

ONLINE FIRST

The Impact of State Laws and District Policies on Physical Education and Recess Practices in a Nationally Representative Sample of US Public Elementary Schools

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Objective: To examine the impact of state- and school district-level policies on the prevalence of physical education (PE) and recess in a nationally representative sample of US public elementary schools.

Design: Analyses from annual, nationally representative, cross-sectional surveys of school administrators in the United States.

Setting: Data were collected through surveys conducted between February and June during the 2006-2007 through 2008-2009 school years. State laws and district policies were compiled annually by researchers at the University of Illinois at Chicago using established legal research techniques.

Participants: The sample size was 47 states, 690 districts, and 1761 schools.

Main Exposures: State- and school district-level PE and recess-related laws

Main Outcome Measures: Twenty minutes of daily recess and 150 min/wk of PE.

Results: The odds of schools having 150 min/wk of PE increased if they were located in states (odds ratio [OR], 2.8; 95% CI, 1.3-5.7) or school districts (OR, 2.4; 95% CI, 1.3-4.3) having a law or policy requiring 150 min/wk of PE. Schools located in states with laws encouraging daily recess were significantly more likely to have 20 minutes of recess daily (OR, 1.8; 95% CI, 1.2-2.8). District policies were not significantly associated with school-level recess practices. Adequate PE time was inversely associated with recess and vice versa, suggesting that schools are substituting one form of physical activity for another rather than providing the recommended amount of both recess and PE.

Conclusion: By mandating PE or recess, policy makers can effectively increase school-based physical activity opportunities for youth.

Arch Pediatr Adolesc Med. 2012;166(4):311-316.

Published online December 5, 2011.

doi:10.1001/archpediatrics.2011.1133

THE PHYSICAL ACTIVITY Guidelines for Americans¹ recommend that school-aged youth (ages 6-18 years) get 60 minutes or more of moderate to vigorous physical activity (MVPA) daily. Children spend the

*For editorial comment
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majority of their waking hours in school, thus schools are important locations to focus obesity prevention activities, such as increasing physical activity (PA) opportunities.² During the typical school day children have 3 potential opportunities for PA: (1) physical education (PE) classes, (2) recess, and (3) other unstructured physical activities such as PA breaks or before and after school activities.

Physical education class can increase daily PA levels of children³ and more weekly hours of school-based PE have also been shown to encourage favorable PA behaviors in adulthood.³ Physical activity has also been linked to positive influences on concentration, memory, classroom behavior,⁴ and overall academic achievement.^{5,6} The national recommendation for school PE—endorsed by the National Association of Sport and Physical Education (NASPE)⁷ and the American Heart Association⁸—is that elementary school students be offered at least 150 min/wk of PE. However, fewer than 20% of third grade students at public elementary schools in the United States were offered this amount during the 2007-2008 school year.⁹

Recess also provides another important opportunity for regular PA, particularly among elementary school students.

It has been shown to be a good source of PA¹⁰⁻¹² and can account for up to half of the recommended 60 minutes of MVPA.¹⁰ The unstructured nature of recess provides students discretionary time to be active while playing. Participating in recess is associated with teacher reports of better student classroom behavior, better focus, and less fidgeting among students.¹³⁻¹⁶ The NASPE recommends that all elementary school students be provided with at least 1 daily session of recess for a period of at least 20 minutes.¹⁷ While only a few studies have examined the impact state-level policies have on the amount of time allocated to PE and/or PA during the school day, all show an increase in the number of weekly PE minutes after the passage of a state law.¹⁸⁻²⁰ However, implementation of state policy varied across the affected school districts^{19,20} and some schools cited competing time demands as a barrier to full implementation.¹⁹ A limitation of these studies was that they examined individual states, did not account for additional policies at the school district level, and only focused on PE and/or PA without examining recess-related policies. We build on existing evidence by examining the impact of state- and school district-level policies on the prevalence of PE and recess in a nationally representative sample of US public elementary school; to our knowledge, this is the first study to do this. We focused on PE and recess because these are 2 primary opportunities for in-school PA time at the elementary level.

