INTERVENTION TABLE 14

School Physical Activity Policies

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Physical Activity Policies-United States						
Sallis, McKenzie (2003); McKenzie, Sallis (2004); Zive, Pelletier (2002) San Diego County, California	Project M-SPAN (Middle School Physical Activity and Nutrition) Increased physical activity time during class, improved teacher instructional skills; activity/ physical education equipment available to students; class credit for out of physical education activities; more accessible activity areas ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. School policy to reduce fat content of breakfast, lunch, a la carte and school store foods through purchasing, preparing and serving practices on middle-school campuses *(continued next page)*	***DESIGN:*** Group randomized trial ***DURATION:*** 2 years ***SAMPLE SIZE:*** ~26,616 students from 24 middle schools (12 intervention, 12 control) ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Observations (physical activity and composition bag lunches) 2. System for Observing Fitness Instruction Time [SOFIT] and System for Observing Play and Leisure Time in Youth [SOPLAY] (physical activity) blocks with less than 1/100 square miles) 3. Menu composition analysis (foods with >1 gram of total fat per serving) 4. Student and parent surveys (7-day recall of 32 physical activities, 9 sedentary behaviors and 31 high-fat foods and beverages, height and weight [body mass index]) ***DATA COLLECTION:*** Observations of physical activity and bag lunches were performed on randomly selected days at each school, 3 days at baseline and 2 days during each intervention semester. Foods with >1 gram of total fat per serving were collected during the same period. Labels were collected for nutrient information and recipes were analyzed using the Nutrition Data Systems software. Surveys were distributed to separate random samples at baseline (n=1678 student-parent pairs) and 2 years later (n=1435 student/parent pairs). SOFIT and SOPLAY are validated measures. ***LIMITATIONS:*** Self-reported data; ICC for student MVPA score on the survey was 0.47 and probably reduced by the memory demands of the 7-day recall task; sample of 24 schools limits power to detect statistically significant effects	11-13 year old Lower income 44.5% non-White, 39.5% received free/reduced price lunches ***ELIGIBILITY:*** 48 middle schools were asked to participate and the first 24 to respond were included in the study. ***EXPOSURE/ PARTICIPATION:*** All children in the 12 intervention schools were exposed to the intervention. Participation in staff development sessions (50% attended all 5; the others attended an average of 2.2 sessions).	***LEAD AGENCY:*** San Diego State University Research Team ***THEORY/ FRAMEWORK:*** A structural, ecologic model of health behavior (Cohen et al. 2000). ***EVIDENCE-BASED:*** Study built off previous effective school environmental and policy approaches (e.g., CATCH), and applies it to a less studied middle school population ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Key school personnel including administrators, faculty, staff, parents, and students met for three, 90 minute meetings per school across 2 years with project staff to select and implement policy changes. ***IMPLEMENTATION:*** San Diego State University researchers designed the intervention. Physical education staff received five 3-hr staff development sessions to improve instructional skills. *(continued next page)*	***RESOURCES:*** 1. Incentives for physical education equipment, kitchen equipment 2. Materials for newsletters, posters, flyers 3. Educational packet for store managers and other school staff 4. Material for staff training ***FUNDING:*** Full study funded by the National Institutes of Health ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Significant reduction in body mass index (BMI) for intervention boys compared to control boys (F=4.60, p=0.044. effect size, d=0.83). 2. No significant BMI change for girls (F=0.09, p=0.771. effect size, d=-0.12). ***PHYSICAL ACTIVITY:*** 3. Physical activity increased at intervention schools at a greater rate than control schools (F=7.53, p<0.009. effect size, d=0.93). 4. The increase in physical activity in intervention boys compared to control boys was significant (F=12.16, p=0.0001. effect size, d=1.10) while the increase among intervention girls was not (F=0.73, p=0.396. effect size, d=0.37). 5. Boys in intervention schools increased about equally in physical activity in physical education and out of physical education, but intervention girls increased their activity mainly through physical education. 6. The intervention resulted in significant overall increases in the time students spent in MVPA [F(1,46)= 5.43, p= 0.02; d= 0.88], approximately 3 min per lesson. 7. Intervention effects on MVPA were different for boys and girls. Effect sizes on MVPA were large for boys (d=0.98; F[1,22]=8.36, p=0.009) and moderate for girls (d=0.68; F[1,46]=3.20, p=0.08). By year 2, girls in intervention schools were engaging in MVPA at a level similar to the boys in control schools. 8. The intervention had a moderate effect (d=0.66) but non-significant trend [F(1,46)=2.99, p=0.09] for increasing the proportion of class time students engaged in MVPA. During year 2, students in the intervention schools were active about 52% of lesson time, compared with 48% for those in control schools. ***NUTRITION:*** 9. No significant change in fat intake was observed. Effect sizes indicated a near null effect for total (d=0.03) and saturated fat (d=0.13).

(Continued from previous study)						
	Complex: 1. Nutrition- Salad bars during lunch, posters and newsletters promoting low fat foods, healthy lunch contests 2. Student health committees 3. Hours of operation reduced in the school store 4. Flyers, posters, newsletters to promote programs			The physical education staff made changes to the physical education curriculum. The Child Nutrition Service (CNS) staff completed 11hrs of training and chose goals to carry out, including recipe modification and ingredient substitution. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** 1. Site visits by project staff to provide feedback, set goals, monitor progress. 2. Surveys for students to assess enjoyment of and attendance at physical education. 3. 20-item surveys to evaluate quality of staff development sessions. 4. Questionnaires assessing teacher satisfaction with each M-SPAN PE component.		

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Caballero, Clay (2003); Himes, Ring (2003); Story, Snyder (2003); Cunningham-Sabo, Snyder (2003); Steckler, Ethelbah (2003); Going, Thompson (2003); Stevens, Story (2003); Helitzer, Davis (1999); Snyder, Anliker (1999); Teufel, Perry (1999); Davis, Going (1999); Gittelsohn, Evans (1999); Davis, Clay (2003); Davis, Hunsberger (1999); Stone, Norman (2003); Gittelsohn, Merkle (2003) New Mexico, Arizona, Minnesota, South Dakota	Pathways - Physical activity component: Minimum of three 30 min sessions per week of moderate to vigorous physical activity (MVPA); daily recess for 15 minutes 1-2 days/ week; 2-10 minute classroom exercise breaks (physical activity program based on Sports, Play, and Active Recreation for Kids [SPARK] program with addition of an American Indian games module) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School breakfast & lunch healthy eating policies to: 1. Reduce % of energy from fat to <30% while maintaining recommended levels of calories and key nutrients (665 kcal for lunch, 500 kcal for breakfast) 2. Reduce the % of energy from saturated fat to <10% *(continued next page)*	***DESIGN:*** Group randomized trial ***DURATION:*** 6 years ***SAMPLE SIZE:*** 1409 students followed from grades 3-5 (682 unexposed, 727 exposed) in 41 schools (21 intervention, 20 control) ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Anthropometric measurements and body composition (weight, height, triceps and subscapular skinfold thickness, bioelectrical impedance) 2. Motion sensor (physical activity) 3. Self-reported questionnaire (physical activity during the preceding 24 hours) 4. Accelerometry (physical activity) 5. Questionnaire - developed and pilot tested during Phase 1 (knowledge, attitudes, behavior related to diet and physical activity) 6. 24 hour recall (food eaten inside/outside school) 7. Direct observation (food intake) 8. Menu data ***DATA COLLECTION:*** Anthropometric measures and body composition data were collected at baseline (end of 2nd grade) and at follow up (end of 5th grade) using digital scales, Shorr board, Lange calipers, and a single frequency tetrapolar plethysmograph. Accelerometry recordings were collected for 24 h on a random sample of 15 children at each school at the end of 2nd and 5th grade. Groups of 2-3 children were observed during lunch by 2 trained Pathways staff with food intake calculated after food left on the tray was measured. 24 hour recall was performed only at the end of the study. Menu data was collected from 38 schools for breakfast and 41 schools for lunch, representing menus offered during a 5 day period. Data was collected using meal forms, recipe forms and vendor product forms filled out by the school food manager. All data were analyzed by the Nutrition Data System at the University of Minnesota. *(continued next page)*	Lower income 100% Native American/ American Indian 8-11 year olds On average, 90% of children received free reduced price lunch. ***ELIGIBILITY:*** *School criteria:* Projected 3rd grade enrollment of > 15 children, > 90% of 3rd grade children of American Indian ethnicity, retention from 3rd to 5th grade over the past 3 years of > 70%, school meals prepared and administered on site, availability of minimum facilities to deliver a PA program at the school and approval of the study by the school, community, and tribal authorities. Schools that were considering closing or merging in the next three years were excluded. *(continued next page)*	***LEAD AGENCY:*** The schools, John Hopkins University, University of New Mexico, University of Minnesota, University of Arizona, and University of North Carolina-Chapel Hill ***THEORY/ FRAMEWORK:*** Social learning theory and principles of American Indian culture and practices ***EVIDENCE-BASED:*** Study builds off previous school based interventions such as CATCH and Lunchpower! that have demonstrated the feasibility of lowering fat in school lunches, without compromising recommended levels of calories and key nutrients. ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** There were two phases to the intervention. Phase 1 (3 years) included intervention and measurement development, testing and validation by the research team. Phase two (3 years) included implementation of the intervention. *(continued next page)*	***RESOURCES:*** 1. Educational materials for curriculum 2. Incentives for food service staff 3. Pathways Behavioral Guidelines providing skill building techniques for food service staff 4. Funds to support changes in food environment 5. Materials for family events 6. Instructors manual for teachers 7. Materials to implement curriculum (e.g., overhead transparencies, audio tapes, posters, incentives) 8. Funds/ personnel to conduct trainings 9. Training manual to guide teacher training ***FUNDING:*** National Heart Lung and Blood Institute ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. There were no statistically significant differences between the intervention and control groups in any of the anthropometric variables at baseline or follow-up. 2. Percent body fat (%BF) increased by ~7% in both groups (mean difference in change in %BF between the intervention and controls was 0.2, 95% CI: -0.84 - 1.31). 3. From baseline to follow-up the percent of children with BMIs greater than the 85th percentile increased in intervention and control schools (6% and 8% increase, respectively). ***PHYSICAL ACTIVITY:*** 4. Motion sensor measurements indicated no significant difference over a 24 hour period between the intervention and control schools. 5. Based on accelerometry data, at follow-up children in intervention schools were more active (+6.3% to +27.2%) than children in control schools at 3 of the 4 study sites. None of the differences between intervention and control schools were significant. 6. Boys were significantly ($p \leq 0.01$) more active than girls by 17-21% at both baseline and follow-up. ***NUTRITION:*** 7. The 24-hour recall showed a significantly lower total daily energy intake (1892 compared with 2157 kcal/d, $p<0.003$) and percent of energy from total fat (31.1% compared to 33.6%, $p<0.001$) in the intervention group compared to the control group. 8. Mean differences between intervention and control nutrient intakes for lunch observations did not reach statistical significance. As percent of energy, however, total fat intake decreased by 3.6%, saturated fat decreased by 2.1% and total carbohydrates increased by 3.7% compared with control children. ($p<0.05$ for all changes). 9. Based on 24-hour recalls, intervention children compared to control children reported significantly less intake for absolute amounts of energy (-263 kcal), protein (-9.5 g), total fat (-15.1 g), saturated fat (-6.0 g), and polyunsaturated fat (-2.3 g), and as a percent of calories, total fat (-2.5%) and saturated fat (-1.1%), $p<0.05$ for all. While meals eaten in school contribute substantially to the observed all-day intakes, these 24-hour recall data support a conclusion of significant overall dietary impact for the Pathways intervention. *(continued next page*

