

Impact of Physical Education Litigation on Fifth Graders' Cardio-Respiratory Fitness, California, 2007–2018

Hannah R. Thompson, PhD, MPH, Rucker C. Johnson, PhD, Kristine A. Madsen, MD, MPH, and Bruce Fuller, PhD

Objectives. To examine the impact of physical education (PE) litigation on changes in cardio-respiratory fitness among racially/ethnically and socioeconomically diverse students.

Methods. We used annual school-level data for all California schools with measures of fifth graders' cardio-respiratory fitness spanning 2007–2008 through 2017–2018. A difference-in-difference design assessed changes before and after lawsuits in the proportion of students meeting fitness standards in schools in districts that were parties to PE lawsuits ($n = 2715$) versus in schools in districts not involved ($n = 3152$). We ran separate models with the proportion of students meeting fitness standards by sex, race/ethnicity, and low-income status as outcomes.

Results. PE litigation led to a 1-percentage-point increase in the proportion of fifth-grade students meeting cardio-respiratory fitness standards (95% confidence interval [CI] = 0.03%, 2.0%). Effects were especially pronounced for female (1.3-percentage-point increase; 95% CI = 0.1%, 2.5%), African American (3.4-percentage-point increase; 95% CI = 0.5%, 6.2%), and low-income (2.8-percentage-point increase; 95% CI = 0.5%, 6.0%) students.

Conclusions. Schools in districts subject to PE litigation showed greater improvements in student fitness, particularly among students typically at higher risk for inactivity and low fitness. Litigation may be an impactful tool for enforcing PE provision in accordance with the law. (*Am J Public Health*. Published online ahead of print September 19, 2019; e1–e7. doi:10.2105/AJPH.2019.305264)

School physical education (PE) is a critical venue for improving youth health. Students have been shown to accumulate more than one third of the recommended daily 60 minutes of moderate-to-vigorous physical activity during PE class.¹ Furthermore, PE participation has been shown to improve youth cardiovascular fitness as well as to support the skill development, knowledge acquisition, and behaviors that enable an active lifestyle.^{2–4} PE is also positively related to scholastic achievement, including increased cognitive skills, academic behavior, and success.^{5,6}

As of 2016, 19 states (38%) had education laws requiring a minimum number of PE minutes students should receive.⁷ In California, the state with the largest public school system in the nation, education law mandates that elementary students receive 200 minutes

of PE every 10 days—the equivalent of 20 minutes per day.⁸ While the existence of PE laws demonstrates the value and importance of PE, schools, especially at the elementary level, are often noncompliant because of the dearth of resources (including funding and PE teachers) to support PE.^{9–11}

In 1 California study, half of the 55 randomly selected elementary districts examined were shown to be noncompliant with the state PE law.¹² Noncompliant districts have a

higher proportion of Latino/a and African American students and a higher proportion of students who are low-income (as measured by eligibility for free or reduced-price meals) than do compliant districts.¹² In addition, students in noncompliant districts are less likely to meet physical fitness standards.¹² As a result, unequal provision of PE may be a contributor to racial/ethnic- and income-related health disparities.^{13,14} Furthermore, given that girls are less likely to be physically fit than boys,¹⁵ it is possible that unequal PE provision is also associated with sex-related disparities.

In an effort to ensure compliance with the California state PE law, 4 separate lawsuits were filed between 2010 and 2015 against 128 California school districts that were shown to be noncompliant. The first lawsuit was filed in 2010 against a single school district and settled in 2012.¹⁶ A second suit was filed in 2013 against 37 districts and settled in 2015.¹⁷ Two additional lawsuits were later filed by the same plaintiff (Cal200: a group led by a public-school parent advocating the 200 minutes of PE every 10 days mandated by state education law): the third in 2014¹⁸ naming just 1 district (which settled in 2015) and the fourth in 2015 naming an additional 89 districts¹⁹ (some districts in this suit have settled; others are still litigating). Settlement requirements have varied slightly across the 4 lawsuits; however, all have mandated that schools teach the required PE minutes, and the 3 filed in 2013 and later required that schools and districts implement tracking of PE

ABOUT THE AUTHORS

Hannah R. Thompson and Kristine A. Madsen are with the School of Public Health, University of California, Berkeley. Rucker C. Johnson is with the Goldman School of Public Policy, University of California, Berkeley. Bruce Fuller is with the Graduate School of Education, University of California, Berkeley.