METHODS

Our study collects information on food environments and PA in elementary school, as well as district-level policy data from corresponding school districts, and relevant state laws. This study was approved by the University of Illinois at Chicago (UIC) institutional review board.

SAMPLE

Our nationally representative samples were developed at the Institute for Survey Research at the University of Michigan, using sampling frames based on the National Center for Education Statistics Common Core of Data.²¹ Because elementary schools vary in grade composition (eg, kindergarten to third grade, second to fifth grade), all schools were required to include a third grade. Public schools from all coterminous US states (excluding Alaska and Hawaii) were eligible for sampling. School weights adjusted for potential nonresponse bias by modeling every school's propensity to respond based on the following: student enrollment; school racial/ethnic composition; percentage of students eligible for free or reduced-cost lunch; region; and urbanicity.

STATE-LEVEL DATA

State PE and recess-related laws effective as of September 2006, 2007, and 2008 were compiled by UIC researchers²² using primary legal research techniques^{23,24} through searches of the Lexis and Westlaw state statutory and administrative law databases (September of each year was chosen as reflective of the laws in place as of the beginning of each school year, 2006-2007, 2007-2008, and 2008-2009). The state law information was validated against secondary source compilations available from the Trust for America's Health annual *F as in FAT* reports,²⁵⁻²⁸ the National Association of State Boards of Education State School

Health Policy Database,²⁹ and the National Conference of State Legislatures legislative summary reports.^{30,31}

Each state's laws were reviewed and analyzed by 2 coders to create 3-category variables, which focus on time requirements for PE and daily recess. The variables differentiate between strong (2), weak (1), and no policies (0). For the PE time variable, state laws were coded as follows: *strong* if they met the NASPE standard for time spent in PE by requiring that students receive 150 min/wk of PE; *weak* if they included a lesser requirement (ie, <150 min/wk) or suggested, but did not require, 150 min/wk; and *no policy* if they did not address PE time requirements. For recess, we examined if a state law existed requiring daily recess for elementary school students (2), if the state law encouraged or suggested daily recess (1), or if there is no state law addressing daily recess for elementary school (0).

SCHOOL DISTRICT-LEVEL DATA

Concurrent with school administrator surveys, researchers collected congressionally mandated school district (herein after "district") wellness policies.^{32,33} Wellness policies were required to include goals for PA and, although not required, nearly all addressed PE.^{32,33} District wellness policies and other relevant district policy documents (eg, regulations, curricula standards) were gathered for all corresponding districts that contained elementary schools in our sample for each of the school years. Wellness policies were gathered via Web site searches with telephone and mail follow-up, as necessary. Wellness and related policies were obtained from 94%, 94%, and 97% of all districts included in the sample for the 2006-2007, 2007-2008, and 2008-2009 study years, respectively. All district policies were double coded and analyzed by 2 trained researchers using the same coding scheme applied to the state laws and, for this analysis, the focus is on the district policies related to amounts of time required or suggested for PE and recess for elementary school students. All policies were coded to reflect policies in place as of the first day of each school year of interest (the day after Labor Day was used as the proxy for the first day of the school year).

SCHOOL-LEVEL DATA

Data were collected with mail-back school surveys conducted during school years 2006-2007, 2007-2008, and 2008-2009, primarily between February and June of each school year. Our survey was mailed to the school principal and a \$100 incentive was offered. Response rates calculated using the American Association for Public Opinion Research method 2³⁴—counting partial responses as complete—across the 3 years, were 54.6% (578 schools); 70.6% (748 schools); and 61.8% (641 schools), respectively.

Survey respondents were asked about the number of days per week and number of minutes for which each PE class was scheduled during a typical week for third-grade students. This information was combined to calculate the total minutes of PE weekly, and we calculated a dichotomous outcome variable according to the NASPE standard for 150 min/wk of PE (1) vs any amount less than 150 min/wk. Survey respondents were also asked to report on possible barriers to implementing or maintaining regular PE classes, each coded yes (1) or no (0), including the following: lack of necessary staff; inadequate indoor facilities/equipment; inadequate outdoor facilities; competing demands for teaching other subject areas; physical education is not a high priority for district administrators; no state or district policies requiring PE; and financial constraints.

