



## Correlates of state enactment of elementary school physical education laws



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### ABSTRACT

**Objective.** To describe variation in U.S. state elementary school physical education (PE) policies and to assess associations between state PE policy enactment and education funding, academic achievement, sociodemographic disadvantage, and political characteristics.

**Methods.** U.S. state laws regarding school PE time, staffing, curriculum, fitness assessment, and moderate-to-vigorous physical activity (MVPA) in 2012 were classified as strong/specific, weak/nonspecific, or none based on codified law ratings within the Classification of Laws Associated with School Students (C.L.A.S.S.). Laws were merged with state-level data from multiple sources. Logistic regression was used to determine associations between state characteristics and PE laws (N = 51).

**Results.** Laws with specific PE and MVPA time requirements and evidence-based curriculum standards were more likely in states with low academic performance and in states with sociodemographically disadvantaged populations. School day length was positively associated with enacting a PE curriculum that referenced evidence-based standards. School funding and political characteristics were not associated with PE laws.

**Conclusions.** Limited time and high-stake testing requirements force schools to prioritize academic programs, posing barriers to state passage of specific PE laws. To facilitate PE policy enactment, it may be necessary to provide evidence on how PE policies can be implemented within existing time and staffing structures.

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### Introduction

Physical education (PE) is a key evidence-based strategy for providing and promoting physical activity (PA), reducing childhood obesity, and improving academic performance (Boehmer et al., 2007; CDC, 2010a, 2011; Eyster et al., 2010; Strong et al., 2005). Yet there is no federal law requiring PE, the majority of U.S. children do not receive the recommended minutes of moderate-to-vigorous PA (MVPA) in PE (Troiano et al., 2008), and standards for PE curricula, teacher certification, and fitness assessment vary across states (Lee et al., 2007; McKenzie and Lounsbury, 2009; McCullick et al., 2012; Walker et al., 2010).

In 2003, the National Cancer Institute (NCI) began collecting and scoring state-level codified laws for PE (NCI, 2014), providing an opportunity to examine differences in PE laws across states. Although previous researchers have used these data to examine associations between state policies and time spent in PE, PA, and body mass index changes

(Kim, 2012; Perna et al., 2012; Taber et al., 2013), no research has examined the relationship between state-level characteristics and state enactment of PE laws. Given a political context wherein public health decision-making is increasingly devolved from the federal to the state level and given findings that state laws are positively associated with time spent in PE (Perna et al., 2012; Slater et al., 2012) and greater PA participation (Kim, 2012; Taber et al., 2013), understanding what motivates or prohibits states from enacting PE laws is important for improving children's health.

Accordingly, this study examined associations between state enactment of elementary school PE laws and various state-level education system, educational testing, sociodemographic, and political characteristics. The study advances previous research by identifying salient predictors of state PE policy enactment. Because this is the first study to relate state-level characteristics to elementary PE policies, it was not our purpose to test specific focused hypotheses about predictors of state uptake of PE policies. However, based upon previous school- and district-level PE policy research, there are some general characteristics that we hypothesize may be related to state-level PE policy enactment.

First, several education system characteristics may be associated with state PE policies. In a study of barriers to requiring evidence-based PE in elementary schools, Lounsbury et al. (2011) found that

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funding and time constraints were among the greatest perceived barriers to strong policy requirements. Therefore, we hypothesize that state-level education revenue and expenditures would be important predictors of state PE policy enactment. Time constraints related to school-day length may also play a role; we hypothesize that states with shorter average school days may be less inclined to devote that limited time to non-core subjects. Relatedly, the federal reauthorization of the Elementary and Secondary Education Act of 2001, known as “No Child Left Behind”, launched targeted goals to improve academic performance. Consequently, non-core programs like PE moved to low priority status and have since suffered time reductions (McMurrer, 2007; Trost and van der Mars, 2009). This suggests that PE may be viewed by state policymakers as a time and funding drain that competes with, rather than complements, improvements in academic performance. Therefore, it is possible that schools with relatively strong testing outcomes would be less likely to enact strong PE laws than schools with worse academic performance. Along these lines, states whose academic outcomes are most at risk (i.e., low performing schools) may be more likely than better performing states to forego PE in an effort to increase test performance.