Correspondence should be sent to Hannah R. Thompson, School of Public Health, University of California, Berkeley, 2115 Milvia St, Third Floor, Berkeley, CA 94704 (e-mail: thompsonh@berkeley.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

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class time and reporting systems to ensure schools are accountable for delivering required PE minutes.

Only 1 previous study has examined the impact of PE litigation on PE delivery.²⁰ In that qualitative study, schools that were parties to the lawsuits reported a greater increase in PE minutes than did control schools, primarily because of lawsuit settlement requirements that mandated PE tracking and reporting, which increased accountability for PE. However, the impact of litigation on PE law compliance has yet to be quantitatively verified with data from all schools affected in a particular state, nor have their impacts on student outcomes been assessed.

The succession of PE lawsuits in California, coupled with the availability of public-school student physical fitness testing data for nearly all schools in the state,²¹ provides a unique opportunity to examine the impact of PE litigation on an important student health outcome. Previous research has demonstrated a positive association between PE provision and student cardiorespiratory health^{12,22,23}; if the PE lawsuits increased compliance with PE laws, students in lawsuit districts should have received more PE minutes, which would have a positive impact on their aerobic fitness.

The purpose of this study was to analyze the impacts of court order–induced increases in PE provision in elementary schools on students' cardiorespiratory fitness. We used annual school-level data for all California schools with measures of fifth graders' cardiorespiratory fitness spanning 2007–2008 through 2017–2018. We used a difference-in-difference design that exploited the timing of PE litigation to assess resultant changes in cardiorespiratory fitness following the lawsuits among students in schools in districts that were parties to the lawsuits compared with the corresponding changes for students from those same schools before the PE litigation (and for students in schools in districts not involved in the lawsuits).

METHODS

We compiled data on all schools in California public-school districts that served elementary (kindergarten [K]–fifth grade) students between the 2007–2008 school year

(SY) and the 2017–2018 SY. Our main analysis sample included schools that had publicly available nonmissing fifth-grade student cardiorespiratory fitness data during at least 1 study year ($n = 5867$ schools from 829 districts), representing 94% of elementary schools in the state (and nearly 4.8 million student-year observations). There were 2715 schools in districts that were parties to PE lawsuits and 3152 schools in districts not parties to a lawsuit. Schools in districts educating students in grades K through 5 were the focus of this study because the PE lawsuits were filed for noncompliance with the elementary PE law.²⁴ Although the elementary PE law also applies in grade 6, the majority of sixth graders in California are educated in middle schools (sixth–eighth grades), which are structurally different from elementary schools (with PE teachers on staff and set schedules for students, which affect PE provision); thus middle schools (sixth–eighth grade) and higher were excluded from this study.

Physical Education Lawsuits

A total of 128 California school districts, representing 48% of elementary-school students in the state, were parties to an elementary PE lawsuit between 2010 and 2015 (1 district was missing student cardiorespiratory fitness data and was not included in this analysis). We obtained information on the lawsuits, date of lawsuit settlements, and the districts involved from court filings and the filing attorney.^{17–19} Sixty-six districts (52%) had settled their lawsuits at the time of this analysis. We used the timing of being named as a party to a lawsuit as our primary predictor, as previous research on court-order–induced school finance reform has shown that the timing of the initial litigation is more plausibly exogenous to resultant changes in school resource inputs than the timing of final lawsuit settlements and implementation.²⁵ We also included the 702 districts in California educating K through fifth-grade students that were not parties to PE lawsuits in our analyses.

Student Fitness and Demographic Data

In the spring of each school year, California fifth-, seventh-, and ninth-grade public-school students participate in the

FitnessGram, a battery of 6 fitness tests assessing aerobic capacity, strength, and flexibility. Aerobic capacity is evaluated using estimates of $VO_2\max$ (maximal oxygen uptake), which reflects the maximum rate at which the cardiovascular, respiratory, and muscular systems take in, transport, and use oxygen during physical activity. $VO_2\max$ is assessed by (1) a timed mile run, (2) the Progressive Aerobic Cardiovascular Endurance Run (PACER) Test, also known as the Beep Test; or (3) a walk test.²⁶ FitnessGram data are publicly available through the California Department of Education (CDE).²¹ The CDE data provide the proportion of students in each grade meeting sex- and age-appropriate $VO_2\max$ standards. A student who meets the standards is considered to be in the Healthy Fitness Zone (HFZ) for aerobic capacity. School-level data are available for all students, and by student sex, race/ethnicity, and free or reduced-price meal eligibility (a proxy for living in a low-income household). Data are available only for schools with more than 10 students, so for some of the subgroup analyses we report, schools with suppressed data have been excluded.

