

Effects of state physical education-related policies on children's physical activity and obesity

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This study examines whether state physical education (PE)-related policies affect physical activity (PA) and weight status among 11- to 17-year-old school children and assesses whether PE-related practices in schools mediate the relationship. By examining macro- and micro-level data simultaneously, this study provides an overall picture of the impact of state PE-related policies on children's outcomes. The analysis uses two-level cross-sectional data collected from state officials, school administrators and teachers, and parents of sampled children.

The alarming increase in obesity among children is a major public health concern in the United States (Institute of Medicine [IOM], 2005). Faced with a childhood obesity epidemic, there has been a growing interest in changing school environments and practices to promote PA and healthy nutritional choices as PA and diet modification are the major avenues to decrease obesity (Booth et al., 2001). In recent years, an increasing number of legislative and regulatory actions have been taken at the federal, state, and local level to address childhood obesity (Cawley & Liu, 2008; Chaloupka & Johnston, 2007). State legislations and regulations are considered particularly critical in preventing childhood obesity because states have substantial authority to modify public health policies in general and school health policies in particular (Boehmer et al., 2008; IOM, 2005). However, despite the surge of state legislations and regulations, there is little evidence that enactment and adoption of such state bills contributed to an increase in PA and reduction in obesity among children (Boehmer et al., 2007). Although progress has been made recently, only part of the links between different levels of policy factors and their impact on individual outcomes are documented. Particularly, despite the expected role of schools in promoting PA and, in turn, improving children's weight status as an implementer of state policies, there is little empirical evidence that schools have played the role.

This analysis examines whether the nature and extent of state policies (statutes and regulations) on school PE are related to PA and, in turn, to weight status among children and whether the relationship, if it exists, is partly attributed to PE-related practices in schools based on a set of cross-sectional data at the state and individual level. The specific aims of the study are to: 1) examine whether the nature and extent of state PE-related policies are associated with children's PA and weight status; 2) assess whether school PE-related practices mediate the relationship between state policies and children's outcomes; and 3) investigate whether the impact of the state policies and school practices on children's outcomes vary across different socio-demographic groups.

The analysis uses the 2006 data from the Physical Education-Related State Policy Classification System (PERSPCS) for information on PE-related policies at the state level. PERSPCS is a tool that systematically assesses the nature and extent of state PE and recess-related policies (Mâsse et al., 2007). An aggregate score across grade levels can be determined for each of the 4 topic areas (PE time requirements, staffing requirements, curriculum standards, and assessment of fitness) by summing scores of middle and high schools. Since this analysis focuses on children of secondary-school ages, recess time-related information is excluded from

the analysis. To measure a state's overall level of PE-related policies, a weighted summary score is calculated by summing weighted across-grade-level scores of the 4 topic areas. Both topic area-specific scores and weighted summary scores of states are used as independent variables.

Information on school practices comes from the 2006 School Health Profiles (SHP) (Balaji et al., 2008). SHP provides information on some components of the Coordinated School Health Program including practices and policies on PE, health education, and nutrition services in schools. SHP collects information from representative samples of schools that serve 6th through 12th grade students in 50 states, the District of Columbia, and several local jurisdictions. Other state-level social and health indicators come from multiple sources including the U.S. Census and the Behavioral Risk Factor Surveillance System data.

Individual-level information on children's PA and weight status comes from the 2007 National Survey of Children's Health (NSCH) data. NSCH is one of the largest surveys on the health of U.S. children, designed to provide both national- and state-level estimates (Blumberg et al., 2005). NSCH collects information on children's health, behavior, health care use, health insurance status, social wellbeing, family composition and SES, parental health and behavior, and perceived community environment.

In the first step of the analysis, the degree to which each state- and individual-level context contributes to variation in children's PA (meeting current PA recommendations or not) and weight outcomes (gender-specific body mass index (BMI) percentile-for-age and above-normal BMI ($85 \leq$ BMI percentile) or not) is examined. An unconditional 2-level random intercept model is fitted with state- and individual-level random effects. The variance of the random effects and an intraclass correlation can be calculated based on this model.

The second step of the analysis is to examine the association between state PE-related policies and children's PA and weight outcomes, controlling for other state and individual characteristics. Each topic-area-specific PERSPCS score and weighted summary score is used to test state policies' influence on individual-level outcomes. For both PA and BMI-based outcomes, age, gender, race/ethnicity, hours spent on TV/video games on an average school day, family composition (two-parent family or not), household adults' education level (highest grade completed), household income, and perceived neighborhood safety are controlled for. For BMI-based outcomes, the frequency of PA (number of physically active days per week) and birth weight of a child are included to control for the child's PA level and biological predisposition, respectively. In a model for PA outcome, household adults' PA behavior is included to control for the potential impact of adults' health behavior on children's PA. Other state-level factors such as overall socioeconomic status, educational resources, public safety, and adult obesity rates that could be correlated with state PE-related policies or children's outcomes are also controlled for. This is to minimize biased estimation resulting from endogeneity and to rule out the influence of unmeasured correlates.

In the third step of the analysis, the percentage of schools requiring PE and that of schools allowing exemption from required PE are added to the previous model to determine whether school practices mediate the effect of state PE-related policies on individual-level outcomes. If the influence of state policies becomes null or weak after the inclusion of school

practice variables, it may indicate that the association between state policy and children's outcomes is due to differences in school PE-related practices.

The final step of the analysis is to examine inter-level interactions. Significant state policy variables and school practice variables identified in the previous step are examined for their inter-level interaction with individual and family demographic and socioeconomic characteristics (e.g., race/ethnicity, gender, age, household income, two-parent family or not). This analysis is to determine if the effects of state policies and school practices vary by individual and family characteristics. For example, it is hypothesized that state PE-related policies and practices in schools are likely to have greater impacts on children of low-SES families. Low-SES families are less likely to have resources to have their children participate in extracurricular physical activities such as sports teams and private classes. For those children, school PE may be the only time when they are physically active. Therefore, state policies and school practices are likely to have more direct and significant impacts on children of low-SES families. The results of this study will add to the evidence base of obesity prevention approaches.

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