Respondents were asked about scheduled recess during a typical week for third-grade students including the number of days per week, times per day, and total number of minutes per

day of recess. This information was combined to create a dichotomous outcome of whether students were offered at least 20 minutes of recess daily for every day of the week (1) or not (0), corresponding to national recommendations for recess. At schools without regularly scheduled recess, respondents were asked to indicate which of the following reasons why not, each coded as yes (1) or no (0): inadequate resources (eg, staff, facilities); or competing time demands for academics. Multiple approaches were tried for constructing the outcome variables and dichotomization was the best fit for the data.

To control for relevant school-level characteristics, demographic and socioeconomic data were obtained.²¹ We obtained data from the 2006-2007 Common Core of Data file for the corresponding year of survey data and from the 2007-2008 Common Core of Data file for the 2007-2008 and 2008-2009 survey data, since the 2008-2009 demographics were not available at the time of analysis. Variables included free or reduced-cost lunch, coded in tertiles (lowest tertile as the referent group); race/ethnicity of the schools' students, coded in 4 mutually exclusive and exhaustive categories of majority black, majority Hispanic, diverse (no majority race), or majority white (referent group); and locale, coded as suburb, rural, township, or city (referent group). The length of the school day, provided through the elementary school survey, was also included.

STATISTICAL ANALYSIS

This study is a stacked cross-sectional analysis of 1761 public elementary schools, nested within 690 districts and 47 states. Owing to the hierarchical nature of the data, 3-level Bernoulli logit models^{35,36} were used to examine the binary outcomes for recess and PE (described in the previous subsection), correctly adjusting the standard errors for the clustering of schools within districts and districts within states. Descriptive and regression analyses were weighted using school-level sampling weights. All data were prepared using the STATA/SE version 11 (StataCorp), analyzed using hierarchical linear model (HLM) 6.08 (Scientific Software International Inc), and used 2-sided tests with a significance level of .05.

Each model included demographic covariates and relevant PE barriers or recess barriers, as appropriate. In addition, because schools sometimes substitute recess time for formal PE class time, we included the recess variable as a covariate in predicting PE outcomes and vice versa for the recess outcome.

RESULTS

Table 1 presents descriptive statistics on the study sample. Approximately 70% of the schools in our sample offered at least 20 minutes of daily recess and 17.9% offered 150 min/wk of PE. The majority of states (83%) offered no daily recess law and less than half offered some kind of law addressing the recommended 150 min/wk of PE.

The PE model is presented in **Table 2**. The odds of schools meeting the NASPE recommendation of 150 min/wk of PE increased if they were located in states or school districts having a law or a policy requiring 150 min/wk of PE. Schools meeting the NASPE recommendation for recess were significantly less likely to meet the PE criterion (odds ratio [OR], 0.5; 95% CI, 0.4-0.7). Schools reporting PE not being a school priority were significantly less likely to have 150 min/wk of PE.

As noted in **Table 3**, several variables emerged as significant predictors of schools meeting the nationally recommended criterion of offering at least 20 minutes of daily

Table 1. Weighted Descriptive Percentages and Unweighted Numbers at the State, District, and School Levels^a