In addition, previous studies of factors that shape passage of state policies more broadly suggest that the sociodemographic composition of states is an important predictor of enacting strong laws (Soss et al., 2001). Socially and economically vulnerable residents may have alternative political priorities or may not have political power to advocate for stronger health- or education-related requirements. Therefore, we hypothesize that states with more sociodemographically vulnerable residents (e.g., low income, high percent black) are less likely to enact strong or specific PE policies.

Finally, electoral politics may play a role in PE policy enactment. In a study of school districts in Connecticut, Schwartz et al. (2012) found that districts with a greater ratio of registered Republicans to Democrats enacted weaker school wellness policies, including those related to PA. Differing beliefs about the proper role of government may lead politically conservative states that are more likely to favor a leaner government role in promoting public health, to be less likely to enact strong PE requirements. Therefore, we hypothesize that states with a Republican governor or with Republican majorities in the House and Senate will be less likely to enact strong PE policies.

We recognize that these characteristics do not represent the full array of potential predictors of state PE policy uptake. However, based on data availability and the literature we have outlined above, we believe that testing the potential relationships we have identified represents an important first step toward better understanding the educational, sociodemographic, and political characteristics that may be associated with states' enactment of strong PE policies.

## Methods

### Data

Data for PE laws are from the Classification of Laws Associated with School Students (C.L.A.S.S.) compiled by the National Cancer Institute (NCI, 2014). C.L.A.S.S. uses a system to score state codified PE laws based on current public health research and national recommendations and standards for PE in schools. States are coded on a scale based on the law's stringency and specificity on policies related to time, curriculum standards, fitness assessment, and staffing requirements for 2003–2012. For an in-depth discussion of the development of C.L.A.S.S., see Masse et al. (2007).

Our outcomes represent the scores for elementary school PE laws for all 50 states and Washington, DC as of 2012. We focus on elementary school both because strong and specific laws were more common at that level and because there was more variability in elementary PE laws than there was for middle or high school. We merged the C.L.A.S.S. data with state-level data from several sources. Data sources and years for each variable are listed in Appendix A.

### Measures

We examined all elementary PE laws that were included in C.L.A.S.S. — PE time and PE MVPA time requirements, staffing requirements, two different curriculum standard policies, and a fitness assessment requirement. We employ a coding scheme consistent with similar previous research (Perna et al., 2012; Schwartz et al., 2009; Taber et al., 2013), where states are distinguished by whether they had no requirement at all, a weak or non-specific requirement, or a strong or specific requirement (see Table 1). A binary curriculum standard variable indicates whether the state referenced and incorporated curriculum standards from the National Association for Sport and Physical Education (NASPE), a specific state agency, or other organization into the state codified law (1 = yes; 0 = no).

We consider states with specific fitness assessment requirements, specific staffing requirements, and evidence based curriculum standards (i.e., those that reference NASPE, etc.) to have strong policies, and we often use the term ‘strong’ as a proxy for ‘specific’ when referring to those laws throughout the paper. However, we refrain from labeling states with specific PE time and PE MVPA time requirements as having ‘strong’ policies because some states require far fewer than the NASPE-recommended 150 min per week. Thus, even though their laws require a specific number of minutes, the requirement does not meet a ‘strong’ PE standard.

Potential correlates were grouped into four categories: education system characteristics, educational testing outcomes, sociodemographic disadvantage, and political characteristics. *Education system characteristics* included 2003–2010 averages for total education expenditures and instructional expenditures per pupil, total revenue and state revenue per pupil, percentage of revenue coming from the state, number of students, pupil-to-teacher ratio, and average school day length. *Educational testing outcomes* included the 2003, 2005, 2007, and 2009 averages for 4th and 8th grade math and reading test scores and the percentages of students scoring below the basic and proficient levels in 4th and 8th grade math and reading. From these variables, we created an index of summed 4th