(Continued from previous study)						
	3. Limit fat served for lunch to 22g and to 17g for breakfast 4. Reflect USDA regulations of protein, vitamin A and C, calcium and iron as one-third of the daily recommended intakes *Complex:* 1. Class curriculum component: two 45 min lessons promoting healthy eating and active living weekly (12 weeks for 3rd & 4th grade, and 8 weeks for 5th grade) 2. Parental component: Family action packs (including snack packs with low fat foods); family events at school	***LIMITATIONS:*** Potential reporting bias from the 24 hour recall (recall showed significantly lower total daily energy intake in the intervention group, but there were no differences in weight, adiposity, or physical activity between the groups); researchers were unable to ensure that each child wore the same accelerometers at baseline and follow-up; lack of process evaluation data collected from control schools and parents; process evaluation data was retrospective and self-reported; United States Department of Agriculture school menu initiative was taking place at the same time as Pathways	*Student criteria:* Written parental consent, student verbal consent and provision of both baseline and follow-up measures. ***EXPOSURE/ PARTICIPATION:*** 1. Student knowledge questionnaire completed at end of each year (exposure to intervention) 2. Teacher classroom curriculum training attendance (95.6% during 3rd grade, 98% during 4th grade, 92% during 5th grade) 3. Food service staff training attendance (92.9% during 3rd grade, 95.5% during 4th grade, 166.7% during fifth grade – sent more workers than required during 5th grade) 4. Class attendance 5. Attendance at family events (average 58% of children or 0.9 adults per child attended family events) All students at the 21 intervention schools were potentially exposed to the intervention.	The study was coordinated through the University of North Carolina by a steering committee including the principal investigators, the project officer (from the National Heart Lung and Blood Institute) and 2 American Indian representatives elected by an all American Indian study personnel. Almost all of the intervention was delivered by school personnel, teachers, and food service staff. The Pathways research staff trained and supported school staff. Teachers were trained annually in local or regional meetings. Teachers in charge of physical education at each intervention school were trained 1.5 days before each fall and spring semester by licensed SPARK instructors or Pathways staff. Twice per year, trained Pathways staff conducted 2-hour trainings for school food service staff. ***FORMATIVE EVALUATION:*** In-depth interviews, semi-structured interviews, focus groups, and direct observations were conducted with school personnel, students in grades 3-5 and their caregivers, and community members regarding specific obesity risk behaviors (to develop intervention components). The intervention was tested in pilot studies in 4 schools representing 6 different American Indian tribes. ***PROCESS EVALUATION:*** Conducted annually by Pathways staff not involved in delivering the intervention. *Classroom component:* Teacher evaluation of training, curriculum checklist *Physical activity component:* Teacher evaluation of training, monthly physical education calendar that noted when physical education was taught and what Pathways lessons were used, site visits by physical education teachers' mentors, curriculum checklist and interviews with physical education teachers *Food service component:* Food service staff evaluation of training, site visits from nutritionist recording information about extent and fidelity at least 5 times a year, semester interviews with the food service manager *Family component:* Written evaluations by adults and students at each family event, observations of family events by Pathways staff		***ENVIRONMENT CHANGE:*** 10. The percent of energy from fat in the intervention school lunches decreased 4.9% from baseline to follow-up, compared to a 1% decrease observed in control schools (mean adjusted difference of change from baseline to follow-up between the intervention and control schools was -3.9%, p=0.006). 11. The percent of energy from saturated fat in the intervention school lunches decreased 2.7% from baseline to follow-up, compared to 1% decrease in control schools, (mean difference of change from baseline to follow-up -1.6%, p=0.003). 12. Average total fat served in the intervention school breakfasts decreased 2.4g from baseline to follow-up, compared to a 0.1g increase in control schools (mean adjusted difference of change from baseline to follow-up between the intervention and control schools was -3.2g, p=0.030). Similar results were found for percent of calories from total fat (mean adjusted difference of change -3.3%, p=0.033), saturated fat (mean adjusted difference of change -1.5g, p=0.011) and percent of calories from saturated fat (mean adjusted difference of change (-1.6%, p=0.014).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
McKenzie, Sallis (1993); Sallis, McKenzie (1993); Sallis, McKenzie (1997); McKenzie, Sallis (1997); Sallis, McKenzie (1999); Marcoux, Sallis (1999); Dowda, James (2005); McKenzie, Sallis (2009) California	Sports, Play, and Active Recreation for Kids (SPARK) - school physical education (PE) policy to increase intensity, duration and complexity of physical activity during PE classes through three 30-minute PE classes per week. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Self-management curricula -weekly 30-min classes promoting physical activity outside of school by teaching skills related to self-management, self-monitoring, self-evaluation and self-reinforcement. 2. Self-management workshops –32 lessons teaching a skill or concept related to physical activity outside school and maintenance of activity habits. 3. Parent participation through homework, newsletters, and weekly goal sheets.	***DESIGN:*** Group randomized trial ***DURATION:*** Fall 1990 – Spring 1992 ***SAMPLE SIZE:*** 955 fourth grade students from 7 schools (264 specialist-led group, 331 teacher-led group, 360 control) ***PRIMARY OUTCOME:*** Physical activity (PA) and overweight/obesity ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Calf and triceps skin folds 3. Mile run test (cardiovascular endurance) 4. Bent-knee sit-ups (muscular strength and endurance) 5. Pull-ups (upper body strength) 6. Sit and reach test (hamstring flexibility) 7. Accelerometers (previously validated) to measure physical activity outside of school 8. 1-day physical activity recall (previously validated) to measure physical activity outside of school 9. System for Observing Fitness Instruction Time (SOFIT) to measure physical activity 10. Metropolitan Achievement Tests (MAT6 and MAT7) to assess academic achievement ***DATA COLLECTION:*** Baseline measures were taken in the fall of 1990 and follow-up measures were taken in the spring of 1991, fall of 1991, and spring of 1992. Maintenance follow-up observations were made during the fall of 1993 and spring of 1994. At the beginning and end of each school year, students participated in the fitness and anthropometric variable assessment using FITNESSGRAM protocol. Out of school physical activity was assessed with a 1-day recall and accelerometers. Children reported which of 20 activities they participated in for at least 15 minutes, and a summary score was based on the intensity weightings of each activity. Recall was administered two times per week to capture weekday and weekend activities. Accelerometers monitored physical activity outside of school one weekday per semester and one weekend per school year. SOFIT was used to measure physical activity during PE classes. PE classes at all schools were observed annually during 2 full weeks. Four randomly chosen children were observed every 20-sec during rotating 4-min blocks throughout the class. The MAT6 and MAT7 were administered by classroom teachers before and after the intervention. *(continued next page)*	9-11 year olds 82% European American, 12% Asian/ Pacific Islander, 4% Latino and 2% African American (participating schools and the evaluation sample) ***ELIGIBILITY:*** Parent written consent was required. Study participants had to complete baseline and final surveys and fitness tests, as well as have at least one valid accelerometer measure in both fourth and fifth grade. ***EXPOSURE/ PARTICIPATION:*** All 4th grade students at the intervention schools were exposed to the intervention. Attendance for teacher in-service was 89% for 15 sessions over 3 years. *(continued next page)*	***LEAD AGENCY:*** Researchers from San Diego State University ***THEORY/ FRAMEWORK:*** Social Cognitive Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The intervention had three conditions: *Condition 1:* Certified physical education specialist led PE *Condition 2:* Trained classroom teacher-led PE *Condition 3:* Control – usual PE curriculum Researchers at San Diego State University developed the intervention. The PE specialists and teachers delivered the intervention components. The teachers in condition 2 received in-service training from the PE specialists including 23 hours in year one and 15 hours in year two. PE specialists provided additional training and assistance to the teachers through bi-weekly to bimonthly visits. *(continued next page)*	***RESOURCES:*** 1. PE equipment 2. Daily lesson plans 3. Monthly parent newsletter 4. Weekly goal sheets 5. Incentives (pencils, sports water bottles, stickers, etc.) ***FUNDING:*** National Institutes of Health ***STRATEGIES:*** Due to lack of funding, PE specialists were no longer able to be employed by the schools. Classroom teachers resumed the responsibility for teaching their own physical education classes.	***OVERWEIGHT/OBESITY:*** 1. All boys (n=305) increased their body mass index (BMI) at follow-up. In the spring of 1991 the control boys had significantly lower adjusted BMI than those in the teacher-led condition ($p<0.05$). In the fall of 1991 the control boys were lower than both intervention conditions ($p<0.05$). However, by spring of 1992 all conditions had similar BMI scores. 2. For girls (n= 244), the control condition had the lowest adjusted BMI at each measurement point. The only significant difference was in the spring of 1992 where the control girls had significantly lower BMIs than girls in both of the other conditions ($p<0.01$). 3. No significant differences in skinfold thickness measures were observed for boys or girls in any condition. ***PHYSICAL ACTIVITY:*** 4. Girls in the specialist-led condition improved substantially in the mile run. The mean difference between specialist and control conditions of one minute at posttest reflected a moderate effect size of 0.32. There was no significant intervention effect for boys. 5. Specialist-led girls improved better than those in the control for the sit-up test. The mean difference of about 11 sit-ups in one minute at post-test produced a moderate effect size of 0.31. Although there was not a significant difference for boys at post-test, difference between specialist-led and control groups were significant at spring of fourth grade ($p<0.002$) and fall of fifth grade ($p< 0.001$). 6. There were no significant intervention effects on sit-and-reach, pull-ups or weekday or weekend recalls of physical activity. 7. There were no significant group differences on any accelerometer measure. ***POLICY CHANGE:*** 8. Students in the control condition spent significantly fewer minutes per week in physical education classes (38.0 min, 95% CI: 27.9 – 48.1) compared to teacher-led (64.6 min, 95% CI: 59.0 – 70.2) and specialist-led conditions (79.7 min, 95% CI: 76.3 – 83.1), $p<0.001$. ***OTHER:*** 9. For cohort 1 (n=330), there were no effects of the SPARK intervention on the Basic Battery or Math score. On the language score, the decline in percentile ranking was significantly less in the teacher-led group compared to the control group [$F(2)=3.37$, $p=0.04$]. On the Reading score, students in the specialist-led group increased in percentile ranking, while the control students declined [$F(2)=4.29$, $p=0.02$]. (*continued next page*)

(Continued from previous study)						