Factor	No.	% Yes
State-level factors (n=47 states)		
No state daily recess law	39	83.0
State law suggesting daily recess	5	11.0
State law requiring daily recess	3	6.0
No state PE time-related law	24	51.0
State law suggesting 150 min/wk of PE or requiring <150 min/wk	17	36.0
State law requiring 150 min/wk of PE	6	13.0
Region		
Northeast	9	19.0
Midwest	12	26.0
South	16	34.0
West	10	21.0
District-level factors (n=690)		
No district recess policy	442	64.0
District policy suggesting daily recess	117	17.0
District policy requiring daily recess	131	19.0
No district PE policy	462	67.0
District policy suggesting 150 min/wk of PE or requiring <150 min/wk	200	29.0
District policy requiring 150 min/wk of PE	28	4.0
School-level factors (n=1761)		
Outcomes		
Recess at least 20 min/d	1192	69.9
PE ≥150 min/wk	323	17.9
Barriers		
PE: lack of staff	327	18.6
PE: lack of indoor facilities	329	8.9
PE: lack of outdoor facilities	164	9.6
PE: competing demands	424	23.4
PE: PE not a school priority	98	5.7
PE: no PE policy	48	2.5
PE: financial constraints	288	16.6
Recess: lack of resources	30	1.7
Recess: time demands	168	8.8
Controls		
Locale		
City	496	29.9
Suburban	634	31.8
Rural	410	26.5
Township	221	11.9
Racial composition		
Majority white	873	50.4
Majority black	136	8.1
Majority Hispanic	240	12.8
No majority race	512	28.6
Free or reduced-cost lunch		
First tertile	609	32.4
Second tertile	643	37.8
Third tertile	509	29.8
School year		
2006-2007	515	33.1
2007-2008	670	33.6
2008-2009	576	33.2

Abbreviation: PE, physical education.

^aData are weighted using school-based sampling weights. There are no statistically significant differences in the sample across years. Mean (SD) length of school day is 6.6 (0.40) hours (range, 5.5-8.7 hours).

recess. Schools in states with policies encouraging daily recess had higher odds of having 20 minutes of recess daily (OR, 1.8; 95% CI, 1.2-2.8). District policies were not significantly associated with school-level recess practices. Adequate PE time was inversely associated with re-

Table 2. Multilevel, Multivariate Associations Between State and District Policy and Elementary School Physical Education Class Weekly Minutes for Third-Grade Students^a

Factor	PE ≥150 min/wk, Odds Ratio (95% CI)
State-level factors	
No state PE time-related law	1 [Reference]
State law suggesting 150 min/wk of PE or requiring <150 min/wk	1.4 (0.7-2.5)
State law requiring 150 min/wk of PE	2.8 (1.3-5.7)
Region	
Northeast	1 [Reference]
Midwest	1.6 (0.7-3.6)
South	3.2 (1.5-6.5)
West	1.7 (0.7-4.4)
District-level factors	
No district PE policy	1 [Reference]
District policy suggesting 150 min/wk of PE or requiring <150 min/wk	0.7 (0.4-1.1)
District policy requiring 150 min/wk of PE	2.4 (1.3-4.3)
School-level factors	
Recess at least 20 min/d	0.5 (0.4-0.7)
Lack of staff	0.7 (0.4-1.0)
Lack of indoor facilities	0.8 (0.5-1.3)
Lack of outdoor facilities	1.1 (0.7-1.8)
Competing demands	0.8 (0.5-1.2)
PE not a school priority	0.3 (0.2-0.7)
No PE policy	0.5 (0.1-2.1)
Financial constraints	0.9 (0.6-1.3)
Length of school day	2.7 (1.8-4.1)
Locale	
City	1 [Reference]
Suburban	0.8 (0.6-1.3)
Rural	1.1 (0.8-1.7)
Township	0.8 (0.5-1.2)
Racial composition	
Majority white	1 [Reference]
Majority black	1.9 (1.1-3.6)
Majority Hispanic	0.7 (0.4-1.4)
No majority race	0.6 (0.4-0.9)
Free or reduced-cost lunch	
First tertile	1 [Reference]
Second tertile	1.1 (0.7-1.6)
Third tertile	1.2 (0.8-1.9)
School year	
2006-2007	1 [Reference]
2007-2008	0.8 (0.6-1.2)
2008-2009	1.0 (0.7-1.5)

Abbreviation: PE, physical education.