We obtained school-level socioeconomic and demographic data for all study years from the CDE,²¹ including student enrollment, student race/ethnicity, proportion of low-income students as measured by free or reduced-price meal eligibility, and proportion of English-language learners. We downloaded data on school community-level poverty rate (defined as proportion of residents living at or below 150% of the federal poverty level within each school's zip code) from the US Census.²⁷

Analysis

To identify the effect of litigation-induced increases in PE provision on changes in student cardiorespiratory fitness, we used a difference-in-difference approach exploiting the timing of PE litigation as an instrument for PE provision at the school (and thus compliance with state law). The primary predictor was a binary indicator of having been involved in a PE lawsuit (0 in years before a lawsuit was filed in the district, 1 after a lawsuit was filed; hence, schools served as their own controls in years before litigation). The

primary outcome was the proportion of all fifth-grade students in the HFZ for aerobic capacity. Student outcomes were also analyzed in 7 separate models by subgroup, with the school-level proportion of male, female, African American, Asian, Latino/a, White, and low-income students in the HFZ for aerobic capacity as outcomes. (Because fitness outcomes by low-income status were only available from the CDE after 2010, this model was limited to school years 2010–2011 and later.)

Linear regression models included school fixed effects and year fixed effects, were weighted by fifth-grade student enrollment, and used robust standard errors clustered at the district level. The inclusion of year fixed effects accounted for statewide year-to-year changes attributable to both observable and unobservable factors. We accounted for time-varying school- and neighborhood-level factors through controls for student racial/ethnic composition, proportion of low-income students, proportion of English-language learners, number of fifth graders who took the FitnessGram, and school community-level poverty rates. Our empirical strategy essentially identified the effect of increased PE provision by examining changes in student fitness outcomes for children from the same school before and after PE litigation, and accounted for both statewide year-to-year changes attributable to other (observable and unobservable) factors and other observed changes in school-level socioeconomic factors.

Analyses included several robustness checks. First, in our models, we tested for pre-existing time trends in student cardiorespiratory fitness in years leading up to the litigation that could provide a counterexplanation for the results. Second, we ran all primary models by using the proportion of both seventh- and ninth-grade students in the HFZ for aerobic capacity as the outcome measure (the PE lawsuits did not affect middle and high schools; thus, we would not expect to see statistically significant differences in changes in PE-related outcomes before and after lawsuits in these grades). Last, because FitnessGram changed its calculation of $VO_2\max$ (which determines whether a student is in the HFZ for aerobic capacity) in SY 2011–2012 through

2012–2013 and again in SY 2013–2014 and beyond,²⁸ we estimated our primary models restricting the analysis sample to only SYs 2013–2014 through 2017–2018 (where HFZ determination is identical).

RESULTS

At baseline, during the 2007–2008 SY, there were 5105 California public schools that served elementary students with student fitness data: 2400 (47%) in districts that would become subject to a PE lawsuit (and educating roughly half of elementary students in the state) and 2705 (53%) in districts that were not sued. Schools excluded from this analysis because of missing fitness data (6% of schools serving K through fifth-grade students statewide) were smaller (mean enrollment 222 vs 493; $P < .001$) and had a higher proportion of White students (45% vs 30%; $P < .001$) than did schools with nonmissing student fitness data.

Summary descriptive statistics are reported in Table 1. Schools in districts that were subject to a PE lawsuit were larger (mean of 540 vs 472 students), had a higher proportion of African American (9% vs 5%) and Asian students (10% vs 7%), had a lower proportion of White students (27% vs 32%), and had a slightly greater proportion of students in the HFZ for aerobic capacity (66% vs 63%; Table 1).

At the school level, overall, African American children exhibited the lowest levels of cardiorespiratory fitness of all racial/ethnic groups, with just over half (53%) in the HFZ. Similarly, at the school level overall, only 53% of low-income students were in the HFZ for aerobic capacity. Across all study years, an average of 96% of fifth graders per school completed the FitnessGram. Fifth graders were highly representative of the whole school population: 6% (fifth graders) versus 7% (whole school) African American; 8% versus 7% Asian; 51% versus 50% Latino/a; 27% versus 28% White; and 60% versus 60% low-income.