		LIMITATIONS: BMI lacks specificity; study conducted in only one school district with 7 schools; no baseline measures for the accelerometer; follow-up data were restricted only to classroom teachers who were associated with the intervention for at least 2 years and who then remained to teach in their same schools; no assessment of new PE teachers or classes; splitting the sample decreased the statistical power to detect differences between conditions; teachers had limited time to teach all of the components for the self-management workshops; study could not assess the relationship between quality of teacher implementation and student outcomes	After the intervention concluded, researchers provided program components to teachers from the control schools. Teachers from those 3 schools attended three 2 hour group training sessions to help them implement the SPARK PE program. Approximately 67% of this group participated.	***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** 1. Direct observation of self-management workshops to record the occurrence of 14 lesson characteristics. 2. Teacher questionnaire completed at the end of each year documenting the ease of implementation of the self-management workshops. 3. Lesson context and teacher behavior was assessed using SOFIT measures.		10. For cohort 2 (n=424), students in the teacher-led course declined less on the Basic Battery and Reading scores than those in the other two conditions [F(2)=7.23, p=0.001; F(2)=8.36, p=0.001 respectively]. There was a negative effect for Language score, where declines in the specialist-led group were significantly greater than the other 2 conditions [F(2)=5.8, p=0.004]. ***MAINTENANCE OF EFFECTS:*** 11. After PE specialists were withdrawn, there were significant reductions in both the frequency of lessons (2.9 vs. 1.6 per week) and total minutes of PE per week (81.9 vs. 38.1 min) in schools that were originally led by specialists, p=0.001. 12. Weekly moderate-to-vigorous physical activity (43.1 vs. 17.5 min) and very active minutes (18.3 vs. 7.0 min) were also lower at follow-up in schools where the PE specialists were withdrawn, resulting in children spending less than half as much energy (7.5 vs. 3.3 kcal/kg) during physical education, p<0.001.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Pate, Ward (2005) & Ward, Saunders (2006) South Carolina	Lifestyle Education for Activity Program (LEAP) - school physical education policy to increase the amount of time girls spend in moderate to vigorous activity to 50% or more of physical education time. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. LEAP teams focus on instituting school-wide policies and practices to encourage physical activity (e.g., use of school space and resources outside the school day, opportunities for increased physical activity). *Complex:* 1. Health education including 15 lessons on physical activity behavioral skills 2. Physical activity promotion by school nurses (e.g., posters, flyers, class presentations) 3. Physical activity opportunities for staff to promote active role modeling 4. 'Communities in motion' program linking girls to physical activity opportunities in the community	***DESIGN:*** Group randomized trial and cross-sectional study ***DURATION:*** One school year ***SAMPLE SIZE:*** 1604 eighth and ninth grade girls from 24 schools ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. 3-Day Physical Activity Recall- (3DPAR) to measure physical activity – found to be valid and reliable in girls grade 8 and 9. 3. Teacher interviews and direct observation of physical education classes (level of intervention implementation) ***DATA COLLECTION:*** Data was collected in 2 successive class cohorts of students, spring of eighth grade (base-line) and spring of ninth grade (post-intervention). Cross-sectional follow-up data was collected from students when they were in the twelfth grade. 3DPAR was used to assess physical activity. Participants filled out a separate form for each day reporting predominant activity performed during each of the 34 thirty minute blocks. Activities were assigned a metabolic equivalent, based on intensity of activity, in accordance with the Compendium of Physical Activities. Daily data was reduced to a number for moderate-vigorous activity and all 3 days were averaged. BMI was calculated from height and weight and classified based on the Centers for Disease Control and Prevention growth charts. Interviews with physical education teachers and direct observation of physical education classes assessed the level of intervention implementation at follow-up (12th grade). ***LIMITATIONS:*** Physical activity was self-reported; 506 girls were lost to follow-up; study was multi-component so it was not possible to determine whether all the components were required to produce the observed effect	13-15 year olds girls 52.1% African American (intervention) 47.5% African American (control) The racial/ethnic breakdown of the evaluation sample was comparable to the population of the participating schools. ***ELIGIBILITY:*** Each girl and her parent had to provide consent in order to participate. ***EXPOSURE/ PARTICIPATION:*** All 9th grade girls who attended the intervention schools were exposed to the intervention. School attendance at central workshops was 86.7% in year 1 and 70.8% in year two. School participation in demonstrations was 37.5%.	***LEAD AGENCY:*** Researchers from the University of South Carolina ***THEORY/ FRAMEWORK:*** The study used a social ecological model that was drawn primarily from the Social Cognitive Theory. The Coordinated School Health Program model provided guidance when designing LEAP components. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** LEAP project staff, which consisted of two health and physical education professionals, were hired by the research team to develop and supervise implementation of the intervention. LEAP staff developed 15 lessons of physical activity behavioral skills instruction for use at the intervention schools, and also conducted teacher workshops to inform school staff on ways they could help students become more physically active. School physical education teachers carried out the physical education component. School nurses promoted physical activity throughout the school, presented to health and physical education classes and provided services (e.g., blood pressure screening) to faculty/ staff. LEAP staff provided information about opportunities for physical activity to school faculty/staff. Teachers carried out the 'communities-in-motion" program in physical education, health education and family/consumer science classes. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Records documenting staff activities throughout the intervention were collected, including announcements, reimbursement records, communication records and field notes (e.g., visitation logs, physical education observation, school visits). LEAP staff created reports that provided a qualitative view of school intervention implementation.	***RESOURCES:*** 1. Incentives for participation (gifts valued at <$10) 2. LEAP Resource Manual 3. Promotional materials (e.g., signs, bulletin boards, posters, fliers) 4. 'School newspaper 5. Personnel (health and physical education professionals ***FUNDING:*** National Heart, Lung, and Blood Institute ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. The percentage of girls who were classified as at risk for overweight (~34%) or overweight (~17%) did not differ between intervention and the control schools at follow-up. ***PHYSICAL ACTIVITY:*** 2. At follow-up, after adjustment for baseline value and other covariates, the percentage of girls who reported regular vigorous physical activity (VPA) during an average of 1 or more 30-minute time blocks per day over the 3-day recall period was approximately 8% greater in the intervention schools than in the control schools [adjusted mean (standard deviation)= 44.5%(2.6) vs. 36.4%(2.9); p=0.05]. 3. Most girls in both groups reported a daily average of at least two 30 minute blocks of moderate-to-vigorous physical activity at both baseline and follow-up, and the prevalence of meeting that standard was not altered by the intervention. ***MAINTENANCE:*** 4. (Cross-sectional data) No differences in the percentages of girls who engaged in one or more blocks of VPA per day, with or without adjustment for race/ethnicity and BMI and regardless of whether they attended control schools, schools with low intervention implementation or schools with high intervention implementation.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Neumark-Sztainer, Story (2003) Minnesota	The New Moves Program (NMP) – school policy to increase physical activity among girls by offering physical activity (PA) four times a week. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Field trips and free passes to local community centers, recreation facilities, and parks. 2. Nutrition education sessions (offered every other week) focused on skill building and increasing self-efficacy to implement long-term changes in eating behaviors. 3. Social support sessions (offered every other week) focused on enhancing self-image and increasing awareness of weight-related media messages. 4. Postcards containing information related to physical activity, social support or nutrition mailed home every 2-3 weeks throughout the intervention and maintenance periods. 5. Weekly lunch meetings with healthy food (maintenance period only).	***DESIGN:*** Group randomized trial ***DURATION:*** 16 weeks ***SAMPLE SIZE:*** 190 girls (84 intervention, 106 control) from 3 intervention and 3 control high schools ***PRIMARY OUTCOME:*** Overweight/ obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Physical activity stage of change 3. Youth and Adolescent Food Frequency Questionnaire (fruit and vegetable intake) 4. School staff interviews (n=6) to assess program satisfaction and sustainability 5. Parent surveys (n= 67) to assess satisfaction with the program, daughter eating habits and physical activity and suggestions for improvement 6. Student surveys (n=79) to assess satisfaction with the program, strengths and challenges of the program 7. Student interviews (n=30) to assess physical activity, eating behavior and self-image ***DATA COLLECTION:*** Data on physical, behavioral, personal and socio-environmental variables were collected from participants at baseline, post intervention (16 weeks) and 8 month follow-up. Researchers conducted the interviews and surveys at the end of the intervention. ***LIMITATIONS:*** Short intervention duration; limited statistical power to detect changes (small number of participating schools); lack of measures sensitive to changes in body composition [body mass index (BMI) not best measure], self-reported physical activity and eating behavior; short follow-up period; baseline differences between intervention and control girls	Female, 14-18 year olds (target) 41.9% White, 28.6% African American, 21.1% Asian American, 4.4% Hispanic, 1.0% Native American, 3.0% mixed/other (evaluation sample) ***ELIGIBILITY:*** Self-reported low physical activity (defined as being in pre-contemplation, contemplation or preparation stages of change for physical activity) and activity levels at or below 30 min/day. Girls with BMI values ≥75th percentile for age and gender who had low levels of physical activity were given priority for participation. Girls were excluded if a doctor told them they had an eating disorder or they reported disordered eating behaviors during the past month. Parental consent was required. ***EXPOSURE/ PARTICIPATION:*** All girls at the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Social Cognitive Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:***T ***IMPLEMENTATION:*** The New Moves Program was implemented by school staff in conjunction with the research team. The physical education component was taught by a physical education teacher, the social support component was taught by either a school counselor or a member of the research team, and the nutrition component was led by a member of the research team who was a registered dietician. School intervention staff participated in a full day of training, received a detailed manual to guide program implementation, and had ongoing contact with the research team members. Each school had a New Moves intervention coordinator. The New Moves intervention coordinator made weekly visits to the physical education teachers, providing support, materials and consultation on the New Moves classes. ***FORMATIVE EVALUATION:*** Conducted a comprehensive needs assessment that included in-depth interviews with 61 multi-ethnic overweight adolescents, 25 focus groups with 203 adolescents from the general student body in middle and senior high schools, and a survey of 114 teachers, school nurses and school social workers. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Recruitment flyers and posters 2. Program manuals 3. Guest fitness instructors for the physical activity classes 4. Funds for field trips 5. Free passes to community recreation facilities 6. Healthy food for weekly lunch meetings 7. Materials for teacher training 8. Personnel (New Moves intervention coordinator, registered dietician) ***FUNDING:*** American Heart Association ***STRATEGIES:*** A one year follow-up found that all intervention schools continued to offer an all-girls physical education section, invite guest instructors to offer special classes to the girls and integrate nutrition and social support components into the physical education classes.	***OVERWEIGHT/OBESITY:*** 1. There were no differences in BMI between intervention and control girls at either post-intervention (16 weeks) or the 8 month follow-up. ***PHYSICAL ACTIVITY:*** 2. High percentages of girls reported that the program was helpful in increasing physical activity levels (77%), increasing the number of healthy food choices made (81%) and improving self-esteem (69%). 3. There were differences between the intervention and control groups in progression of stage of change for physical activity. At post-intervention in the control schools, 20% of the 106 girls progressed in their stage of physical activity, and 24% regressed in their stage of physical activity. In the intervention schools, 31% of the 84 girls progressed, and 19% of the girls regressed [mean increases in stage (x100) were -1.26 in control and +5.16 in the intervention schools; p=0.120]. 4. At the 8 month follow-up, the corresponding percentage changes in stage were effectively unchanged in the control schools, but enhanced in the intervention schools, where 38% of the 81 girls progressed while only 11% regressed in stage [mean increases in stage (x100) were -1.33 control and +11.11 intervention; p=0.004].