^aThe sample size was 47 states, 690 districts, and 1761 schools for all models. Statistically significant differences at $P < .05$ are in bold. Regressions are weighted using school-based sampling weights.

cess, with schools meeting the NASPE recommendations of at least 150 min/wk of PE being 50% less likely to meet the recess criterion. The odds of schools meeting the recess criterion were lower (OR, 0.2; 95% CI, 0.1-0.3) if the survey respondent reported competing time demands as a barrier. Predominantly white schools were more likely than all other racial/ethnic groups to have daily recess. Schools with the highest number of students receiving free or reduced-cost lunch were less likely to have 20 minutes of recess daily (OR, 0.50; 95% CI, 0.3-0.7). Finally, having a longer school day was posi-

Table 3. Multilevel, Multivariate Associations Between State and District Policy and Elementary Schools Offering 20 Minutes of Recess Daily to Third-Grade Students^a

Factor	Recess 20 Minutes Daily, Odds Ratio (95% CI)
State-level factors	
No state daily recess law	1 [Reference]
State law suggesting daily recess	1.8 (1.2-2.8)
State law requiring daily recess	0.8 (0.5-1.4)
Region	
Northeast	1 [Reference]
Midwest	1.4 (0.7-3.0)
South	0.4 (0.3-0.8)
West	2.6 (1.5-4.6)
District-level factors	
No district recess policy	1 [Reference]
District policy suggesting daily recess	1.2 (0.7-1.9)
District policy requiring daily recess	1.2 (0.8-1.8)
School-level factors	
PE class ≥150 min/wk	0.5 (0.4-0.6)
Limited resources	0.7 (0.3-1.5)
Competing time demands	0.2 (0.1-0.3)
Length of school day	1.8 (1.2-2.9)
Locale	
City	1 [Reference]
Suburban	0.7 (0.4-1.1)
Rural	0.9 (0.5-1.9)
Township	0.7 (0.4-1.1)
Racial composition	
Majority white	1 [Reference]
Majority black	0.4 (0.2-0.8)
Majority Hispanic	0.4 (0.2-0.6)
No majority race	0.6 (0.4-0.9)
Free or reduced-cost lunch	
First tertile	1 [Reference]
Second tertile	0.8 (0.6-1.1)
Third tertile	0.5 (0.3-0.7)
School year	
2006-2007	1 [Reference]
2007-2008	1.0 (0.8-1.4)
2008-2009	1.1 (0.9-1.4)

Abbreviation: PE, physical education.

^aThe sample size was 47 states, 690 districts, and 1761 schools. Statistically significant differences at $P < .05$ are in bold. Data are weighted using school-based sampling weights.

tively associated with meeting the NASPE standards for both PE and recess.

COMMENT

To our knowledge, this is the first study to examine nationally the impact of state- and district-level policies on public elementary school PE and recess time practices. Results showed that state policies are associated with increased PE and recess time in elementary school. Having strong district-level PE laws was also associated with increased weekly PE minutes offered in schools. More importantly, although the federal wellness policy mandate did not require districts to address PE,³⁷ results show that having strong district-level PE policies increased the likelihood of schools having 150 min/wk or more of PE independent of the state having a strong PE law. We found

instances where districts adopted strong policies in states with weak or no policies (results not shown). We also found that the lack of necessary staff and the lack of PE as a district-level priority were barriers to having a greater number of weekly PE minutes. This finding coupled with results from a recent study showing that wellness policy provisions related to PA were weaker and less prominent than those related to nutrition³² highlights the need and importance of educating district administrators about the benefits to youth of receiving an adequate amount of daily PA, as well as providing schools with the necessary resources to fully implement new policies.

We found that weak, but not strong, state-level recess laws were associated with schools having at least 20 minutes of daily recess. However, only 3 states' laws (Delaware, Nebraska, and Virginia) in our sample required daily recess and less than 2% of our school sample was located in these states, thus we have too few schools impacted by these laws to detect a significant effect. We also found no association between the number of weekly recess minutes offered by schools and district recess policies; however, it is important to note that the wellness and related policies compiled for this study were not required to address recess, so it may be that districts have other or informal policies that address recess time but that are outside the scope of this study.

Consistent with previous research,¹⁹ we found that a barrier to meeting the national criterion for 20 minutes of recess daily was competing time demands. Results of both models showed schools that had either 20 minutes of daily recess or 150 min/wk of PE were less likely to have the other, although those with longer school days were more likely to meet the NASPE requirements. This suggests that schools are substituting one form of PA for another rather than providing the recommended amount of both recess and PE. With many districts placing greater emphasis on academic achievement, schools may be sacrificing PA time in lieu of more classroom instruction. Schools may need to be better informed about the growing evidence of the positive relationship between PA and academics.^{3-6,38} More research into this trade-off of school-based PA opportunities is warranted.

