

**PE Audit and Feedback Pilot Study**  
**NCT05509803**  
**1K01HL151805**  
**Study Protocol and Statistical Analysis Plan**  
**October 3, 2025**

**Study Protocol**

The objective of this study is to determine a cost-effective and scalable tool to increase schools' compliance with state PE laws. Our recent survey of all elementary school principals in REDACTED DISTRICT identified 15 elementary schools that are currently non-compliant (or unsure about compliance) with the California state PE law. We will repeat this survey to obtain current data and from the pool of schools with the lowest reported weekly PE minutes. For both the recently completed survey and for the survey to be repeated, no human subjects data are included and the principals themselves are not human subjects as no information about the principals was/will be collected. From the ~15 elementary schools identified as non-compliant with state PE law, we will stratify schools by enrollment and proportion of low-income students enrolled (two key factors known to impeded PE law compliance) and use block randomization to randomize schools to intervention (n=5) and control (n=5) arms, ensuring equal representation across strata. If schools choose not to participate, then we will re-run randomization to also include the schools not initialize randomized to participation until we have achieved our sample of 10 schools that are willing to participate.

The intervention will include use of a PE audit and feedback tool implemented by district personnel within the 5 intervention schools. The current PE Works audit and feedback tool consists of 9 binary (yes/no) PE quantity and quality indicators, including whether or not: 1) The school employs credentialed PE teachers and whether or not they teach an appropriate number of students at a time; 2) At least 200 minutes of PE and whether or not they teach an appropriate number of students at a time; 2) At least 200 minutes of PE are scheduled every 10 days, per CA education law; 3) PE class content meets instructional standards; 4) PE teachers participate in appropriate staff development and training; 5) School communicates with families about PE; 6) The school community is educated about physical activity and wellness opportunities; 7) The school's education plan includes wellness goals; 8) There is designated PE space where students can move safely; 9) The school fosters a PE culture that is inclusive of all students. This is the type of data that will be obtained/recorded by district personnel during onsite school observations and conversations with the school principal. District-level PE employees complete an onsite audit of the 9 indicators (through visual assessment and discussion with school administrators and teachers). No information about individuals will be obtained, collected, or recorded during these observations and discussions.

Once completed, data are entered into a database and a visually-pleasing 2-page report is produced for each school that: 1) describes all 9 components that were assessed; 2) highlights components where the school is succeeding; and 3) details components that need improvement, providing suggestions on how to do so. No information about individuals be entered into the database in order to generate the report. Data from the Audit and Feedback Report will be used as part of our research. We will use the 9 binary (yes/no) indicators from the report in our

analyses. We will not use data from the observations, discussions, or meetings, other than the data that goes directly into the Audit and Feedback Report. Members of the research team will not have a role in suggesting or implementing the specific changes to PE at the various schools - those decisions will be made by the district personnel and the school principal. District personnel share this report in a face-to-face meeting with the school principal. This gives the principal the opportunity to discuss and process the findings, as well as to begin creating a plan for making necessary improvements to PE, based on the feedback. All activities described above conducted by district personnel and school principals and neither the PI nor members of the study team be present for these observations, discussions, and meetings.

The PE Works tool will be updated based on formative work with New York City educators and administrators to build school-, principal-, and teacher-level capacity and creativity for, and ownership over, providing PE that meets state mandates. REDACTED DISTRICT personnel will provide technical assistance (TA) and support for school principals to develop an action plan to address PE indicators needing improvement. TA and action plan items range from helping schools create a master PE schedule that ensures appropriate time and space scheduled for all grades to meet the state PE minute mandate, to helping set up organizational systems for PE equipment to ensure proper storage and sharing across classes. The TA will be delivered by district personnel to school principals and teachers and neither the PI nor members of the study team be present for these trainings, discussions, and/or meetings.

REDACTED DISTRICT personnel will be trained to implement the PE audit and feedback tool in the fall of pilot year 1 (PY1) and will collect audit data in the spring. REDACTED DISTRICT will give feedback to school principals during one-on-one meetings in the fall of PY2. The intervention will take place over 2 years (PY2 and PY3). At the start of PY1-PY3, researchers will obtain school-level PE master schedules, which contain PE times for all classes in the school. Administrators at participating schools will either provide study team contact information to prospective 2nd and 5th grade teacher participants or will forward a recruitment email that the research team has written onto prospective participants so that prospective participants may make the first point of contact with our team if they are interested in participating. Our team will not be provided with names or contact information of prospective participants in order to recruit prospective participants. All recruitment materials and consent forms will emphasize the voluntary nature of participation in the research and that participants are free to skip/not answer any question that they do not wish to answer and are free to stop participating in the research at anytime. Once consented to participate, researchers will collect 2nd and 5th grade teachers' individual classroom PE schedules (we know PE operates differently in lower (Kindergarten – 2nd) and upper (3rd – 5th) elementary grades, which is why these two grades have been chosen.