Table 2 presents results for the difference-in-difference estimated effects of litigation-induced increases in PE provision on student cardiorespiratory fitness. We found statistically significant increases in the school-level proportion of students in the

HFZ for aerobic capacity following the lawsuits, compared with the corresponding rates for children from those same schools before the PE litigation and relative to students in nonlawsuit districts. These results hold true on average for all fifth graders, with larger effects for female (1.3-percentage-point increase; 95% confidence interval [CI] = 0.1%, 2.5%), African American (3.4-percentage-point increase; 95% CI = 0.5%, 6.2%), and low-income (2.8-percentage-point increase; 95% CI = 0.5%, 5.0%) students following lawsuits.

Results from several robustness checks support litigation-induced increases in PE provision as the most likely source of these improvements in student cardiorespiratory fitness. First, we found no evidence of positive, pre-existing time trends in cardiorespiratory fitness in years leading up to the litigation that could provide a counterexplanation for the results. The coefficients for the pre-existing time trend in the years immediately before litigation were consistently negative (coefficient estimate -0.2%) and statistically significant in all models, indicating student fitness outcomes in schools that would become subject to litigation were consistently declining leading up to their respective lawsuits. Student fitness improvements occurred only after the lawsuits were initiated.

Second, effect sizes and 95% CIs (1.3-percentage-point increase for all students at the school level; 95% CI = 0.03%, 2.3%) were similar when we restricted the study period to the 2013–2014 through 2017–2018 SYs, when the FitnessGram protocol for calculating student $VO_2\max$ was consistent (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>).

Finally, placebo tests showed no detectable improvements in the proportion of middle-school (-0.7 -percentage-point; 95% CI = -1.8% , 0.7%) or high-school (-0.8 -percentage-point; 95% CI = -2.7% , 1.1%) students in the HFZ in schools in districts that were sued compared with students in schools in districts where the lawsuits did not apply and where changes in PE provision were not expected to occur (Table B, available as a supplement to the online version of this article at <http://www.ajph.org>).

TABLE 1—Baseline Demographic Characteristics of Schools in Districts Serving Elementary Students (Grades K–5): California, 2007–2008 School Year

	Schools in Districts Involved in a PE Lawsuit ^a (n = 127 Districts; n = 2400 Schools)	Schools in Districts Not Involved in a PE Lawsuit (n = 702 Districts; n = 2705 Schools)	<i>p</i> ^b
Kindergarten–fifth-grade student enrollment, mean ±SD	540 ±217	472 ±196	<.001
Student race/ethnicity, % ±SD			
African American	8.9 ±1.3	5.2 ±7.6	<.001
Asian	9.5 ±14.7	7.1 ±11.6	<.001
Latino/a	47.2 ±31.2	48.0 ±29.5	.38
White	26.5 ±25.0	31.6 ±27.1	<.001
Students who qualify for free or reduced-price meals, % ±SD	54.3 ±31.4	55.1 ±28.5	.34
Fifth-grade students in the Healthy Fitness Zone for aerobic capacity, ^c % ±SD	65.6 ±21.0	63.3 ±21.6	.001
Female	66.5 ±24.6	69.8 ±23.9	<.001
Male	61.8 ±20.6	60.7 ±20.9	.07
African American	57.3 ±25.6	48.6 ±27.9	<.001
Asian	73.0 ±22.8	60.8 ±30.1	<.001
Latino/a	63.2 ±21.8	61.0 ±22.0	.001
White	70.4 ±20.3	66.3 ±22.7	<.001
Students who qualify for free or reduced-price meals ^d	54.9 ±40.4	51.3 ±44.5	<.001

Note. PE = physical education. Includes schools that educated students in kindergarten (K)–5/6, K–8, or K–12 schools.

^aFour lawsuits were filed against California school districts for being noncompliant with state elementary PE law: 2010 (n = 1 district), 2013 (n = 37 districts), 2014 (n = 1 district), 2015 (n = 89 districts).

^b*P* values for difference between lawsuit and nonlawsuit schools calculated with the unpaired *t* test.

^cThe state-wide fitness test, the FitnessGram, uses Healthy Fitness Zones to evaluate fitness performance of fifth graders. These zones are criterion-referenced standards and represent minimum levels of fitness for age and sex that offer protection against the diseases that result from sedentary living. Aerobic capacity reflects the maximum rate of oxygen uptake and use during exercise.

^dBaseline fitness data by free or reduced-price meal status (a proxy for living in a low-income household) is from the 2010–2011 school year, the first school year for which these data were available.