**Table 1**  
Coding conventions used for grouping of U.S. state PE laws, 2012.

Law	Specific law	Non-specific law	No law
PE time requirement	Law requires specific amount of time for PE	PE is required, but no time amount is specified <sup>a</sup>	No PE requirement
MVPA time requirement	Law requires specific amount of MVPA time in PE	Law requires MVPA, but no time amount is specified	No MVPA time requirement
Law	Strong law	Weak law	No law
PE curriculum standards	Law requires PE to address student knowledge of PA, behavioral and motor skills, and health-related fitness	Law requires PE to have some sort of curriculum standard	No curriculum standard requirements
Health related fitness assessment	Law requires that students participate in a standardized fitness test that addresses cardiovascular endurance, flexibility, and body composition	Law requires a fitness test without specific fitness components	No requirement for health-related fitness

<sup>a</sup> C.L.A.S.S. includes three states with time requirements of less than 60 min in this ‘nonspecific’ category along with the states that do not specify a time requirement. Results are robust to moving these three states into the ‘specific’ category.

and 8th grade math and reading test scores (Cronbach's alpha = .98) and an index of summed percentages below basic and proficient in 4th and 8th grade math and reading (Cronbach's alpha = .99). *Sociodemographic disadvantage* variables included 2003–2012 averages for percentage of black students, black residents, students eligible for free/reduced lunch, child and total poverty, female headed households, and childhood obesity. Consistent with prior demographic studies employing sociodemographic disadvantage variables (Morenoff et al., 2001; Sampson et al., 1997, 1999), we conducted a factor analysis of these variables and found that all loaded highly onto one factor (loadings over 0.80). Accordingly, we calculated a factor score that weighted each variable by its factor loading and then summed the seven variables into one 'disadvantage' score (Cronbach's alpha = 0.94). We standardized all three indexes as z-scores so they represent standard deviation units. Finally, *political characteristics* included dummy variables for whether the state had a Republican governor, whether Republicans controlled the state House of Representatives, and whether Republicans controlled the state Senate for the majority of years (2003–2012). Because regions also have their own political and demographic histories and other unobserved characteristics, we also examined policy variation by US Census region (northeast, Midwest, South, West). Descriptive statistics for all variables are presented in Table 2.

The years used for all variables were based on data availability and temporal proximity to the C.L.A.S.S. data. We examined several specifications (e.g., selecting one year instead of averaging, selecting only earliest year or latest year), and the results were robust to all specifications.

### Statistical analysis

We first present a table displaying the percentage and number of states with specific/strong, nonspecific/weak, and no requirements for each law. We then present a table of percentages of states with concomitant laws (e.g., are states with specific PE time laws also likely to have strong PE staffing requirements?). Finally, we present the results from unadjusted binary logistic regression models to examine associations between each potential state-level characteristic and odds of having *specific* PE time requirements, *strong* PE staffing requirements, and referencing NASPE, a specific state agency, or other organization in the

curriculum standards. Because only 4 states have specific PE MVPA time requirements, we combined the states with specific and nonspecific laws to create an outcome of having *any* PE MVPA time requirement (9 states) vs. having no PE MVPA time requirement (42 states). We used the penalized likelihood method (aka, the Firth method) to help reduce the small sample bias associated with having a rare event (in this case, the value of '1' has a cell size of only 9).

We also assessed odds of having strong PE curriculum standards (see Table 1) and odds of having any PE fitness assessment laws (we used 'any' laws instead of specific laws because only 3 states have specific laws), but none of the regression models for these two outcomes produced any significant associations with our predictor variables, so we do not discuss these two outcomes in our paper, but results are available upon request.

We elected to use binary logistic regression in lieu of ordinal logistic regression because we were interested in being able to describe correlates of enacting *specific* and *strong* laws, rather than just *stronger* or *weaker* laws or laws with a 'greater' or 'lesser' level of specificity, as would be the case with ordinal models.

Due to small sample size (N = 51) and strong correlations among many of our predictor variables, we were unable to run adjusted models. We have attempted to deal with the risk of conflation with our sociodemographic disadvantage variables by also examining a model using a sociodemographic disadvantage index as a predictor.

### Results

Specific and strong state-level PE laws are uncommon (see Table 3). Just over a quarter of all states have specific PE time requirements and strong staffing requirements. Only 3 and 4 states, respectively, have strong PE fitness assessment and specific PE MVPA time requirements. Over four-fifths of all states have no PE MVPA time requirement. Strong PE curriculum standards are most common; 20 states fall into this category, and over half of all states reference NASPE, a state agency, or other organization in their curriculum laws.