During the fall and spring of PY1-PY3 we will collect objective data on PE class length and proportion of class spent in moderate to vigorous physical activity using the validated System for Observing Fitness Instruction Time (SOFIT) tool, observing 3 PE classes of 2 randomly selected 2nd and 5th grade teachers (n=4 teachers) and the PE teacher (if there is one) at each school on random days, per semester. Random day selection for observation days allows verification of self-reported PE minutes. SOFIT data will be collected by members of the research team who have been trained in the SOFIT protocol (and who have been CITI certified) and who have been fingerprinted and background checked and approved to visit REDACTED DISTRICT schools.

The observer will arrive 15 minutes prior to the scheduled start of the PE class to situate him/herself. During observations investigators will have no interactions with teachers or students. Once the class has arrived at the PE area (i.e. gym or blacktop), the observer will randomly select four target students to observe during the lesson (2 girls and 2 boys). No individually identifiable information will be collected on students being observed. The observer will observe Student One for 4 minutes and then rotate to focus on the four students for four minutes each until the lesson ends. A pacing MP3 played through headphones will prompt the observer to collect data every 20 seconds on 1) the activity level of the student being observed (ranging from 1 (sedentary) to 5 (very active)) and 2) what type of activity the whole class is engaged in (game play, fitness, skill acquisition, knowledge acquisition, management, or other). The observer will begin the observation period when the teacher and 51% of the class has reached the instructional station and continue until half the class has departed from the area. The observer will also collect information at the class level, including on the length (in minutes) or the PE class, weather conditions if the class took place outside, class size (and number of boys and girls in the class), and whether the teacher was administering the state FitnessGram test during class. The only identifiable information that will be collected will be the teacher name (this enables the observer to make sure he/she is observing the correct PE class), the teacher type (2nd grade, 5th grade, or PE), and the teacher's sex (M/F).

Teacher and/or student participation during the observation portion of Phase 2 requires no extra time commitment of participants outside of their normal PE class. Members of the research team will not be asking the schools/district to implement curriculum changes. Instead, we will be evaluating whether or not the tool provided feedback to the schools in a manner that allowed the schools to make the necessary changes in order to comply with state law. We will assess adoption, implementation, and maintenance of the PE audit and feedback tool through interviews with: district-level personnel involved in implementing the PE audit and feedback tool; principals in the 5 intervention schools; and all 2nd grade, 5th grade, and PE teachers observed in intervention schools. We will also conduct interviews with principals and teachers observed in the 5 control schools. These interviews will take place in PY2 and PY3 and will last approximately 20-30 minutes each. If a teacher or administrator participates in the study during both years, he/she will be interviewed twice (once in PY1 and once in PY2, after SOFIT observations are conducted in the spring). A semi-structured interview guide will enable the collection of data to assess RE-AIM components, including questions about: who teaches PE; priority for PE; the use of the PE audit and feedback tool; barriers encountered; successes and struggles with providing and sustaining mandated PE minutes; and plans for continuing to implement the PE audit and feedback tool and provide mandated minutes.

### **Statistical Analysis Plan**

School-level demographic data will be downloaded from the California Department of Education's Data Quest website. Differences in school-level characteristics between all district elementary schools and study schools, as well as between intervention and control schools, will be determined using unpaired t-tests. Linear mixed effects models with random effects for school and grade will be used to determine 1) within-group changes and 2) difference in change between intervention and control schools in: scheduled minutes of physical education/week;

estimated minutes of physical education/week; and the proportion of observed lesson time in MVPA. All analyses will be performed using Stata/ SE (16.1).

Interview data will be coded and analyzed using a thematic analysis approach using Dedoose Qualitative Software (version 9.0.54, SocioCultural Research Consultants LLC). First, deductive coding, with codes based on predefined themes guided by the RE-AIM framework (e.g. reach, effectiveness, etc.) and Diffusion of Innovation theory (e.g. drivers of success) will be used. Second, inductive coding will be used for sub-themes that emerged from the data (e.g. specific barriers/facilitators to success and impact). Each transcript will independently coded by two researchers using an iterative process, with the researchers refining and consolidating codes and adding sub-codes and emergent codes as needed. Once the coding structure stabilizes and saturation is reached (defined as no new codes found in the data), the researchers will apply final codes to all transcripts. Once transcripts were double-coded, the researchers will review all transcripts to ensure consistent code application. If disagreements ensue, the researchers will revise and refined coding until consensus is reached. Lastly, the researchers will come to an agreement on final themes and identified drivers of successful implementation. No interviewees will provided feedback on the findings.