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Bayne-Smith, Fardy (2004) New York	Physical Activity and Teenage Health (PATH) intervention - 30-minute physical education classes conducted 5 days per week for 12 weeks including: 1. 5-10 minute lecture and discussion 2. 20-25 minutes of vigorous physical activity (resistance exercise or aerobic exercise). ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. PATH student manuals including information on cardiovascular health, exercise, nutrition and smoking. 2. Homework assignments designed to enhance or clarify lecture material. 3. PATH physical education teacher manuals including guidance for teaching the program curriculum and assessing outcomes.	***DESIGN:*** Group randomized trial ***DURATION:*** 12 weeks ***SAMPLE SIZE:*** 442 girls (310 PATH, 132 traditional physical education) from 3 New York City high schools ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Triceps, subscapular, and suprailiac skinfolds 3. Total serum cholesterol 4. Queens College step test (maximum oxygen uptake) 5. Self-administered questionnaires (age, ethnicity, heart health knowledge, self-perception of health, non-school related physical activity, socioeconomic status, family history of cardiovascular disease, and risk factors) 6. Food frequency checklist (dietary habits) ***DATA COLLECTION:*** Physiological measures and self-administered anonymous questionnaires were completed at the beginning and end of the study for each participant. Heart health knowledge was determined by a 50-item, multiple-choice test developed for the program. Self-perception of health was determined by having participants rate their health compared with that of their peers. Level of non-school physical activity was defined as the number of activities engaged in for a minimum of 15 min/ session/ wk. The food frequency checklist contained 35 common foods that are high in cholesterol, saturated fat, sugar, and salt and higher scores represented poorer eating habits. Test-retest reliabilities ranged from 0.83 to 0.90 for questionnaire items. ***LIMITATIONS:*** Scheduling limitations limited the number of classes that could serve as controls; intervention and control students were located in the same school possibly causing contamination; inconsistent implementation of the intervention across schools; significant differences in % body fat (29.7 vs. 31.1, $p<0.05$), self-perceptions of health (6.2 vs. 5.8; $p<0.05$) and socioeconomic status (25.0 vs. 26.7 years; $p<0.05$) between intervention and control students at baseline	Female Urban 14-19 year olds 10% White, 46% African American, 29% Hispanic, 15% Asian (evaluation sample) The schools chosen to participate were representative of the demographic and racial/ethnic composition of Queens County. ***ELIGIBILITY:*** Parental consent was required for cholesterol testing. ***EXPOSURE/ PARTICIPATION:*** Sample of 9th through 12th grade classes were exposed to the intervention.	***LEAD AGENCY:*** The research team from the Queens College, City University of New York and the schools ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The researchers designed the curriculum and manuals and the physical education teachers carried out the intervention. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. PATH student and teacher manuals 2. Physical education teachers 3. Equipment for PATH activities ***FUNDING:*** Professional Staff Congress-City University of New York, Faculty Research Awards Program; the Research Foundation of City University of New York; the Department of Health, State of New York; and Operation Fitkids, Inc ***STRATEGIES:*** The program has been introduced in approximately 50 middle and high schools.	***OVERWEIGHT/OBESITY:*** 1. Mean changes in PATH versus control physiological measures were significant for % body fat (PATH: -1.2%; control: -0.4%; $p<0.001$), systolic blood pressure (PATH: -5.3; control: -3.0; $p<0.05$), and diastolic blood pressure (PATH: -3.2; control: +0.2; $p<0.001$). 2. Mean differences in BMI, total serum cholesterol, and estimated maximum oxygen uptake were not significant between PATH and control students. ***OTHER:*** 3. Significant differences in health knowledge and eating breakfast were observed between PATH and control students ($\chi^2 = 14.8$, df=1, $p<0.05$). 4. Analysis of other lifestyle measures revealed no significant differences between mean change scores for self-perception of health, out-of-school physical activity, and dietary habits between PATH and control students.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Hopper, Munoz (2005) California	School policy increasing physical education (PE) instruction to three 30-minute lessons per week, emphasizing physical activity and fitness objectives specified in Healthy People 2000. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Orientation event: Overview of program for parents and students 2. Home component: Families were asked to set activity goals. Students took home a packet including exercise and nutrition activities to be completed during the week. Families kept a family fitness scorecard and students received stickers and points for returning the scorecard to class. 3. Nutrition education component: Teacher-led classroom nutrition education for two 30-minute lessons per week. Included hands-on activities, games, group discussion, and role-playing designed to encourage the use of healthy foods.	***DESIGN:*** Group randomized trial ***DURATION:*** 20 weeks ***SAMPLE SIZE:*** 238 students (142 exposed, 96 unexposed) from 15 classrooms (9 intervention, 6 control) in 6 elementary schools ***PRIMARY OUTCOME:*** Physical activity (PA) and nutrition ***MEASURES:*** 1. Anthropometric measures (height and weight (body mass index [BMI]), calf and triceps skinfold thickness) 2. One mile run test (fitness) 3. Blood cholesterol (Reflotron dry chemistry analyzer – validated tool; test-retest reliability = 0.74) 4. 25-item exercise and nutrition knowledge questionnaire (internal reliability = 0.65) 5. 24-hour dietary recalls (dietary intake) ***DATA COLLECTION:*** All measures were completed at pre- and post-intervention. All children completed a 1-mile run and were timed in seconds. To reduce error due to students' different reading readiness levels, all classroom teachers read each question in class when administering the questionnaire. Trained interviewers administered dietary recalls with a random sample of 146 to obtain estimates of food intake pre- and post-intervention. Data was collected on 1 week day and 1 weekend day and the 2 days were averaged and fed into the Food Processor II computer program. The program calculated each child's intake of kilocalories, grams of protein, carbohydrate, fiber, total fat, saturated fat, mg of cholesterol and sodium. ***LIMITATIONS:*** The effect on diet and exercise may be confounded by developmental changes, which include increases in weight, body mass index, and skinfold measures; the study was limited by moderate participation rates of parents in the home component and by the amount of school time devoted to the program	8-9 year olds Rural 83% Caucasian, 5% Native American, 5% Asian, 5% Hispanic and 2% African American (evaluation sample) ***ELIGIBILITY:*** Children whose parents completed a consent-to-participate form were allowed to participate in the study. ***EXPOSURE/ PARTICIPATION:*** All third grade students from 9 elementary school classrooms were exposed to the intervention. Parent participation throughout the intervention was measured using the weekly scorecard tallies.	***LEAD AGENCY:*** The research team from Humboldt State University and Oregon State University ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team planned the intervention. Classroom teachers taught the physical education and nutrition components. Teacher-led lessons were taken from the curriculum guide by Hopper, Munoz and included a variety of cooperative activities and games with 20 minutes of aerobic activity within each. Teachers received a 10 hr training (1 hr per week) to prepare them to implement the classroom lessons, and also received on-going assistance from the research team throughout the school year. All curriculum materials were given to control teachers and parents at conclusion of the intervention. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Teachers 2. Materials for teacher training 3. Resources for parent orientation 4. Family fitness scorecards 5. Incentives (t-shirts, stickers, door prizes) 6. Resources for physical education and nutrition lessons ***FUNDING:*** National Heart, Lung and Blood Institute ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. There were no significant differences for any fitness measures between intervention and control schools at pre- or post-intervention. ***NUTRITION:*** 2. At post-intervention the intervention schools scored significantly lower (mean=57.05, SD=4.21) than the control schools (mean=64.68, SD=0.87) on mean total fat intake [$F(1,4)= 9.41$, $p<0.05$; $n^2=0.70$]. ***OTHER:*** 3. At post-intervention, intervention schools scored significantly higher (mean=15.41, SD=1.10) than control schools (mean=13.43, SD=0.55) on mean knowledge scores [$F(1,4)= 7.85$, $p<0.05$, $n^2= 0.66$]. Note: degrees of freedom for the school mean comparisons were low.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Donnelly, Greene (2009); Gibson, Smith (2008); DuBose, Mayo (2008); Honas, Washburn (2008) Kansas	Physical Activity Across the Curriculum (PAAC) – School policy integrating moderate-intensity physical activity (PA) into regular classroom activities intermittently throughout the school day for grades 2-5. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Teachers provided with TAKE10! material kits (lesson ideas worksheets, colorful posters, stickers) 2. Notebook of physically active lesson examples that could be taught as part of the regular school curriculum (integrated within mathematics, science, language arts and social studies) provided to teachers 3. $2,000 incentive to participate	***DESIGN:*** Group- randomized trial ***DURATION:*** 3 years ***SAMPLE SIZE:*** 1527 students in grades 2-5 from 24 elementary schools (14 intervention, 10 control) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Waist and hip circumference 3. Body composition (triceps and calf skinfold measurements, bioelectrical impedance analysis) 4. Systolic and diastolic blood pressure 5. Blood lipids, glucose and insulin levels 6. Modified version of the Physical Activity Checklist Interview [PACI] (previous day PA levels) 7. Modified bike test (aerobic fitness) 8. Youth/Adolescent Questionnaire [YAQ] (usual dietary intake). 9. Wechsler Individual Achievement Test-2nd Ed [WIAT-II] (academic achievement). Found to be a valid and reliable tool. 10. Accelerometers (physical activity) 11. System for Observing Instruction Time [SOFIT] (physical activity) 12. Heart rate monitor 13. Indirect calorimeter (IC) ***DATA COLLECTION:*** All baseline 2nd and 3rd grade students were followed for 3 years and had their height and weight measured twice per year to calculate body mass index (BMI). A random subsample of 575 participated in additional testing. These assessments (body composition, blood lipids, glucose, insulin, blood pressure, PACI, bike test, YAQ, WIAT-II, accelerometers, and SOFIT) were measured prior to the inception of the intervention and at the end of the study period. Blood samples were collected in a mobile laboratory after an 8-hour fast by a trained phlebotomist. Systolic and diastolic blood pressure were measured in duplicate and averaged. During the bike test, heart rate was measured and recorded every minute and the workload at a heart rate of 170 bpm was used to estimate maximal oxygen uptake. Parents assisted children <9 years with completion of the YAQ survey. Trained psychologists administered the WIAT-II. *(continued next page)*	7-11 year olds Lower-income 77.4% Caucasian, 6.2% African American, 10.1% Hispanic, 1.6% Native American, 1.2% Asian, and 3.6% multi-ethnic. 43% of participants qualified for free or reduced price lunch (evaluation sample) ***ELIGIBILITY:*** All 2nd through 5th grade teachers, principals, and school districts had to be willing to comply with study procedures. Written parental consent and child assent was obtained from those who participated in the sub-sample measurements. Children were excluded from the sub-sample measurements if they had any cardiac disease, asthma, other severe respiratory illness or any condition that affected their mobility. *(continued next page)*	***LEAD AGENCY:*** The research team and International Life Sciences Institute Center for Health Promotion and schools ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team and International Life Sciences Institute planned the intervention, designed the materials, and conducted the training sessions. All 2nd through 5th grade regular education teachers in the intervention schools were trained to incorporate PA into their regular academic curriculum. In yr 1, training occurred as a traditional in-service and included organization and management techniques, observation of student behaviors, safety procedures, active teaching techniques, motivational techniques, and understanding moderate-intensity PA. This method was also used in yrs 2-3 to review study procedures and any modifications made by the research staff. School teachers implemented the intervention activities in the classrooms. ***FORMATIVE EVALUATION:*** Not reported *(continued next page)*	***RESOURCES:*** 1. Compensation for teacher trainings ($150 for yr 1 and $100 for yr 2-3) 2. $2,000 incentive per school 3. TAKE10! material kits 4. Sample lesson notebooks ***FUNDING:*** National Institute of Diabetes and Digestive and Kidney Disease ***STRATEGIES:*** PAAC has been sustained by teachers without any further contact by the investigators. Teachers were surveyed 9 months after completion of PAAC. Approximately 95% of teachers indicated that they were using PAAC lessons one day/ wk or more. About 55% of teachers indicated that they were using PAAC 2 to 4 days/wk, 35% were using PAAC on most days or every day, and only 5% were not using PAAC lessons.	***OVERWEIGHT/OBESITY:*** 1. There were no significant differences for change in BMI or BMI percentile (baseline to year 3) for PAAC vs. control (p=0.83), and this finding was not influenced by gender. 2. Schools (n=9) with ≥ 75 min of PAAC/week showed significantly less increase in BMI at 3 years (1.8 ± 1.8) compared to schools (n=5) that had <75 minutes of PAAC/week. (2.4 ± 2.0), p=0.02. 3. In children at risk for obesity at baseline, 21.8% moved to normal BMI in the PAAC group compared to 16.8% in the control group, while 22.6% in the PAAC group moved to overweight status compared to 31.1% in the control group (changes not significant). 4. Of those who were overweight at baseline, 17.1% of the PAAC group compared to 8.3% of the control group moved to at risk for overweight at follow-up (p=0.08). ***PHYSICAL ACTIVITY:*** 5. Accelerometry data (n= 77 PAAC, n= 90 control) showed on average over the 3-year intervention, children in PAAC schools had 13% greater PA compared to children in control schools, p=0.007. 6. Children in PAAC schools had greater levels of PA during the school day (12%>, p=0.01), on weekends (17%>, p=0.001) and on weekdays (8%>, p=0.05) compared to children in control schools. 7. Children in PAAC schools also exhibited 27% greater levels of moderate-to-vigorous intensity PA compared to children in control schools (p=0.001). 8. Teachers in the intervention schools who were more physically active during lessons had students who were more physically active (p<0.001). *1 yr outcome of SOFIT observations:* 9. Students in the intervention schools (n= 3465) performed significantly greater levels of physical activity in the classroom than students in the control schools (n=1050); higher scores indicate higher activity intensity levels (intervention students 3.40 ± 0.02 vs control students 2.17 ± 0.03, p<0.0001). ***OTHER:*** 10. Significant improvements in academic achievement from baseline to 3 years were observed in the PAAC compared to the control schools for composite, reading, math and spelling scores (data not reported).