Results from Table 4 demonstrate that enactment of a law in one area does not always accompany enactment of a law in another area. For example, of the 14 states that had a law with a specific PE time requirement, only 5 also had a strong PE staffing law or strong PE curriculum standards. However, of the 4 states with a specific PE MVPA time requirement, 3 also had a specific PE time requirement, and all four referenced standards from NASPE or another organization in their PE curricula.

Results of our regression analyses are presented in Table 5. First, education funding was not a significant predictor of any state PE laws. The only education system variables to show associations with state PE laws were number of students and school day length. States with more students were more likely to have a law with a specific PE time requirement, and states with longer average school days were substantially more likely to have referenced NASPE, etc. in their PE curriculum requirements.

In terms of academic performance, states with higher average test scores were significantly less likely to have a PE MVPA time requirement. Further, states with higher percentages of underperforming students (i.e., higher percentages scoring below basic and proficient on math and reading tests) had significantly greater odds of having a specific PE time requirement, significantly greater odds of having a PE

**Table 2**  
Descriptive statistics of U.S. state-level characteristics, 2003–2012 (N = 51).

	Mean	S.D.	Min.	Max.
<i>Education system characteristics</i>				
Total expenditure per pupil	10,809	2028	6517	15,849
Instructional expenditure per pupil	6484	1676	4005	11,836
Total revenue per pupil	12,302	2960	7787	21,161
State revenue per pupil	5918	2102	2973	13,435
% of education revenue coming from state	48.8	12.2	29.6	86.0
Number of students	963,642	1,142,660	74,040	6,364,799
Pupil-to-teacher ratio	15.2	2.5	11.0	22.7
School day length	6.7	0.2	6.2	7.2
Test score index	383.7	58.5	282.3	590.5
Testing underperformance index	998.1	28.9	894.4	1047.6
<i>Sociodemographic disadvantage</i>				
% black students	15.7	16.0	0.9	82.3
% black residents	10.8	10.9	1.2	46.3
% of students eligible for free/reduced lunch	40.4	10.4	18.4	67.4
% child poverty	18.0	4.8	9.5	29.6
% poverty	13.1	3.0	7.6	20.7
% female heads of household	6.9	1.0	5.2	10.0
% child obesity	29.8	4.2	20.8	39.6
Disadvantage index <sup>a</sup>	113.6	36.6	59.8	238.8
<i>Political characteristics (% states)</i>				
Republican governor	42.0			
State house of reps. controlled by republicans	37.3			
State senate controlled by republicans	41.1			

<sup>a</sup> Disadvantage index is composed of factor score weighted values for percent black students, percent free/reduced lunch eligible students, percent poverty, percent black residents, percent female heads of household, percent child poverty, and percent childhood obesity.

**Table 3**  
Percentage and number of U.S. states with each category of law, 2012 (N = 51).

	Specific	Nonspecific	None
PE time law	27.5 (14)	64.7 (33)	7.8 (4)
PE MVPA time law	7.8 (4)	9.8 (5)	82.4 (42)
	Strong	Weak	None
PE staffing law	29.4 (15)	64.7 (33)	5.9 (3)
PE curriculum standards law	39.2 (20)	39.2 (20)	21.6 (11)
PE fitness assessment law	5.9 (3)	31.4 (16)	62.8 (32)
	Yes	No	
Curriculum standards reference NASPE, another state agency or another organization (evidence-based curriculum standards)	52.9 (27)	47.1 (24)	

