
Competitive Foods^a	
Elementary School	31 (61%)
Middle School	26 (51%)
High School	21 (41%)
Physical Education Time^b	
Elementary School	16 (31%)
Middle School	10 (20%)
High School	7 (14%)

Source: School Health Policies and Practices Study, Classification of Laws Associated with School Students, United States, 2012

^aCompetitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

^bPhysical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

Table 2

Prevalence of collaboration and strong policies by grade level, United States, 2012

Organizations Collaborating with State Child Nutrition Staff on School Nutrition Activities	Prevalence of Collaboration %	Prevalence of Strong Competitive Foods ^c Policy		
		Elementary School	Middle School	High School
		%	%	%
State-Level School Health Staff ^a				
<i>No collaboration (12%)</i>	12	50	50	33
<i>1–2 organizations (22%)</i>	22	36	36	27
<i>3–4 organizations (67%)</i>	67	71	56	47
Health-Focused Non-profit Organizations ^b				
<i>No collaboration (4%)</i>	4	50	50	50
<i>1–2 organizations (51%)</i>	51	58	50	35
<i>3–4 organizations (45%)</i>	45	65	52	48
Businesses				
<i>No (49%)</i>	49	68	56	40
<i>Yes (51%)</i>	51	54	46	42
Organizations Collaborating with State Physical Education Staff on Physical Education Activities (Prevalence)	Prevalence of Collaboration %	Prevalence of Strong Physical Education Time ^d Policy		
		Elementary School	Middle School	High School
		%	%	%
State-Level School Health Staff ^a				
<i>No collaboration (10%)</i>	10	0	0	0
<i>1–2 organizations (24%)</i>	24	50	33	17
<i>3–4 organizations (67%)</i>	67	29	18	15
Health-Focused Non-profit Organizations ^b				
<i>No collaboration (8%)</i>	8	25	25	25
<i>1–2 organizations (31%)</i>	31	25	19	25
<i>3–5 organizations (61%)</i>	61	35	19	6
Businesses				
<i>No (51%)</i>	51	27	15	19
<i>Yes (49%)</i>	49	36	24	8
State Department of Parks/Recreation				
<i>No (57%)</i>	57	24	17	14
<i>Yes (43%)</i>	43	41	23	14

Source: School Health Policies and Practices Study, Classification of Laws Associated with School Students, United States, 2012

^a State-level school health staff are from health education, health services, mental health and social services, and either nutrition/food service or physical education (range: 0–4)

^b Health-focused non-profit organizations are state-level health organizations, Action for Healthy Kids, school nurses association, state physicians' association, and governor's council on physical fitness and sports (range: 0–4 for Competitive Foods and 0–5 for Physical Education)

^c Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

^dPhysical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

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Table 3

Unadjusted Associations between State Collaboration and Strong Policies, United States, 2012

Collaboration Measure	Elementary School		Middle School		High School	
	PR	95% CI	PR	95% CI	PR	95% CI
School Nutrition Activities	Competitive Foods^c					
State-Level School Health Staff ^a	1.20	[0.98,1.47]	1.18	[0.91,1.52]	1.17	[0.88,1.56]
Health-Focused Non-profit Organizations ^b	1.12	[0.92,1.37]	1.06	[0.83,1.34]	1.12	[0.83,1.51]
Businesses	0.79	[0.51,1.24]	0.82	[0.48,1.42]	1.06	[0.55,2.04]
Physical Education Activities	Physical Education Time^d					
State-Level School Health Staff ^a	0.99	[0.75,1.32]	0.97	[0.65,1.43]	1.05	[0.63,1.75]
Health-Focused Non-profit Organizations ^b	1.35	[0.94,1.94]	1.08	[0.71,1.63]	0.72	[0.46,1.12]
Businesses	1.34	[0.59,3.04]	1.56	[0.50,4.88]	0.42	[0.09,1.95]
State Department of Parks/Recreation	1.69	[0.75,3.84]	1.32	[0.43,4.00]	0.99	[0.25,3.97]

Source: School Health Policies and Practices Study, Classification of Laws Associated with School Students, United States, 2012

^a State-level school health staff are from health education, health services, mental health and social services, and either nutrition/food service or physical education (range: 0–4)

^b Health-focused non-profit organizations are state-level health organizations, Action for Healthy Kids, school nurses association, state physicians' association, and governor's council on physical fitness and sports (range: 0–4 for Competitive Foods and 0–5 for Physical Education)

^c Competitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

^d Physical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

PR is prevalence ratio, CI is confidence interval

Table 4

Unadjusted Associations between State Characteristics and Strong Policies, United States, 2012