(Continued from previous study)						
		Physical activity observations (SOFIT) took place on a weekly basis for all intervention schools, and 3 randomly selected control schools. From the sub-sample, 167 children were randomly selected to wear an accelerometer 3 times over the study period. Accelerometers were worn over 4 consecutive days (2 weekdays and 2 weekend days). ***LIMITATIONS:*** Lack of time to incorporate PA into teacher lesson plans; physical activities were not age-appropriate for 4th and 5th grade students; process evaluation relied on self-reported data; potential recall bias due to delayed reporting; low response rate for end-of-year surveys	***EXPOSURE/ PARTICIPATION:*** All students in grades 2-5 in the intervention school participated in PAAC as it was adopted as a curriculum. Attendance at teacher training sessions was measured. The overall workshop attendance rate was 81% of 2nd through 5th grade teachers.	***PROCESS EVALUATION:*** 1. 15 item training survey (organization, appropriateness, and relevance of the teacher trainings) 2. Direct observation (frequency of teacher participation in active lessons with students, overall student enjoyment level) 3. Weekly online teacher questionnaires (days/week and minutes/day teachers performed PA lessons) 4. Yearly teacher survey, adapted from Child and Adolescent Trial for Cardiovascular Health (CATCH) (demographics, level of confidence to instruct and demonstrate how to become more physically active, level of confidence to incorporate PA into lesson plans, perceptions of the school's support) 5. Yearly 9-item online teacher survey adapted from CATCH Physical Education Observation Form (teacher observations of child PA, child and teacher PA enjoyment, use of lesson notebook) 6. Teacher focus groups (intervention improvement) 7. Principal surveys (presence of existing health promotion programs)		

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Mahar, Murphy (2006) North Carolina	School policy incorporating short classroom-based physical activities called Energizers (10 minutes) into grade-appropriate learning materials. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Energizers booklet of activities for teachers.	***DESIGN:*** Group randomized trial ***DURATION:*** 12 weeks ***SAMPLE SIZE:*** 243 students (135 intervention, 108 control) in kindergarten to 4th grade (15 classes, 3 per grade level). Two classes were randomly selected from each grade level to serve as the intervention classes and one served as the controls. ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Pedometers (physical activity levels) 2. Direct observation (on-task and off-task academic behavior) ***DATA COLLECTION:*** Physical activity was assessed over 8 weeks. Students wore pedometers for 5 days. During the intervention period, students (grades 3 and 4) or teachers (kindergarten and grades 1 and 2) recorded the number of steps accumulated before the Energizers activity, after the activity, and at the end of the school day. The control classes only recorded steps at the end of the school day. On-task or off-task behavior was assessed in 3rd and 4th grade students for 30 minutes during academic instruction time immediately before and for 30 minutes immediately after students participated in an Energizers activity. Primary and secondary observers practiced observations in their respective classrooms for 1 week prior to data collection to familiarize observers with the setting and to eliminate the reactivity effect on the teachers and students. Six students were chosen per day to assess their behaviors. Behavior was recorded in one of 4 categories: on-task, motor off-task, noise off-task, or passive/other off-task. ***LIMITATIONS:*** Observers were not blinded to students' participation in the Energizers activities, however the observers were thoroughly trained in observation techniques and overall reliability between observers was high; pedometers do not give an indication of the intensity of physical activity	5-10 year olds ***ELIGIBILITY:*** Students who returned signed informed consent forms were allowed to participate in the study. ***EXPOSURE/ PARTICIPATION:*** All kindergarten through 4th grade children in the intervention classes were exposed to the intervention.	***LEAD AGENCY:*** The research team from Eastern Carolina University ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team from Eastern Carolina University trained the classroom teachers. Before the study, classroom teachers attended a 45-minute training session where they were taught how to lead students through the activities. Classroom teachers led the Energizers activities. Teachers were provided copies of all the activities and were allowed to choose whichever activity they wanted to use each day. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Resources for teacher training 2. Energizers booklet 3. Classroom teachers ***FUNDING:*** Pitt Memorial Hospital Foundation, Inc. ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. The intervention classes averaged approximately 782 more daily in-school steps than the control classes ($p<0.05$); the size of the mean difference was moderate (effect size= 0.49). ***OTHER:*** 2. The improvement in on-task behavior of 8% (from 70.9±15.3 to 79.2±11.4) between the pre-Energizers and post-Energizers observations was statistically significant ($p<0.017$). The mean increase in on-task behavior from pre-Energizers to post-Energizers (n=62) was moderate (effect size= 0.60). 3. Among the least on-task students at baseline, the increase in mean percentage of on-task behavior from the pre-Energizers to the post-Energizers (n=62) observations during the intervention period was large (effect size= 2.20) and statistically significant ($p< 0.05$). The mean percentage of on-task behavior increased by about 20% after these students had participated in an Energizers activity.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
McMurray, Harrell (2002) North Carolina	School policy implementing 30 minutes of aerobic exercise for 3 days a week in physical education classes. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Knowledge program consisting of information on nutrition, and smoking, 2. Materials were presented in two physical education class periods per week. *Complex:* Not reported	***DESIGN:*** Group randomized trial ***DURATION:*** 8 weeks ***SAMPLE SIZE:*** 1140 youth (266 exercise only, 319 education only, 308 exercise and education, 247 unexposed) from 5 rural middle schools participating in the Cardiovascular Health in Children and Youth Study (CHIC II) ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Height and weight (calculated body mass index -BMI) 2. Triceps and subscapular skinfold thickness 3. Blood pressure 4. Parental questionnaire (socioeconomic status) 5. Submaximal cycle ergometry test (aerobic power) ***DATA COLLECTION:*** Data were gathered at the schools at baseline and follow-up by trained research assistants. Skinfold thickness was measured using procedures outlined by National Health and Nutrition Examination Survey. Blood pressure was measured twice from the right arm following American Heart Association procedures. Adolescents completed a multistage, submaximal cycle ergometry test to estimate aerobic power (pVO2¬max). The youth pedaled the ergometer at a rate of 60 revolutions per minute for three 3-minute stages, with heart rates measured for the last 10 seconds each minute. The initial workload was based on the subject's weight and the resistance was increased during the next two stages by 30 or 60 watts, depending on the subject's heart rate response during the preceding stage. ***LIMITATIONS:*** Schools were randomly assigned, but not randomly selected, which could have resulted in a clustering effect by school; Baseline data was obtained in the fall, while post-testing occurred in the winter; Adolescents are usually more active in the fall than in the winter, and a decrease in overall activity could have had some negative effect on pVO2max, especially in the groups that did not receive an exercise program; The exercise only group contained significantly more African-Americans and had lower socioeconomic status than the other 3 groups (p=0.001)	11-14 year olds Rural 64% White, 24.4% African-American, 11.6% other ethnicities (evaluation sample) The demographics of the sample were similar to the overall populations of the schools. ***ELIGIBILITY:*** School communities had to be rural, have a good proportion of African-American students and be geographically separate (to minimize cross-contamination). All students capable of exercising were eligible to participate. Parental consent and student assent were required. ***EXPOSURE/ PARTICIPATION:*** All students in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The intervention had three exposure groups: exercise only (ExO), education only (EdO) and combined exercise and education (EE). The exercise program was developed by one of the authors and a specialist in middle-school physical and health education. The "knowledge program" was developed by a state-certified health educator. The teachers administered the exercise and knowledge programs during regular physical education classes. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Specialist in middle-school physical and health education to develop the exercise program 2. State-certified health educator to develop curriculum 3. Physical education teachers to deliver the exercise and education program 4. Physical education textbooks ***FUNDING:*** National Institute of Nursing Research of the National Institutes of Health ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. There were no differences in the change in BMI among the four groups from baseline to follow-up (education only group mean=0.26 kg/m^2 ± 0.06, exercise only group mean = 0.21 kg/m^2 ± 0.05, exercise and education group mean =0.23 kg/m^2 ± 0.06, control mean = 0.23 kg/m^2 ± 0.06; ANCOVA, p=0.709). 2. There was a significant difference in the change in sum of skinfolds among the four groups (education only group mean=1.9 ± 0.4, exercise only group mean=1.4 ±0.3, exercise and education group mean= 0.9 ± 0.3, control mean =3.7 ± 0.4; ANCOVA, p=0.0001). The increase in sum of skinfolds was less in the exercise and education group than the education only or control groups (p=0.0001). ***OTHER:*** 3. The small increase in aerobic power (VO2max) of the exercise and education group (0.8 ± 0.4 mL/kg/min) was significantly greater than in the education only group (-1.1 ± 0.4 mL/kg/min), p=0.0001. 4. Changes in systolic blood pressure were significantly different between groups (education only group mean = -1.1±0.6 mmHg, exercise only group mean = -2.8±0.5 mmHg, exercise and education group mean = -2.0±0.6 mmHg, control mean = +1.8±0.6; ANCOVA, p=0.0001). 5. Changes in diastolic blood pressure were significantly different between groups (education only group mean = +0.1±0.6 mmHg, exercise only group mean = -4.8±0.6 mmHg, exercise and education group mean = -0.5±0.6 mmHg, control mean = +1.4±0.7; ANCOVA, p=0.0001). 6. The increases in systolic and diastolic blood pressure for the control group were significantly different from all 3 of the intervention groups (p<0.001). The decrease in diastolic blood pressure for the exercise only group was significantly different from that of the education only group (p=0.0001).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Luepker, Perry (1996); Luepker, Perry (1998); McKenzie, Nader (1996); McKenzie, Stone (2001); Webber, Osganian (1996); Dwyer, Hewes (1996); Osganian, Ebzery (1996); Lytle, Stone (1996); Perry, Lytle (1998); Nader, Sellers (1996); Perry, Sellers (1997); Nicklas, Dwyer (1996); Nicklas, Stone (1994); Nader, Stone (1999); Hoelscher, Feldman (2004); Osganian, Hoelscher (2003) California, Louisiana, Texas, and Minnesota	Child and Adolescent Trial for Cardiovascular Health (CATCH)-School physical activity policies to: CATCH PE component: Distribution of PE materials (PE Guidebook, Activity Box, and 3 videotapes); teachers encouraged to add their own activities that met CATCH objectives ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Increase use of fresh, frozen, canned, or dried fruit 2. Increase use of fresh, frozen, or unsalted canned vegetables and salads 3. Reduce total fat to no more than 11g, saturated fat to 3.5g, and sodium to 600-1,000 mg per school meal 4. Maintain total energy at 338 calories or more 5. Maintain other essential nutrient levels by meeting minimum requirements specified by the USDA *(continued next page)*	***DESIGN:*** Group randomized delayed intervention ***DURATION:*** Main CATCH intervention was implemented over 3 school years (1991-1994), with 3 year follow-up (1995-1997) and 5 year follow-up (CATCH-ON 1998-2000) ***SAMPLE SIZE:*** Main trial: 4019 children (3297 exposed, 722 unexposed) in grades 3-5 from 96 public schools (56 intervention-14 per field center, 40 control-10 per field center). 3-and 5-year follow up: 56 former intervention schools, 20 former CATCH controls, and 12 new unexposed schools that had not participated in CATCH (5 year follow-up only). ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Eat Smart Menu data (recipes, menus of meals offered, vendor product info) 2. Records of student participation in school meals 3. In-person interviews with food managers and cooks about menus and recipes (ingredients, prep methods) 4. 