**Table 4**  
Percentages (N) of U.S. states with concomitant laws<sup>a</sup>, 2012, N = 51.

	(1) N = 14	(2) N = 15	(3) N = 20	(4) N = 3	(5) N = 4	(6) N = 27
(1) Specific PE time law	–	33.3 (5)	25.0 (5)	100.0 (3)	75.0 (3)	37.0 (10)
(2) Strong PE staffing law	35.7 (5)	–	35.0 (7)	33.3 (1)	50.0 (2)	37.0 (10)
(3) Strong PE curriculum law	35.7 (5)	46.7 (7)	–	33.3 (1)	50.0 (2)	51.9 (14)
(4) Strong fitness assessment law	21.4 (3)	6.7 (1)	5.0 (1)	–	25.0 (1)	11.1 (3)
(5) Specific PE MVPA time law	21.4 (3)	13.3 (2)	10.0 (2)	33.3 (1)	–	14.8 (4)
(6) Curriculum standards from NASPE, etc.	71.4 (10)	66.7 (10)	70.0 (14)	100.0 (3)	100.0 (4)	–

<sup>a</sup> Represents the percentage of states, out of those with each law, that also have the identified concomitant law. For example, of the 14 states with a specific PE time requirement (1), 5 of those states (35.7% of the 14) also have a strong PE staffing requirement (2).

MVPA time requirement, and significantly greater odds of referencing NASPE, etc. in curriculum standards.

State sociodemographic disadvantage characteristics were significantly associated with all laws. In general, states with a higher percentage of socioeconomically disadvantaged populations had greater odds of enacting specific/strong PE laws. Having higher percentages of black students and black residents was positively associated with having a PE MVPA time requirement, enacting a strong PE staffing requirement, and with referencing NASPE or another agency in the PE curriculum standards requirement. Percent eligible for free/reduced lunch, child poverty, female headed households, and total poverty were positively associated with enacting a specific PE time law, having a PE MVPA time law, and with referencing NASPE, etc. in curriculum laws. Percent female-headed households was also positively associated with having a strong PE staffing requirement. Higher childhood obesity

rates were positively associated with referencing NASPE, etc. in curriculum laws. Odds ratios demonstrate that for each standard deviation increase on the disadvantage index, a state has over twice the odds of having a specific PE time and PE MVPA time requirement and over three times the odds of referencing NASPE, etc. in curriculum laws.

Finally, political characteristics were not significantly associated with state PE laws, but a specific PE time law, PE MVPA time law, and enacting evidence-based curriculum standards (i.e., NASPE) were more likely in southern states than in non-southern states. In supplemental analysis (not shown, but available upon request), we attempted to adjust our educational testing and sociodemographic disadvantage models by region (i.e., south vs. non-south), but formal mediation analyses with the KHB method in STATA indicated that any changes we observed were explained by model rescaling due to the introduction of a covariate rather than the confounding effect of 'south vs. non-south' itself.

**Table 5**  
Unadjusted odds ratios and 95% confidence intervals for associations between U.S. state-level characteristics and state PE laws, 2012 (N = 51). \*p<.05; \*\*p<.01.