DISCUSSION

This is the first quantitative study, to our knowledge, to examine the impact of PE litigation on student health. We used panel data over an 11-year period from the largest state public school system in the nation—a state that also has clear education law mandating PE provision. Previous work shows that schools in districts subject to PE litigation were more likely to implement larger increases in PE provision following the rulings,²⁰ which, in the present study, was associated with slight improvements in school-level student fitness, particularly among groups of students typically at higher risk for inactivity and low fitness. These findings suggest that litigation may be an impactful tool for increasing the provision of PE in accordance with the law.

Previous qualitative research provides complementary evidence on the impact of PE lawsuits, demonstrating that litigation resulted in improved accountability for PE, largely

by requiring schools to track and report PE minutes, which led students to receive more PE time in school.²⁰ Personnel in lawsuit districts reported greater increases in compliance with the PE law after the lawsuit than did personnel in districts that were not sued. In fact, all of the district personnel interviewed in that study reported that their schools were brought up to compliance with the PE minute law after the lawsuit. The positive relationship between PE and student fitness has been previously suggested in the literature.^{12,22,23,29} Using a more plausibly exogenous source of increases in PE provision induced by litigation, the present study demonstrates an association between PE provision and increased student fitness. Together, this collective evidence suggests that the PE lawsuits increased compliance with PE laws in schools that were subject to litigation, leading to greater provision of PE, which had a positive impact on aerobic fitness.

The present study suggests that greater adherence to PE laws could have a positive impact on the health of some of our highest-risk students. Increased PE minutes via the lawsuits had the greatest impact on African American students, who had the lowest cardio-respiratory fitness at baseline and who, both state-wide and nationally, have lower physical activity and fitness levels and fewer out-of-school opportunities to be active than do White students.^{15,30} We saw similar positive findings for low-income students, who are similarly at higher risk for inactivity (and its related health concerns) as compared with their higher-income counterparts.¹⁵ Given that California public schools are among the most racially/ethnically and economically diverse in the nation³¹ and currently provide fewer within-school physical and mental health services than almost any other state,³² investing in PE may be a particularly necessary and effective means for addressing pressing racial/ethnic and

TABLE 2—Difference-in-Difference Estimated Effects of Litigation-Induced PE Provision on the Proportion of Fifth-Grade Students at the School Level Achieving Healthy Cardio-Respiratory Fitness Levels: California, 2007–2018

	Proportion of Students With Healthy Cardio-Respiratory Fitness (in the School), $b^a \pm SE$ (95% CI)							
	All Students	Female Students	Male Students	Students Who Qualify for FRPMs	African American Students	Asian Students	Latino/a Students	White Students
PE litigation exposure in elementary school	1.0 \pm 0.5 (0.03, 2.0)	1.3 \pm 0.6 (0.1, 2.5)	0.8 \pm 0.4 (-0.02, 1.7)	2.8 \pm 1.1 (0.5, 5.0)	3.4 \pm 1.5 (0.5, 6.2)	-1.3 \pm 1.0 (-5.1, 2.5)	0.7 \pm 0.9 (-1.1, 2.4)	-0.1 \pm 0.9 (-1.9, 1.7)
No. of school-year observations	52 373	50 591	50 716	30 313	10 633	11 631	28 887	44 437
No. of schools	5 786	5 666	5 671	4 478	2 760	2 586	4 493	5 447
No. of school districts	831	789	792	775	529	534	825	776

Notes. CI = confidence interval; FRPMs = free or reduced-price meals (the proxy used by the California Department of Education for living in a low-income household); PE = physical education. The California-wide fitness test, the FitnessGram, uses Healthy Fitness Zones to evaluate fitness performance of fifth graders. These zones are criterion-referenced standards and represent minimum levels of fitness for age and sex that offer protection against the diseases that result from sedentary living. Aerobic capacity reflects the maximum rate of oxygen uptake and use during exercise.

^aData set includes California public schools that educated students in kindergarten (K)–5/6, K–8, or K–12 schools from 2007–2008 through 2017–2018. The coefficients are estimated from 8 linear mixed-effects models, each weighted by student enrollment, with robust SEs clustered at the district level. All models included school and year fixed effects and time-varying covariates: zip code–level poverty rates from the US Census, number of students who took the FitnessGram test, and school-level socioeconomic and demographic factors (student racial/ethnic composition, proportion of students eligible for FRPMs, and proportion of English-language learners).

poverty-related disparities in youth physical activity and fitness.

Improved PE also has the potential to narrow sex-related disparities. Girls are less likely to meet physical activity recommendations and to be physically fit compared with boys,¹⁵ as well as less likely to participate in organized sports programs.³⁰ These disparities widen even farther for female students of color.^{15,33} Female students in schools in districts that were parties to 1 of the PE lawsuits showed a greater increase in the proportion of students in the HFZ for aerobic capacity, suggesting that the increases in PE provision that resulted from the lawsuits most positively affected some of the most high-risk students.