State Characteristics	Elementary School			Middle School			High School		
	%	PR	95% CI	%	PR	95% CI	%	PR	95% CI
Competitive Foods^a									
Childhood Obesity Prevalence									
<i>Below Median</i>	44.4	Ref.		37.0	Ref.		37.0	Ref.	
<i>Above Median</i>	79.2	1.78	[1.11,2.85]	66.7	1.80	[1.02,3.17]	45.8	1.24	[0.64,2.39]
High School Non-Completion									
<i>Below Median</i>	36.0	Ref.		36.0	Ref.		36.0	Ref.	
<i>Above Median</i>	84.6	2.35	[1.36,4.06]	65.4	1.82	[1.00,3.29]	46.2	1.28	[0.66,2.50]
Poverty Rate									
<i>Below Median</i>	42.3	Ref.		38.5	Ref.		34.6	Ref.	
<i>Above Median</i>	80.0	1.89	[1.16,3.09]	64.0	1.66	[0.94,2.94]	48.0	1.39	[0.71,2.70]
Proportion Non-White or Hispanic Residents									
<i>Below Median</i>	44.0	Ref.		40.0	Ref.		36.0	Ref.	
<i>Above Median</i>	76.9	1.75	[1.07,2.85]	61.5	1.54	[0.87,2.72]	46.2	1.28	[0.66,2.50]
CDC Total Funding									
<i>Below Median</i>	50.0	Ref.		50.0	Ref.		46.2	Ref.	
<i>Above Median</i>	72.0	1.44	[0.91,2.27]	52.0	1.04	[0.61,1.78]	36.0	0.78	[0.40,1.52]
State Public Health Budget									
<i>Below Median</i>	50.0	Ref.		42.3	Ref.		38.5	Ref.	
<i>Above Median</i>	72.0	1.44	[0.91,2.27]	60.0	1.42	[0.82,2.46]	44.0	1.14	[0.59,2.21]
Governor's Political Party									
<i>Not a Democrat</i>	53.3	Ref.		40.0	Ref.		26.7	Ref.	
<i>Democrat</i>	70.0	1.31	[0.84,2.04]	65.0	1.62	[0.94,2.80]	60.0	2.25	[1.13,4.50]
Democratic Party Majority in State Legislature									
<i>0 houses</i>	48.3	Ref.		34.5	Ref.		20.7	Ref.	
<i>1 house^c</i>	100.0	1.00	[1.00,1.00]	100.0	1.00	[1.00,1.00]	100.0	1.00	[1.00,1.00]
<i>2 houses</i>	73.3	1.52	[0.94,2.47]	66.7	1.93	[1.04,3.58]	60.0	2.90	[1.27,6.61]
Physical Education Time^b									
Childhood Obesity Prevalence									
<i>Below Median</i>	22.2	Ref.		22.2	Ref.		18.5	Ref.	
<i>Above Median</i>	41.7	1.87	[0.80,4.39]	16.7	0.75	[0.24,2.34]	8.3	0.45	[0.10,2.11]
High School Non-Completion									
<i>Below Median</i>	16.0	Ref.		16.0	Ref.		8.0	Ref.	
<i>Above Median</i>	46.2	2.88	[1.07,7.76]	23.1	1.44	[0.46,4.51]	19.2	2.40	[0.51,11.27]
Poverty Rate									
<i>Below Median</i>	19.2	Ref.		19.2	Ref.		11.5	Ref.	
<i>Above Median</i>	44.0	2.29	[0.93,5.65]	20.0	1.04	[0.34,3.16]	16.0	1.39	[0.34,5.58]
Proportion Non- White or Hispanic Residents									
<i>Below Median</i>	16.0	Ref.		12.0	Ref.		12.0	Ref.	

State Characteristics	Elementary School			Middle School			High School		
	%	PR	95% CI	%	PR	95% CI	%	PR	95% CI
<i>Above Median</i>	46.2	2.88	[1.07,7.76]	26.9	2.24	[0.65,7.72]	15.4	1.28	[0.32,5.16]
CDC Total Funding									
<i>Below Median</i>	19.2	Ref.		7.7	Ref.		7.7	Ref.	
<i>Above Median</i>	44.0	2.29	[0.93,5.65]	32.0	4.16	[0.98,17.72]	20.0	2.60	[0.55,12.19]
State Public Health Budget									
<i>Below Median</i>	19.2	Ref.		11.5	Ref.		15.4	Ref.	
<i>Above Median</i>	44.0	2.29	[0.93,5.65]	28.0	2.43	[0.71,8.35]	12.0	0.78	[0.19,3.14]
Governor's Political Party									
<i>Not a Democrat</i>	33.3	Ref.		20.0	Ref.		13.3	Ref.	
<i>Democrat</i>	30.0	0.9	[0.39,2.08]	20.0	1.00	[0.32,3.10]	15.0	1.12	[0.28,4.50]
Democratic Party Majority in State Legislature									
<i>0 houses</i>	34.5	Ref.		20.7	Ref.		10.3	Ref.	
<i>1 house^c</i>	20.0	0.58	[0.09,3.59]	20.0	0.97	[0.15,6.41]	20.0	1.93	[0.25,15.09]
<i>2 houses</i>	33.3	0.97	[0.40,2.32]	20.0	0.97	[0.28,3.33]	20.0	1.93	[0.44,8.44]

Source: Classification of Laws Associated with School Students, National Survey of Children's Health, American Community Survey, Trust for America's Health, United States, Council of State Governments, 2012

^aCompetitive Foods policy is defined as an average score >2 across 6 measures of nutrition standards for competitive foods and beverages in school cafeterias, vending machines, and other venues (e.g., school stores/canteens)

^bPhysical Education Time policy is defined as a score >2 on a single measure of states' laws requiring minimum time spent in physical education

^cOnly five states had Democratic control of 1 house in the state legislature.

PR is prevalence ratio, CI is confidence interval