	Specific PE time law		PE MVPA time law <sup>a</sup>		Strong PE staffing law		Curriculum standards reference NASPE, etc.	
	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI	O.R.	95% CI
<i>Education system characteristics</i>								
Total expenditure per pupil (\$1000s)	0.750	0.526–1.068	0.895	0.621–1.289	1.242	0.915–1.686	0.963	0.731–1.267
Expenditure on instruction per pupil (\$1000s)	0.718	0.455–1.135	0.842	0.524–1.351	1.411	0.975–2.042	0.963	0.691–1.342
Total revenue per pupil (\$1000s)	0.810	0.621–1.058	0.984	0.772–1.255	1.213	0.984–1.495	0.993	0.823–1.199
State revenue per pupil	0.824	0.572–1.188	0.758	0.461–1.245	1.022	0.763–1.369	0.923	0.704–1.209
% of education revenue coming from state	0.997	0.947–1.050	0.984	0.923–1.050	0.966	0.911–1.024	0.993	0.948–1.040
Number of students (1000s)	1.001	1.000–1.002	1.024	0.971–1.080	1.000	0.999–1.001	1.000	1.000–1.001
Pupil-to-teacher ratio	1.081	0.846–1.380	0.872	0.626–1.215	0.770	0.559–1.061	0.894	0.709–1.127
School day length	3.389	0.232–49.51	19.78	0.695–563.4	1.346	0.102–17.78	13.77*	1.044–181.8
<i>Education testing outcomes</i>								
Test score index <sup>b</sup>	0.589	0.312–1.109	0.426*	0.199–0.910	0.695	0.381–1.268	0.509	0.257–1.007
Underperformance index <sup>b</sup>	1.854*	1.040–3.241	2.424*	1.128–5.210	1.496	0.816–2.744	2.003*	1.015–3.953
<i>Sociodemographic disadvantage</i>								
% black students	1.025	0.987–1.064	1.050*	1.003–1.098	1.055*	1.008–1.104	1.096**	1.026–1.171
% black residents	1.043	0.987–1.102	1.071*	1.006–1.141	1.078*	1.013–1.147	1.140**	1.038–1.252
% of students eligible for free/reduced lunch	1.137**	1.052–1.230	1.127**	1.038–1.224	1.024	0.966–1.084	1.146**	1.050–1.250
% child poverty	1.275**	1.084–1.500	1.258**	1.058–1.497	1.040	0.917–1.178	1.232**	1.061–1.431
% poverty	1.532**	1.165–2.014	1.401*	1.066–1.842	1.034	0.843–1.267	1.374**	1.084–1.742
% female heads of household	2.014*	1.039–3.906	2.386*	1.110–5.127	1.963*	1.026–3.754	2.725**	1.313–5.654
% child obesity, 2003	1.151	0.982–1.348	1.181	0.985–1.417	1.104	0.950–1.282	1.329**	1.100–1.606
Sociodemographic disadvantage index <sup>b</sup>	2.285*	1.140–4.582	2.730*	1.259–5.920	1.869	0.988–3.534	3.142**	1.316–7.505
<i>Political characteristics</i>								
Republican governor	1.571	0.453–5.450	0.464	0.093–2.322	1.050	0.301–3.661	1.741	0.555–5.460
State house of reps. controlled by republicans	2.083	0.595–7.297	0.865	0.199–3.760	0.509	0.136–1.910	2.455	0.746–8.076
State senate controlled by republicans	1.100	0.317–3.822	0.713	0.165–3.079	0.250	0.060–1.038	1.167	0.379–3.587
<i>Region</i>								
Northeast	0.279	0.032–2.465	<sup>c</sup>	<sup>c</sup>	2.255	0.511–9.944	0.194	0.036–1.051
Midwest	0.182	0.021–1.565	0.352	0.039–3.147	0.400	0.076–2.099	0.552	0.149–2.047
South	6.525**	1.701–25.032	11.20*	1.997–62.83	2.275	0.652–7.936	13.75**	2.682–70.49
West	0.736	0.170–3.198	0.313	0.035–2.776	0.350	0.067–1.819	0.455	0.125–1.651

<sup>a</sup> Imposes penalized likelihood (i.e., the Firth method) to reduce the bias associated with modeling rare events with maximum likelihood estimation (King and Zeng, 2001).

<sup>b</sup> Represents standard deviation units.

<sup>c</sup> No states in the northeast have PE MVPA time requirements.

## Discussion

Our study is the first to describe variation in state elementary school PE laws included in C.L.A.S.S. and associations between state PE policy enactment and education funding, academic achievement, socio-demographic disadvantage, and political characteristics. We found that most states did not have strong/specific PE laws, and the enactment of one strong/specific law was not universally associated with the enactment of other strong/specific laws. Having a law with a specific PE time requirement was related to having a law with a PE MVPA time requirement and with having a strong fitness assessment requirement, suggesting that these laws may be perceived by state policymakers as facilitating common PA goals. It is also noteworthy that having a strong fitness assessment law is positively related to having a law with a specific PE time requirement, lending credence to the notion that having specific outcome expectations for PE may be a key to sustaining or potentially increasing PE minutes.

Given that funding has been found to be a primary barrier to enacting measures to improve PE at the school- and district-levels (Lounsbury et al., 2011), our finding of no statistical association between funding-related education variables and state PE laws was unexpected. It is possible that lack of statistical power prohibits us from detecting significant differences, but this is unlikely given that we found statistical significance for several other variables. Our findings suggest that state school funding levels alone do not facilitate or prohibit the passage of PE laws. It may be that current funding levels do not adequately support core academic programs, so even states with comparatively greater funding levels are not able to support policies to improve PE. Alternatively, it is possible that state-level funding is not associated with PE policy enactment because PE is simply not a priority (San Diego State University, 2007).