We also found that schools comprised primarily of racial and ethnic minority students as well as those containing the most socioeconomically disadvantaged students were less likely to offer at least 20 minutes of daily recess, with mixed racial and ethnic schools also receiving fewer weekly PE minutes. Latino and African American children have higher rates of being overweight or obese than their white counterparts, and the prevalence of obesity is significantly higher among low- vs high-income groups.³⁹ Lower-income youth also participate less in PA.⁴⁰ Existing evidence shows that students who are more physically active have lower body mass index scores than more sedentary youth,^{38,41} and that school-based PA has a positive effect on health outcomes and academic performance particularly among low-income and minority children.⁵ Therefore, it is important to develop strategies to increase the number of minutes of recess offered specifically for these vulnerable populations most at risk to acquire the many health complications associated with obesity.

There are several limitations that should be noted in our study. First, the cross-sectional design limits causal interpretation. However, this study provides valuable insight into how state-level and district-level policies can have an impact on school-based PA opportunities. Second, our sample only examined public elementary schools. Not all state laws apply to private schools, and we did not have comparable district policies for private schools. Future research should examine private school policies and practices, as well as how state-level and school district-level policies affect both middle and high schools. Third, there is potential for response bias because we used self-report school administrator data. However, similar measures have previously been shown to be reliable and valid.⁴² Fifth, data were unavailable for youth PA behavior during PE and recess (eg, percentage of time in MVPA), or weight outcomes such as body mass index. Future research should include these measures to better understand how these programs and related policies are associated with students' health outcomes. Sixth, state and district recess policies only captured provisions for daily recess and did not capture the amount of time required/encouraged each day. We are compiling the daily recess time requirements starting with school year 2009-2010 and will be able to examine whether varying daily recess time requirements are associated with school recess practices. Seventh, PE and recess time are endogenous, which may bias the results, and cannot be adjusted using HLM. Eighth, we did not have sufficient statistical power using HLM to estimate the separate effects of state and district level policies requiring less than 150 min/wk of PE and those suggesting 150 min/wk of PE or more. Finally, states and districts may have noncodified or informal policies or guidance-related policies to PE time or recess not captured by this study. However, given that such informal policies would not carry the force of law, they were not compiled for this study.

In conclusion, given the amount of time youth spend in school and the importance of PA, our study provides important information for policy makers. Our results show that mandating only increased PE or recess time does not result in more overall PA as schools and/or districts appear to compensate for any increased PA in one area by decreasing other PA opportunities. To increase school-based PA, policy makers may need to mandate more of both PE and recess time.

Submitted for Publication: June 16, 2011; final revision received September 28, 2011; accepted October 6, 2011.

Published Online: December 5, 2011. doi:10.1001/archpediatrics.2011.1133

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Author Contributions: Dr Slater had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Slater, Chriqui, Turner, and Chaloupka. *Acquisition of data:* Slater, Nicholson, Chriqui,

Turner, and Chaloupka. *Analysis and interpretation of data: Slater, Nicholson, Chiqui, and Chaloupka. Drafting of the manuscript: Slater and Nicholson. Critical revision of the manuscript for important intellectual content: Nicholson, Chiqui, Turner, and Chaloupka. Statistical analysis: Slater, Nicholson, and Chaloupka. Obtained funding: Turner and Chaloupka. Administrative, technical, and material support: Chiqui and Turner.*

Financial Disclosure: None reported.

Funding/Support: Support for this study was provided by The Robert Wood Johnson Foundation to the Bridging the Gap Program at the University of Illinois at Chicago. Dr Slater's time for this study was supported in part by a grant from the National Institute on Child Health and Human Development (grant K99 HD055033).

Role of the Sponsors: The views expressed are those of the authors and do not necessarily reflect the views of the sponsors or UIC.

Additional Contributions: Linda Schneider, DC, MS, Camille Gourdet, JD, MA, Kristen Ide, RD, MS, and Amy Bruursema, MS, provided support for state and district policy research and analysis; Steven Horvath, support for policy-related data entry; and Anna Sandoval, MPH, support for the elementary survey data collection.