24 h recall interview with students [reliable and valid] (total daily food and nutrient intake) 5. Direct Observation using System for Observing Fitness Instruction Time (SOFIT) [reliable and valid] (e.g. physical activity, lesson context) 6. Physical Activity Record of Classes (PARC) (frequency and duration of PE lessons) 7. 9-minute run (physical fitness) 8. 45- min Health Behavior Questionnaire (HBQ) [reliability/validity tested and validated during CATCH pilot] (e.g. dietary knowledge, intentions, usual food choice) 9. Self-administered Physical Activity Checklist (SAPAC)[developed, validated during CATCH] (e.g. type, duration, and intensity of selected activities) 10. Physiological Measures (total cholesterol, blood pressure, pulse rate, triceps and subscapular skinfold thickness, height, and weight) 11. Food service staff questionnaires (e.g. use of Eat Smart materials, training) *(continued next page)*	5-10 year olds 69.2% White, 13.3% African-American, 13.8% Hispanic, 3.7% other (evaluation sample) ***ELIGIBILITY:*** Schools: distance from 1 of 4 field centers, ethnic diversity, food services' potential for intervention, commitment to offering at least 90 min/week of PE and participating in a 3-year study, and cooperation with random assignment to treatment group. Parental consent and student assent to providing a blood sample at baseline, and to lipid assessment at baseline and follow-up. ***EXPOSURE/ PARTICIPATION:*** 100% of schools participated in CATCH during the entire intervention period. *(continued next page)*	***LEAD AGENCY:*** 4 field centers (Univ. of California - San Diego, Univ. of Minnesota, Univ. Texas - Houston, and Tulane Univ. School of Public Health and Tropical Medicine), a coordinating center (New England Research Institute), and the National Heart, Lung, and Blood Institute (NHLBI) project office. ***THEORY/ FRAMEWORK:*** Organizational change models, Social Cognitive Theory and Diffusion Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** CATCH had 2 intervention groups: Group A (28 schools) received Eat Smart, CATCH PE, and class curriculum; and Group B (28 schools) received Eat Smart, CATCH PE, class curriculum, and the family program. *(continued next page)*	***RESOURCES:*** 1. Food service and school staff personnel 2. Resources for trainings 3. Refrigerator tip sheets and magnets 4. Rewards for home component (pencils, memo pads, certificates) 5. Score cards for home curriculum 6. Resources for family fun nights (food booths with healthy snacks, recipes, games, etc.) 7. CATCH PE Guidebook 8. Activity Box for PE 9. PE videotapes 10. Eat Smart School Nutrition Program Guide 11. Eat Smart Recipe File box 12. Vendor Product Handbook 13. Eat Smart Newsline (newsletter for food service managers) *(continued next page)*	***OVERWEIGHT/OBESITY:*** 1. Measures of body size (height, weight, BMI, skinfolds) did not differ between the intervention and control groups at baseline or follow-up. ***PHYSICAL ACTIVITY:*** 2. Children in intervention schools engaged in more moderate to vigorous physical activity (MVPA) during lessons than those in control schools (51.9% vs. 42.3% of lesson time, p=0.002). 3. Children in intervention schools engaged in more VPA minutes (58.6 vs 46.5; p=0.003) and MET-weighted vigorous minutes (339.5 vs. 270.3; p<0.003) per day than control schools. 4. Children in intervention schools ran 18.6 yards more in the 9 min run test than control schools, not statistically significant. 5. Compared to controls, children in intervention schools had a higher estimated energy expenditure (2.49 kcal/kg vs. 2.26 kcal/kg; p=0.002) and a higher energy expenditure rate (0.0085 kcal/kg/min vs. 0.0078 kcal/kg/min; p=0.002) per lesson. ***NUTRITION:*** 6. Fat intake was significantly reduced among intervention children at follow-up (32.7% to 30.3% of energy consumed) compared with those in control schools (32.6% to 32.3%), p<0.01. Much of this difference came from the intake of saturated fat falling in the intervention schools (from 12.7% to 11.4% of energy) and changing little in the control schools (from 12.5% to 12.1%), p<0.01. 7. Dietary cholesterol was significantly reduced among children in the intervention group (223 mg to 206 mg) compared with controls (218 mg to 225 mg), p<0.05. 8. Analyses of variance revealed no differences in fruit and vegetable (F&V) consumption at follow-up due to site, sex, race, sex by race, or condition by race by sex. 9. Total daily intakes of vitamin B6, folacin, magnesium and sodium increased at follow-up in the intervention schools and decreased in control schools (data not shown). ***ENVIRONMENT CHANGE:*** 10. The % of energy intake from total fat in meals was significantly reduced in the intervention school lunches (38.7% to 31.9%) compared with the control school lunches (38.9% to 36.2%), p<0.001. 11. Mean % of calories from saturated fat decreased in intervention schools (14.8% to 12.0%) compared with control schools (15.1% to 13.7%), adjusted mean difference -1.3%, p=0.003. *(continued next page)*

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	Complex: 1. Eat Smart component: Tools and materials provided to foodservice staff (Eat Smart School Nutrition Program Guide, Eat Smart Recipe File box, Vendor Product Handbook of products, Eat Smart Newsline), promotional events and materials(e.g., food prep demos, cafeteria tours, posters). 2. Family component: 4 home-based curricula, rewards for completed and returned lessons, 2 Family Fun Nights, (grades 3-4: dance performances by students, food booths with healthy snacks, taste testings, distribution of recipes, and games). 3. Class curriculum component: grade appropriate curricula consisting of 30-40 minute lessons (eating habits, physical activity, and cigarette smoking) for 5, 12, and 8 weeks in grades 3, 4, and 5, respectively.	12. Health survey for principals (e.g., school demographics, other health programs and policies) 13. In-depth interviews with 2-4 individuals in each former CATCH school 14. School staff questionnaires for PE and classroom teachers in grades 3-5 (e.g. support for PE by school staff and parents, perceived obstacles) ***DATA COLLECTION:*** Trained observers collected Eat Smart menu data for 5 consecutive, non-randomly selected days at baseline (beginning of 3rd grade), end of grade 4, at follow-up (grade 5), 3 years follow-up, and 5 years follow-up. Trained observers directly observed physical activity using SOFIT during 2 school visits on randomly selected weeks each semester during CATCH and at the 5 year follow-up. PARC was completed by homeroom teachers and administered in all schools during 2 randomly selected weeks per semester. The 9-minute run was administered to 3-7 children at baseline and follow-up. The HBQ was class administered at the end of grades 3 and 4, at follow-up, and at 3 year follow-up. 24-h recall was completed by trained CATCH staff at baseline and follow-up on a random subsample of 30 students per school during 30 minute interviews. At 3-year follow-up a random subsample of those that completed the 24-h recall in grades 3 or 5 were measured again. SAPAC was administered to all participants during the main trial and at 3 year follow-up. All physiological measures were collected at baseline, follow-up, and 3-year follow-up from non-fasting blood samples with levels of cholesterol and apolipoprotein B collected from a 45% randomly selected subsample. Blood pressure and pulse rate were measured 5 times while the participant was seated, with the average of the last 3 used for outcome analyses. Skinfold thickness was measured 3 times at each site. Food service staff questionnaires were self-administered at each school at 5 year follow-up. School health surveys (demographics) were completed by school principals and staff questionnaires were collected from PE and classroom teachers at 5-year follow-up. All observers completed training, videotape analysis, field practice, and certification for each measure in which they participated. Prior to the 3rd and 5th grade data collection periods, senior measurement staff from each study center met for several days for measurement training. The senior staff members, in turn, trained and evaluated all data collectors according to protocols in the CATCH Physical Activity Measurement Manual. *(continued next page)*	94% of PE specialists and 87% of classroom teachers attended the trainings; 78% of supervisors and food service managers, and 86% of cooks attended Eat Smart trainings; 69% of children/ families participated in home activities; 80% of teachers and 56% of students attended Family Fun Nights; 70-75% of students participated in school lunch programs on average throughout the study in all schools.	The control group received intervention materials and an in-service intervention training workshop after the end of the main trial period without follow-up support. The researchers developed the intervention and its components and trained school teachers, PE teachers and specialists, and food service staff. Classroom teachers implemented the classroom and home curricula and PE teachers/ specialists implemented the PE component. Food service personnel went through a one-day training by certified CATCH interventionists. Booster training sessions were conducted throughout the school years with make-up training and sharing sessions conducted as needed. The PE teachers and specialists had 1 to 1.5 days of training at the beginning of each school year. 4th and 5th grade PE teachers received a half-day booster training at midyear. CATCH PE consultants provided on-site follow-up about every 2 weeks following teachers' initial training. Classroom teachers attended 1 to 1.5 days of training yearly on curricula implementation. ***FORMATIVE EVALUATION:*** A feasibility study was conducted in 8 schools (2 from each city) from 1986-1990 to develop and pilot programs and evaluation instruments for the main trial. *(continued next page)*	14. Resources for Eat Smart activities and promotional materials (food prep demos, cafeteria tours, posters, table tents, etc.) 15. Small stipend for those attending training sessions ***FUNDING:*** NHLBI ***STRATEGIES:*** There were higher levels of institutionalization in the former intervention compared to former control schools. The mean CATCH institutionalization score for former intervention schools versus former comparison schools was significantly different (0.75 ± 3.27 vs. -2.10 ± 2.18, P<0.001), indicating that former intervention schools maintained more of the original CATCH components compared to former control schools.	12. The mean sodium content of school lunches increased in both conditions but was significantly lower in intervention schools (1,133 mg to 1,206 mg) compared to control schools (1,144 mg to 1,306 mg), adjusted mean difference -89 mg, p=0.034. 13. A significant increase in potassium was seen in the intervention school lunches (from 330.0mg/1000MJ to 357.9mg/1000MJ) compared to control schools (325.3mg/1000MJ to 326.6mg/1000MJ), p<0.01) 14. There were no statistically significant differences between conditions over time for total amount of cholesterol, carbohydrate, protein, dietary fiber, total sugars, calcium, iron, vitamin A, and vitamin C. 15. Average total calories in school lunches was significantly reduced in intervention schools (719 kcal to 683 kcal) compared with control schools (710 kcal to 746 kcal), adjusted mean difference -71 kcal, p<0.001, but remained above one-third of the Recommended Dietary Allowance at follow-up. ***PHYSIOLOGICAL RESPONSE:*** 16. Systolic blood pressure levels were 4.9 mm Hg higher at follow-up (109.9 mm Hg) than at baseline (105.0 mm Hg). There was a statistically significant site by intervention group interaction (p<0.005). In Minnesota, children in the intervention schools had levels 1.5 mm Hg higher than control schools, while in Louisiana and Texas, children in intervention schools had levels 1.1 and 0.59 mm Hg lower, respectively. In California no differences in levels between the intervention and control schools were seen. No differences in levels due to ethnicity and gender were noted. 17. For diastolic blood pressure, the increase was 2.3 mm Hg from baseline (54.5 mm Hg) to follow-up (55.7 mm Hg). A site by intervention group interaction (p=0.04) was noted with children in intervention schools having higher levels that those in control schools in Minnesota (1.2 mm Hg) and California (0.6 mm Hg), but the reverse effect was noted in Louisiana (0.2 mm Hg lower) and Texas (0.2 mm Hg lower). *3 year follow-up:* 18. No significant differences were noted among physiologic indicators of BMI, blood pressure, or serum lipid and cholesterol levels. 19. The significant differences in self-reported daily energy intake from fat and saturated fat were maintained from grade 5 to grade 8. At the end of 8th grade, intervention students had a mean intake of 30.6% energy from fat and 11.3% energy from saturated fat compared to 31.6% and 11.8% in control students (p= 0.01 and p=0.02, respectively) *(continued next page)*