The present study provides strong evidence that PE lawsuits led to improvements in student cardio-respiratory fitness. In other circumstances in which public institutions appear to be failing their charge (e.g., noncompliance with laws prohibiting sex discrimination in educational activities), lawsuits have been successfully used to seek redress.³⁴ Lawsuits to improve PE are a similarly scalable intervention that could be undertaken at the local or state level to ensure compliance with education law. However, litigation is time-intensive, attracts negative publicity,³⁵ and, most importantly, takes financial resources away from already cash-strapped schools.

Rather than bringing more legal action, there is a real need to develop PE-related policies and laws with built-in accountability mechanisms and financial support to ensure their successful implementation. PE minutes could be increased by developing state-, district-, and school-level systems for tracking and reporting PE minutes; by offering monetary and systematic support for implementation; and by additionally effecting penalties for noncompliance. Developing a more effective statewide PE monitoring system could be expensive, but the money would stay within the Department of Education, as opposed to going to legal fees, and would help guarantee students are receiving PE to the benefit of their health.

Limitations

It would be ideal to observe the exact number of PE minutes provided in schools to quantify the magnitude of PE provision and the extent to which litigation increases compliance with PE law. However, school-level data on PE provision (e.g., minutes of PE provided or type of PE curriculum used) or on additional physical activity programming throughout the school day (e.g., presence of recess or before- or after-school programming) are not publicly available and therefore could not be included in these analyses. Furthermore, qualitative work has

shown that schools are now reluctant to participate in PE-related studies because of concerns about further litigation.²⁰

While we were able to include a measure of school neighborhood-level poverty in models to account for potential school-area confounding (e.g., physical activity resources, opportunity for active transport to and from school), we did not have data on students' home neighborhoods, which could also confound the relationship between PE litigation and student fitness, and which thus may have biased our findings. In addition, student fitness data were only publicly available at the school level; lack of student-level data may have contributed to underestimated standard errors or type-1 error.

Finally, these findings demonstrate the short-term impact of litigation on student fitness. Future work, once more time has passed after the lawsuits, will explore potential duration effects of PE litigation on student fitness outcomes.

Conclusions

School-level student fitness outcomes improved significantly following PE lawsuits compared with the corresponding prevalence rates for those same schools before the litigation and relative to schools in nonlawsuit districts. The effects were most pronounced

for girls, African Americans, and low-income students, all of whom are typically at higher risk for inactivity and low fitness levels.

The evidence suggests that unequal provision of PE may contribute to racial/ethnic and income-related disparities in cardio-respiratory fitness for elementary-school students, which likely portends future health risks. Findings suggest that litigation may be an impactful tool for increasing compliance with PE minute laws, which may help improve student cardiovascular health and reduce health disparities. Systems that support the monitoring, tracking, and implementation of PE are necessary to ensure schools provide PE according to law and to the benefit of student health.

Public Health Implications

Elementary-school PE provides physical activity opportunities to more than 3 million public-school students in California, more than 75% of whom are racial/ethnic minorities and nearly 60% of whom are from low-income families (as measured by eligibility for free or reduced-priced meals).²¹ However, clear disparities in PE exist^{11,12} that must be addressed to ensure that all students have adequate opportunities for physical activity and related skill development. Identifying interventions to ensure PE complies with existing law, to the benefit of students from all backgrounds, is imperative for improving youth health and reducing health disparities. While PE litigation appears to be an effective means for increasing student fitness, legal action removes financial resources from schools. Instead of additional lawsuits, it would be more cost-effective for the Department of Education to mandate and support PE minute tracking and reporting systems to ensure accountability to the law. **AJPH**

CONTRIBUTORS

H. R. Thompson conceptualized this study; assisted with the study design; was responsible for data acquisition, analysis, and interpretation; and drafted the article. R. C. Johnson led the study design and analysis and interpretation of the data and contributed to the writing of the article. K. A. Madsen helped conceptualize and design the study, assisted with data interpretation, and contributed to the writing of the article. B. Fuller assisted with study design and data selection and interpretation and contributed to the writing of the article.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest and have no affiliation, financial agreement, or other involvement with any company.

HUMAN PARTICIPANT PROTECTION

The University of California Berkeley Committee for the Protection of Human Subjects deemed this to be non-human participant research.

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