Another important finding was related to school day length. States with a longer average school day had almost 14 times greater odds of enacting an evidence-based PE curriculum standard. This finding lends support to findings from recent studies indicating that shorter school days pose barriers to school PA programs (Lounsbury et al., 2011, 2013). Stakes for state demonstration of achievement outcomes have never been higher (Dee and Jacobs, 2010; Nichols et al., 2006). Within the limited school day and year, school leaders are forced to adhere to strict prioritization of core academic programs to achieve federal testing standards, often leading to cuts to non-core programs like PE (McMurrer, 2008). Some state leaders may view an evidence-based curriculum standard as something that would require too much time investment for schools.

Relatedly, we found that academic achievement, as proxied by 4th and 8th grade math and reading test scores, was inversely associated with the enactment of PE laws, particularly those related to PE time, PE MVPA time and evidence-based curriculum standards. These findings lend further support to the notion that core academic programs are often prioritized, leaving less time and planning for non-core areas like PE. Even though research has shown that when schools allocate daily time to PE and other PA programming, academic achievement is either maintained or improved (Caterino and Polack, 1999; CDC, 2010a; Coe et al., 2006; Dwyer et al., 2001; McNaughten and Gabbard, 1993; Sallis et al., 1999), the threat of sacrificing higher achievement scores may be used as a convincing lobby against legislative measures that would require greater resources to non-core subjects. Perhaps if education was more adequately funded, lawmakers and school officials alike would have greater motivation and capacity to place more emphases on improving non-core subjects, like PE.

As found in previous studies examining correlates of other state policy choices (Soss et al., 2001; Stebbins and Knitzer, 2007), we found that the sociodemographic characteristics of state residents were important predictors of the enactment of strong/specific PE laws. States with more disadvantaged populations had significantly greater odds of enacting laws with specific PE time requirements, PE MVPA time requirements,

and PE curriculum laws that reference NASPE or another agency. One possibility for our findings may be that the role of schools is perceived more broadly and includes the prioritization of PA programming in states with more sociodemographically disadvantaged populations. Conversely, in more socioeconomically advantaged states, the role of schools may be perceived to be more narrowly focused on academic achievement because enrichment programming for children is provided outside of school and/or parents in more advantaged states have more political power to influence lawmakers to focus more narrowly on academic performance. It is also possible that because health problems related to physical inactivity (e.g., high rates of obesity, diabetes, heart disease, and other related diseases) are more pronounced in socio-demographically disadvantaged states (CDC, 2010b, 2012), schools in those states are given a broader mandate to help tackle those issues. These findings should also be considered in light of our findings related to region. We found greater odds of having a specific PE time requirement and of referencing evidence-based curriculum standards in southern states compared to non-southern states. Some of our findings related to sociodemographic disadvantage may reflect long-term political, social, and cultural legacies that are unique to regions, especially the south.

Our findings related to testing outcomes and sociodemographic disadvantage also suggest the interrelated nature of these characteristics with PE laws. States with socioeconomically disadvantaged populations are also the states most likely to have low academic testing scores. Unfortunately, we cannot test the extent to which sociodemographic disadvantage mediates associations between test scores and PE laws because disadvantage and test scores were very strongly correlated (i.e., greater than .70), preventing concomitant inclusion in the same regression models.

Finally, the finding that percent childhood obesity is positively associated with referencing and incorporating language from NASPE or other organization in the state PE curriculum standards suggests the possibility that states are attempting to combat the childhood obesity epidemic through evidence-based PE curriculum standards.