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		Coordinating Center staff visited each study center during the main data collection periods to verify compliance to protocols. The 3 year follow-up study analyzed the persistence of intervention effects (at grade 8) among the cohort of students who were participants in the main trial. The 5 year follow-up studied a cohort of 3rd -5th grade students who attended former intervention and control schools from the main trial. ***LIMITATIONS:*** Observers were not blinded to condition during data collection; Selection bias was evident between those who completed baseline 24-hour diet recalls and those who did not with participants differing by site ($p<0.001$) and ethnicity ($p<0.03$); There was attrition bias evident for those who participated in the 24-hour diet recalls with participants differing by site $p<0.005$) and ethnicity ($p=0.05$); African Americans and California students were more likely to drop out; 24 h recalls were self-reported; Possible contamination as schools in both conditions used centralized food services and existing infrastructures; Analyses did not include data on foods sold a la carte or from vending machines and self-serve salad bars offered as entrees; Researchers may have underestimated added sugars in the post-follow-up analysis; Secular trends and other programs nationally and locally may have accelerated reductions in fat/ saturated fat in school meals; Differential effects of mass communications, industry influences, or advertising may have varied by site; It's impossible to determine whether changes noted were due to the types of foods offered, preparation methods, or changes in the nutrient content of purchased items without extensive analysis; Analysis is limited by inability to examine family characteristics which could explain variation of adult participation and in the outcome measures		***PROCESS EVALUATION:*** 1. Minutes of PE provided weekly in schools in both conditions 2. Lesson observation checklists (occurrence of 15 characteristics of a CATCH PE lesson) in intervention schools and grade 5 in control schools. 3. CATCH PE debriefing form (teachers' perceptions and satisfaction) for intervention schools at end of grade 5. 4. School meal participation worksheets (e.g., acceptability of meals to students) completed monthly in intervention and control schools from grades 3-5 and at 5 year follow-up. 5. Eat Smart guideline checklists and visit summary forms (implementation of program, purpose and length of monthly support visit, etc.) administered by CATCH staff to food service personnel during monthly site visits to school cafeterias over the 3 year intervention period and at 5 year follow up. 6. Secular Trends Questionnaires (any federal, state, or local programs with nutritional objectives similar to Eat Smart) conducted with state-level personnel and food service managers at the end of each intervention year and at 5 year follow-up. 7. The % of family program activities completed by teachers (fidelity of classroom curriculum)		20. Carbohydrate consumption also remained significantly higher among the intervention group (56.6% vs. 55.4% of energy, $p=0.02$). 21. The intervention effect for minutes of self-reported daily vigorous activity was maintained at grade 8 (30.2 min. intervention & 22.1 min. control, $p=0.001$). *5 year follow-up (CATCH-ON):* 22. From spring 1994 to spring 1999, there were greater mean reductions in the % of calories from total fat in the former control schools than former intervention schools (adjusted mean difference 2.6%, $p=0.02$). However, former intervention schools more closely approached the Eat Smart goals of 30% of calories from total fat than former control schools at the spring 1999 follow-up assessment (31% vs. 33.2% , respectively, $p=0.01$). 23. For saturated fat, mean % of calories decreased from 12.0% to 10.4% in intervention schools, compared with 13.8% to 11.0% in former control schools (adjusted mean difference 1.2%, $p=0.05$). 24. For grade 3 (1991-1999), %VPA decreased in intervention schools (from 21.3% to 17.1% of lesson, $p=0.0004$) but increased slightly in former control schools (from 14.5% to 16.2% of lesson, $p=0.335$), adjusted mean difference -5.8%, $p=0.003$. %MVPA increased in both intervention (from 46.4% to 51.6% of lesson, $p=0.003$) and former control schools (from 34.5% to 48.4% of lesson, $p=0.0001$), adjusted mean difference -8.6%, $p=0.004$. 25. CEE (relative energy expenditure during the lesson) remained the same in intervention schools but increased in former control schools (adjusted mean difference= -0.16 Kcal/kg, $p=0.01$). 26. For grade 4 (1993-1999), %VPA decreased significantly in intervention schools (from 22.5% to 15.0% of lesson, $p=0.0001$) and in former control schools (from 16.4% to 15.0% of lesson, $p=0.424$), adjusted mean difference -6.2%, $p=0.003$. %MVPA also decreased in intervention schools (from 51.4% to 49.4% of lesson, $p=0.254$) but increased in former control schools (41.7% to 48.8% of lesson, $p=0.007$), adjusted mean difference -9.2%, $p=0.031$. 27. CEE decreased in intervention schools and increased in former control schools (adjusted mean difference= -0.20, $p=0.001$). 28. For grade 5 (1994-1999), %VPA decreased in both intervention (from 20.1% to 14.5% of lesson, $p=0.0001$) and former control schools (from 17.1% to 13.6% of lesson, $p=0.094$), adjusted mean difference not significant. %MVPA increased in both intervention (from 50.9% to 52.8% of lesson, $p=0.364$) and former control schools (44.0% to 49.8% of lesson, $p=0.069$), adjusted mean difference not significant.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Heath, Coleman (2002); Heath, Coleman (2003); Coleman, Tiller (2005); Brown, Perez (2007) Texas and New Mexico	CATCH El Paso Study CATCH PE component: Improved school physical education (PE) curriculum, increased physical activity during PE classes; improved PE equipment. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. CATCH Eat Smart component: Modification of school meals to meet the following guidelines: A. <30% of total calories from fat B. 100-600 mg sodium C. <10% of total calories from saturated fat *Complex:* 1. CATCH HOME TEAM component: home/family activities 2. Classroom curriculum component: increased the number of health lessons in curriculum	***DESIGN:*** Group randomized trial ***DURATION:*** 3 years ***SAMPLE SIZE:*** Students from 24 elementary schools (20 intervention, 4 control) from 5 school districts. ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Anthropometric measurements (height, weight [body mass index], waist/hip circumference) 2. SOFIT observations (PE class MVPA and VPA) 3. Breakfast & lunch production sheets (food served, food prep, serving sizes, types and amount of milk offered, copies of recipes/modifications, labels from used products) 4. Nine minute timed run during PE (fitness) - Cohort 5 only ***DATA COLLECTION:*** SOFIT observers collected information from each school in the study for grades 3, 4, and 5 for 2 nonconsecutive days in 2 nonconsecutive weeks each semester of the school year. Trained collectors took anthropometric measurements in the late fall or early spring semester of each year of the project. For all study schools, school breakfast and lunch menus and their recipes were collected from the production sheets for 5 consecutive days during each semester in every year of the study. This information was converted to micro- and macronutrient density information using DINE Healthy 3.0 food analysis software. A cost-effectiveness analysis was run to examine money spent in relation to benefits of an intervention. ***LIMITATIONS:*** Unclear whether program directly led to change in child risk of overweight; control schools could have been exposed to CATCH, potentially minimizing the intervention effects; 152 children were lost to follow-up	Hispanic/Latino Lower- income 5-10 year olds Children in participating schools were 75%-98% of Hispanic heritage. ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the intervention. 91% of the children were retained for the 2nd year of the intervention; 83% of the children were retained for the 3rd year of the intervention.	***LEAD AGENCY:*** Paso Del Norte Health Foundation and El Paso schools ***THEORY/ FRAMEWORK:*** Principles of Dissemination ***EVIDENCE-BASED:*** Study builds off the Child and Adolescent Trial for Cardiovascular Health (CATCH), now called the Coordinated Approach to Child Health, which resulted in lower % of fat in school lunches, higher % time spend in MVPA during PE and improved self-reported PA and fat intake outside of school. ***REPLICATION/ ADAPTATION:*** This intervention was a cultural adaptation of the original CATCH intervention (Luepker et al, 1996). ***ADOPTION:*** Paso Del Norte Foundation organized a task force named BORDER LEAN who selected CATCH to be implemented. Three action committees made up of various stakeholders were created to help implement CATCH. *(continued next page)*	***RESOURCES:*** 1. Incentives ($1000 for control and $8500 total for intervention schools) 2. CATCH PE guidebook 3. PE activity box 4. Curriculum materials 5. Eat Smart manual 6. PE equipment 7. Healthy foods ***FUNDING:*** *Intervention :* Paso Del Norte Health Foundation, Am. Heart Assoc., Texas Dept. of State Health Services Innovations Grants (CDC Division of Nutrition and PA), NIH National Center on Minority Health and Health Disparities; The Texas Diabetes Council (subsidized the purchase of CATCH program materials, including the PE guidebook, PE activity box, curriculum materials, and the EAT SMART manual). *Evaluation:* $500,000 for 3 years from the American Heart Association Patient Care and Outcomes Grant *(continued next page)*	***OVERWEIGHT/OBESITY:*** *Cohort 5 (1999-2000 w/ controls) only:* 1. Girls in control schools had higher increases in percentage of risk of overweight or overweight from 3rd to 5th grade compared with intervention schools (rate of increase 13% vs. 2%, respectively). Boys in control schools had higher increases in percentage of risk of overweight or overweight from 3rd to 5th grade compared with intervention schools (rate of increase 9% vs. 1%, respectively). 2. The % of overweight in girls did not change in control or intervention schools, but the % of overweight in boys significantly increased in both control and intervention boys (8% in control and 5% in intervention). 3. There was no effect of intervention on height, weight, waist-to-hip ratio, or BMI for any children. ***PHYSICAL ACTIVITY:*** 4. Cohort 1 (1998-2000) had significant increases in class time spent in MVPA (40.8% baseline to 59.2% end of year 1; $\chi 2 = 379.5$, $p<0.001$) and VPA (8.2% baseline to 12.7% end of year 1; $\chi 2 = 103.7$, $p<0.001$) at end of year 1, with declining increases by the end of the 2nd year (though still statistically significant from baseline). MVPA goals were met at end of year 1, but not by end of year 2. 5. Cohort 2 (1999-2000) had significant increases in class time spent in MVPA (36.5% baseline to 38.9% end of year 1; $\chi 2 = 4.5$, $p<0.05$) but significant decrease in VPA (9.9% baseline to 7.2% end of year 1; $\chi 2 = 19.98$, $p<0.001$) at end of year 1. Levels of MVPA and VPA never met CATCH goals. 6. Cohort 3 (1997-2000) met CATCH goals for MVPA (50% class time) after 2 years in the program (53.0% class time). 7. Cohort 4 did not meet CATCH goals for MVPA after 3 years in program (41.1% class time). 8. Cohort 5 (1999-2000 w/ controls) had significant increases in class time spent in MVPA (30.3% baseline to 51.5% end of year 1; $\chi 2 = 266.0$, $p<0.001$) and VPA (9.0% baseline to 16.0% end of year 1; $\chi 2 = 98.3$, $p<0.001$) at end of year 1, with no increase in MVPA in control schools, but a significant increase in VPA in control schools (10.8% baseline to 13.3% end of year 1; $\chi 2 = 9.22$, $p<0.01$). Intervention schools were meeting CATCH MVPA goals by end of year 1. No intervention school reached VPA goals. 9. For cohort 5 (1999-2000 w/ controls), the children's mean change in yards run from 3rd to 5th grade in the 9 minute run test was higher in the intervention schools compared to control schools (control boys: 111 yards, 95% CI: 77-144 vs. intervention boys 126 yards 95% CI: 92-160; control girls: 92 yards, 95% CI: 64-120 vs. intervention girls: 101 yards, 95% CI: 66-136; p-values not shown). *(continued next page)*