REFERENCES

1. US Department of Health and Human Services. *Physical Activity Guidelines for Americans*. Washington, DC: US Dept of Health and Human Services; 2009.
2. Story M, Nannery MS, Schwartz MB. Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. *Milbank Q*. 2009;87(1):71-100.
3. Trudeau F, Shephard RJ. Contribution of school programmes to physical activity levels and attitudes in children and adults. *Sports Med*. 2005;35(2):89-105.
4. Trudeau F, Shephard RJ. Physical education, school physical activity, school sports and academic performance. *Int J Behav Nutr Phys Act*. 2008;5:10.
5. Efrat M. The relationship between low-income and minority children's physical activity and academic-related outcomes: a review of the literature. *Health Educ Behav*. 2011;38(5):441-451.
6. Roberts CK, Freed B, McCarthy WJ. Low aerobic fitness and obesity are associated with lower standardized test scores in children. *J Pediatr*. 2010;156(5):711-718, 718, e1.
7. National Association for Sport and Physical Education (NASPE). *Moving Into the Future: National Standards for Physical Education*. 2nd ed. Reston, VA: NASPE; 2004.
8. Policy Position Statement on Physical Education in Schools. Dallas, TX: American Heart Association; 2008. http://www.heart.org/idc/groups/heart-public/@wcm/@adv/documents/downloadable/ucm_301654.pdf. Accessed October 27, 2011.
9. Turner L, Chaloupka FJ, Chiqui JF, Sandoval A. School policies and practices to improve health and prevent obesity: National Elementary School Survey results: school years 2006-07 and 2007-08. Vol 1. Chicago, IL: Bridging the Gap Program, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago; 2010. <http://www.bridgingthegapresearch.org>. Accessed March 5, 2011.
10. Guinhouya BC, Lemdani M, Vilhelm C, Hubert H, Ap  t   GK, Durocher A. How school time physical activity is the "big one" for daily activity among schoolchildren: a semi-experimental approach. *J Phys Act Health*. 2009;6(4):510-519.
11. Beighle A, Morgan CF, Le Masurier G, Pangrazi RP. Children's physical activity during recess and outside of school. *J Sch Health*. 2006;76(10):516-520.
12. Mota J, Silva P, Santos MP, Ribeiro JC, Oliveira J, Duarte JA. Physical activity and school recess time: differences between the sexes and the relationship between children's playground physical activity and habitual physical activity. *J Sports Sci*. 2005;23(3):269-275.
13. Barros RM, Silver EJ, Stein REK. School recess and group classroom behavior. *Pediatrics*. 2009;123(2):431-436.
14. Jarrett OS, Maxwell DM, Dickerson C, et al. The impact of recess on classroom behavior: group effects and individual differences. *J Educ Res*. 1998;92(2):121-126.
15. Pellegrini AD, Huberty PD, Jones I. The effects of recess timing on children's playground and classroom behaviors. *Am Educ Res J*. 1995;32(4):845-864.
16. Roth J, Brooks-Gunn J, Linver M, et al. What happens during the school day? time diaries from a national sample of elementary school teachers. *Teach Coll Rec*. 2003;105(3):317-343.
17. National Association for Sport and Physical Education (NASPE). *Comprehensive School Physical Activity Programs: Position Statement*. Reston, VA: National Association for Sport and Physical Education; 2008.
18. Barroso CS, Kelder SH, Springer AE, et al. Senate Bill 42: implementation and impact on physical activity in middle schools. *J Adolesc Health*. 2009;45(3) (Suppl):S82-S90.
19. Evenson KR, Ballard K, Lee G, Ammerman A. Implementation of a school-based state policy to increase physical activity. *J Sch Health*. 2009;79(5):231-238, quiz 244-246.
20. Kelder SH, Springer AS, Barroso CS, et al. Implementation of Texas Senate Bill 19 to increase physical activity in elementary schools. *J Public Health Policy*. 2009;30(suppl 1):S221-S247.