## Limitations

Our study was confined to the sociodemographic, political, education system, and educational testing characteristics we examined and the years for which those variables were available. Because our study is focused on correlates of policy enactment, we are unable to address causality. In addition, we were restricted to examining bivariate associations because we did not have the statistical power to adjust our regression models for concomitant state-level characteristics. Given that several of those characteristics are strongly correlated, there is risk of confounding. Finally, we relied on C.L.A.S.S. codified PE laws data and scoring as our outcome variables. Hence, our associational analyses are limited to the enactment of state PE laws rather than to actual school- or district-level implementation of those policies. As has been demonstrated in previous research, the existence of PE laws does not necessarily translate to full or even partial implementation of those laws at the district or school level (Lounsbury et al., 2013). Indeed, it is clear from existing research that despite stronger PE laws in low-SES and high percent black states, low-SES and black children receive less PE and PA than their white and more affluent counterparts (San Diego State University, 2007; Whitt-Glover et al., 2009). Compliance with state PE mandates is important, given that district compliance with state-level policies is positively associated with meeting or exceeding fitness standards (Sanchez-Vaznaugh et al., 2012).

## Conclusions

We found many significant predictors of state PE laws related to PE time, PE MVPA time, PE staffing, and curriculum standards. Educational testing outcomes and sociodemographic composition were the most

salient predictors of state enactment of these laws. Our results suggest that even if states are interested in passing laws to improve PE, bills that require additional time and staffing may face greater barriers to passage into law. We did not find that school day length was associated with PE time requirements, but time is still important because states must achieve testing outcome standards within existing school-day time constraints. In order to facilitate state PE policy enactment, it may be necessary to extend the school day or for advocates to provide evidence to state lawmakers illustrating how PE policies can be accomplished within existing time and staffing structures.

Ultimately, additional studies are needed to more fully understand catalysts for passage of polices to improve PE and other school PA programs. Specifically, studies which more fully examine associations between state legislative contexts, broader political and historical contexts, and passage of school PE laws are needed. Research of this nature could help guide legislative advocacy efforts aimed at improving PE. Additionally, studies aimed at providing greater insight into the independent and collective roles of school day length and school funding are needed. Some schools with more sociodemographically disadvantaged populations receive supplemental federal pass-through funding (e.g., Title I and II funds) to enrich programs for targeted students or to improve school programs generally. No study to date has examined the relationship between school receipt of Title I and Title II funds and measures to improve school PE or PA programs. Given the importance of increasing disadvantaged children's access to PE, such a study may provide insight into additional policy options as a condition of funding receipt.

#### Conflict of interest

The authors declare this is no conflict of interest.

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#### Appendix A. Variable data sources

Variables	Source	Years
Total expenditures per pupil, expenditure on instruction per pupil, total revenue per pupil, total state revenue per pupil, % of education revenue coming from the state, number of students, pupil-to-teacher ratio	National Center for Education Statistics, common core of data, <a href="http://nces.ed.gov/programs/stateprofiles/sresult.asp?mode=short&amp;s1=01">http://nces.ed.gov/programs/stateprofiles/sresult.asp?mode=short&amp;s1=01</a>	2003–2010
Elementary school day length <sup>a</sup>	National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire", <a href="http://nces.ed.gov/surveys/sass/dataproducts.asp">http://nces.ed.gov/surveys/sass/dataproducts.asp</a>	2007–2008
Educational testing outcomes	National Assessment of Educational Progress, <a href="http://nces.ed.gov/nationsreportcard/">http://nces.ed.gov/nationsreportcard/</a>	2003, 2005, 2007, 2009
Percent black residents, percent child poverty, percent poverty, percent female heads of household	US Census Bureau American Community Survey, 1-year state estimates	2003–2010
Percent of students eligible for free/reduced lunch	National Center for Education Statistics, common core of data, Table 1, <a href="http://nces.ed.gov/ccd/tables/2000_schoollunch_01.asp">http://nces.ed.gov/ccd/tables/2000_schoollunch_01.asp</a>	2003–2010

(continued)

Variables	Source	Years
Percent black students	National Center for Education Statistics, common core of data, state nonfiscal public elementary/secondary education survey data, <a href="http://nces.ed.gov/ccd/stnfs.asp">http://nces.ed.gov/ccd/stnfs.asp</a>	2003–2010
Percent childhood obesity	Data Resource Center for Child & Adolescent Health, national survey of children's health	2003
State governor party	National Governors Association	2003–2012
State house and senate party control	LexisNexis StateNet, <a href="http://www.statenet.com/">http://www.statenet.com/</a>	2003–2012

<sup>a</sup>School day length reflects data reported by schools, not the state requirement. School reported length of day may exceed state requirements.

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