21. National Center for Education Statistics (NCES). US Department of Education. Institute of Education Sciences, National Center for Education Statistics, 2006-2007. <http://nces.ed.gov>. Accessed January 8, 2010.
22. Chaloupka FJ, Johnston LD. Bridging the Gap: research informing practice and policy for healthy youth behavior. *Am J Prev Med*. 2007;33(4)(suppl):S147-S161.
23. Mersky RM, Dunn DJ. *Fundamentals of Legal Research*. 8th ed. New York, NY: Foundation Press; 2002.
24. Cohen ML, Olson KC. *Legal Research in a Nutshell*. 6th ed. St Paul, MN: West Publishing Co; 1996.
25. Trust for America's Health. *Fas in FAT: How Obesity Policies Are Failing America*. Washington, DC: Trust for America's Health; 2006.
26. Trust for America's Health. *Fas in FAT: How Obesity Policies Are Failing America*. Washington, DC: Trust for America's Health; 2007.
27. Trust for America's Health. *Fas in FAT: How Obesity Policies Are Failing America*. Washington, DC: Trust for America's Health; 2008.
28. Trust for America's Health. *Fas in FAT: How Obesity Policies Are Failing America*. Washington, DC: Trust for America's Health; 2009.
29. National Association of State Boards of Education (NASBE). State School Health Policy Database. Arlington, VA: NASBE. 2010. http://nasbe.org/healthy_schools/hs/index.php. Accessed May 29, 2010.
30. National Conference of State Legislatures. Database for state legislation on health topics. 2006.
31. National Conference of State Legislatures. Childhood obesity—update of legislative policy options. Washington, DC: National Conference of State Legislatures; December 2010. <http://www.ncsl.org/default.aspx?tabid=22156>. Accessed April 10, 2011.
32. Chiqui JF, Schneider L, Chaloupka FJ, Ide K, Pugach O. *Local Wellness Policies: Assessing School District Strategies for Improving Children's Health*. Chicago, IL: Bridging the Gap, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago; 2009.
33. Chiqui JF, Schneider L, Chaloupka FJ, et al. School district wellness policies: evaluating progress and potential for improving children's health three years after the federal mandate: school years 2006-07, 2007-08 and 2008-09. Vol. 2. Chicago, IL: Bridging the Gap Program, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago; 2010. <http://www.bridgingthegapresearch.org>. Accessed March 5, 2011.
34. Smith TW; American Association for Public Opinion Research. A revised review of methods to estimate the status of cases with unknown eligibility. 2009. http://www.aapor.org/AM/Template.cfm?Section=Standard_Definitions1&Template=/CM/ContentDisplay.cfm&ContentID=1815. Accessed February 20, 2011.
35. Raudenbush SW, Bryk AS. *Hierarchical Linear Models: Applications and Data Analysis Methods*. Newbury Park, CA: Sage; 2002.
36. Guo G, Zhao H. Multilevel modeling for binary data. *Annu Rev Sociol*. 2000;26(1):441-462.
37. Child Nutrition and WIC Reauthorization Act of 2004. Pub L No. 108-265,   204.
38. Strong WB, Malina RM, Blimkie CJR, et al. Evidence based physical activity for school-age youth. *J Pediatr*. 2005;146(6):732-737.
39. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003-2006. *JAMA*. 2008;299(20):2401-2405.
40. Crespo CJ, Ainsworth BE, Keteyian SJ, Heath GW, Smit E. Prevalence of physical inactivity and its relation to social class in US adults: results from the Third National Health and Nutrition Examination Survey, 1988-1994. *Med Sci Sports Exerc*. 1999;31(12):1821-1827.
41. Hollar D, Lombardo M, Lopez-Mitnik G, et al. Effective multi-level, multi-sector, school-based obesity prevention programming improves weight, blood pressure, and academic performance, especially among low-income, minority children. *J Health Care Poor Underserved*. 2010;21(2)(suppl):93-108.
42. Brener ND, Kann L, Smith TK. Reliability and validity of the of the school health policies and programs study 2000 questionnaires. *J Sch Health*. 2003;73(1):29-37.