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				The PE action committee was the most successful and included teachers in the elementary schools who were highly motivated to improve the school and health of children. ***IMPLEMENTATION:*** The school staff and the 3 action committees helped to implement CATCH. Teachers and food service staff were trained to deliver the classroom, home team, and PE components and also to make modifications to school meals. ***FORMATIVE EVALUATION:*** Paso Del Norte did research and planning using BRFSS data to determine those most at risk in the community and how to address health issues. ***PROCESS EVALUATION:*** Questionnaires for school staff (implementation of CATCH in school/ district, training and support for CATCH, demographics), structured interviews (specific details about implementation, use of competing programs for physical activity/nutrition, additional funding received by schools, perceptions on CATCH effects on community, promotional activities, communication issues, and account of funds spent during year).	***STRATEGIES:*** Paso Del Norte Foundation awarded another $4.2 million over 4 years for El Paso CATCH beginning in Fall 2000 (after 3 years of program evaluation). Estimated sample size by fall 2002 was 108 schools and 50,000 children from New Mexico to West Texas.	***ENVIRONMENTAL CHANGE:*** 10. Cohort 1 (1998-2000) had a significant decrease in % fat in breakfast from 1st to 2nd year (25.3% to 20.4%; $\chi 2 = 138.1$, $p<0.001$), but a significant increase in % fat in lunch from 1st to 2nd year (30.0% to 31.2%; $\chi 2 = 8.2$, $p<0.01$). School breakfasts met goals for % fat and sodium at years 1 and 2. School lunches met goals for % fat at year 1, but not at end of year 2. 11. Cohort 2 (1999-2000) had no change in % fat in breakfasts at end of year 1 (26.5% baseline to 25.6% end of year 1, $p>0.05$), but a significant decrease in % fat in school lunches (32.3% baseline to 29.8% end of year 1; $\chi 2 = 50.4$, $p<0.001$). No change in sodium content of either breakfast or lunch after year 1. Both breakfast and lunch met goals for % fat, and breakfasts also met goals for sodium content. 12. Cohort 3 (1997-1999) met goals for % fat and sodium in breakfasts but not lunches after 2 years. 13. Cohort 4 (1997-2000) met goals for % fat in school breakfasts and lunches, as well as goals for sodium in breakfasts after 3 years. 14. Cohort 5 (1999-2000 w/ controls) had no change in % fat for intervention breakfasts by end of year 1, but there was a significant decrease in % fat in control school breakfasts (20.2% baseline to 19.2% end of year 1; $\chi 2 = 8.1$, $p< 0.01$). No change in % fat in intervention school lunches at end of year 1, but % fat in control school lunches significantly increased (31.8% baseline to 36.6% end of year 1; $\chi 2 = 102.7$, $p<0.001$). Control school lunches were significantly higher in fat after 1 year compared to intervention schools ($\chi 2 = 43.1$, $p<0.01$). Intervention schools were meeting goals for fat and sodium in breakfasts but not lunches by end of year 1. No intervention school met sodium guidelines for lunches. ***COST:*** 15. The Cost-effectiveness Ratio (CER) was $900, much lower than the $30,000 maximum generally accepted as still cost-effective. The Net Benefit (NB) was $68,125, much higher than the $0 minimum generally accepted as net beneficial.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Harris, Paine-Andrews (1997); Harris, Richter (1997) Kansas	Kansas LEAN School Intervention Project - Physical fitness stations in classrooms (workbooks & fitness activities), noncompetitive incentive system based on students' goals, lesson plans for physical education teachers to enhance variety/intensity of physical activity ***OTHER INTERVENTION COMPONENTS:*** Components varied slightly between communities. *Multi-component:* 1. School policy to reduce dietary fat and maintain adequate calories and food acceptability by changing food prep techniques, recipe ingredients, products from vendors and menu combinations to reduce % calories from fat. *Complex:* 1. Nutrition education component: American Cancer Society's "Change the Course (CTC)" health units, volunteer role models, field trips, teacher incentives for implementation 2. Community component: On-site coordinators (20-30 h/wk) recruited parents, teachers, business leaders and other community members to for community partnerships	***DESIGN:*** Non-randomized trial ***DURATION:*** 2 years ***SAMPLE SIZE:*** 170 students in grades 4 and 5 (74 exposed Salina, 34 exposed Dighton, 62 unexposed Salina) from 4 schools ***PRIMARY OUTCOME:*** Fitness assessment and school environment changes ***MEASURES:*** 1. Menu analysis (fat content, calories) 2. Foodservice records (meals served, food costs, % students participating in lunch program) 3. Student surveys (knowledge, skills, and attitudes; effectiveness of curriculum) 4. Amateur Athletic Union (AAU) physical fitness assessment for students (student fitness) 5. Log monitoring system (community partnership activities) 6. Constituent surveys to community members (importance of goals) ***DATA COLLECTION:*** A dietitian analyzed foodservice menus at baseline (3-5 months) and after menu changes (7-8 months). Constituent surveys were mailed to community members at the end of the 1st year. Evaluators made weekly or monthly phone calls to partnership staff to complete logs. Teachers administered student surveys before and after implementation. ***LIMITATIONS:*** Single assessments may not accurately assess student fitness; student surveys not pilot tested locally; accuracy of nutritional analysis was not verified; menu/recipe revisions were made without complete info on fat content; data on actual consumption of school lunches was unavailable; and log monitoring system did not track maintenance over time and relied on self-reported data.	9-11 year olds Urban and rural Salinas – population of 42,300 Urban and rural Dighton – population of 1,400 ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the school menu changes and all 4th graders in one Salinas schools and all 5th graders in one Dighton school received the entire intervention. Participation in the school lunch program remained relatively constant in the two communities as the menus changed.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** The University of Kansas Work Group model of health promotion through community development (Harris, Richter 1997). ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Community partners in Salina and Dighton met bimonthly to develop goals and action plans for community environmental changes to support physical activity. ***IMPLEMENTATION:*** The lead agencies designed and developed the intervention. They also trained teachers, food service staff and physical education instructors on different components of the intervention (workshops and one-on-one trainings). The Kansas LEAN director provided project oversight and direction. 2 dieticians worked on site 20-30 hrs/ week assisting food service and school staff, modified menus, and implemented enhanced nutrition education and fitness activities. The Univ. of Kansas provided technical assistance. ***FORMATIVE EVALUATION:*** Focus groups with representatives from potential communities throughout the state. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Site coordinators 2. Materials for nutrition education sessions and parent meeting 3. Funds for field trips 4. New menu ingredients 5. CTC curriculum 6. Incentives for teachers and students who achieve personal PA goals ***FUNDING:*** Kansas Health Foundation; Wichita, KS (philanthropic); and Kansas LEAN ***STRATEGIES:*** Not applicable – pilot study	***PHYSICAL ACTIVITY:*** 1. Fitness levels of the intervention students increased from pretest to posttest and in Salina, intervention students were more fit than similar students who did not participate in the project (data not shown). 2. The percentage of intervention Dighton students performing at or above the AAU Fitness Attainment Level increased from pretest (18%) to posttest (29%), p=0.29. 3. In Salina, girls in the intervention group reduced their average 1 mile run time by 1.21 minutes while girls in the comparison group reduced their average time by only 0.32 minutes (t[48]=2.60, p=0.012). 4. Salina intervention boys reduced time by 1.76 minutes compared to 0.64 minute reduction for those in the comparison group (t[59]=2.19, p=0.033). ***ENVIRONMENT CHANGE:*** 5. Post intervention, the mean percent calories from fat in school lunches was reduced from 40% at Dighton and 38% at Salina to target levels (~30% at both schools) while maintaining or increasing total calories. 6. The community partnerships in Dighton created over 179 community changes over a 27-month period. 7. The community partnerships in Salina created over 72 community changes over a 27-month period. ***OTHER:*** 8. In Dighton, intervention students' performance on the Upper Elementary Assessment increased from pretest (71%) to post-test (84%), and the increase was maintained at a 1-year follow-up (83%). Changes from pretest to posttest were significant (t[33] = -6.64, p<0.0001; d= 6.9). 9. In Salina, 4th grade students scored higher at posttest on the Lower Elementary Assessment (82%) than students who did not receive the enhanced nutrition education (74% and 72%), F[2,133] = 21.179, p<0.0001; R^2=0.2328.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Cotts, Goldberg (2008); Cotts, Durussel-Weston (2007) Michigan	Project Healthy Schools Program - physical activity offered 150 minutes per week ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Modifications in the school cafeteria in cooperation with the school's food service vendor, including: addition of a salad bar (fresh vegetable choices) and healthy snack items, replacement of fried chips with lower-fat baked chips and replacement of sugary soft drinks with bottled water in the cafeteria and vending machines. *Complex:* 1. Promotional component: Student assemblies throughout the year promoting healthy lifestyle habits. 2. Education component: Ten 20 min. sessions focused on increasing healthy eating, physical activity, and decreasing screen time. 3. Classroom awards given for the practice of healthy lifestyle habits.	***DESIGN:*** Before and after study ***DURATION:*** Sept. 2005 – May 2006 ***SAMPLE SIZE:*** 287 sixth graders from 3 middle schools; 47% male, mean age 11.5 ± 0.37 years ***PRIMARY OUTCOME:*** Overweight/ obesity, high and low-intensity aerobic activity, and nutrition ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Blood pressure 3. (n= 258) School Physical Activity and Nutrition (SPAN) survey [validated tool] (understanding of healthy lifestyle components, food intake, intense/ low-intensity aerobic activity and strengthening exercise). 4. Cholesterol and glucose level testing (glucose, total cholesterol, high-density lipoprotein cholesterol [HDL], low-density lipoprotein cholesterol [LDL]) ***DATA COLLECTION:*** Measurements were collected in September 2005 (baseline) and in May 2006 (follow-up). Anthropometric measurements were collected from all students by trained examiners. Body mass index (BMI) was calculated using height and weight. Blood pressure was collected 3 times with an automated cuff with the final 2 measurements averaged. Blood pressure was defined as elevated if it exceeded 95% for age and height. Cholesterol and glucose levels were collected from finger prick blood samples and were analyzed using Cholestech LDX (n=223). The SPAN survey was completed during the students' advisory class period. ***LIMITATIONS:*** Rate of participation in the study was only 40% and the more interested students (those more likely to comply with program goals) participated; follow-up assessment was short term; and teacher involvement was mixed	11-13 year olds 60% White, 8% Black, 29% Asian, 5% Hispanic, 7.2% other racial group or unreported (evaluation sample) ***ELIGIBILITY:*** No criteria reported for selection of the schools. Children had to receive parental consent and assent to participate in the study. ***EXPOSURE/ PARTICIPATION:*** All sixth graders (n= 711 eligible children) received the educational curriculum of Project Healthy Schools. All students in the middle schools were exposed to the school lunch modifications.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** A task force made up of a number of organizations (government agencies, community partners, and businesses) helped to form the intervention activities. ***IMPLEMENTATION:*** Schools implemented the salad bars, worked with vendors to replace snacks and sugar-containing drinks with bottled water, and some teachers taught the educational component. Teachers were given flexibility in presentation/ teaching. In schools where teachers declined to teach the program, educators from the Project Healthy Schools team taught the educational component. ***FORMATIVE EVALUATION:*** A pilot study was conducted with 83 6th grade students in one middle school. Students and staff gave input on the modifications to the food available in the school. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Curriculum materials 2. Food for salad bars 3. Healthy snacks and bottled water to replace unhealthy snacks 4. Personnel to teach curriculum (if needed) 5. Funds for school environment changes 6. Resources for assemblies 7. Classroom awards ***FUNDING:*** Ann Arbor Community Foundation, Southeast Michigan Community Foundation, University of Michigan Cardiovascular Center, C. S. Mott Children's Hospital, Borders Group. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Mean BMI z-score at the beginning of the study was 0.4 +/- 1.0. No significant change in BMI occurred over the course of the study period. The difference in the BMI scores between baseline and 5 months was 0.01 (p=0.59). ***PHYSICAL ACTIVITY:*** 2. No significant increase in the frequency of high-intensity aerobic activity or strength training was reported between baseline and follow-up. Lower-intensity aerobic activity increased in frequency (p=0.002). ***NUTRITION:*** 3. No significant change was observed between baseline and follow-up in the reported intake of high-fat and fried protein foods. 4. At follow-up, reported intake of fruits and vegetables was higher than baseline with 65% (vs. 55%) of students reporting consumption of 3 or more servings of fruits and vegetables each day, 16% (vs. 25%) reporting 2 servings for a given day and 7% reporting no fruit and vegetable intake (p=0.053). 5. There was no statistically significant difference in reported daily intake of high-sugar beverages between baseline and follow-up (p=0.311). ***OTHER:*** 6. The average diastolic blood pressure was 65.6 ± 8.6 mmHG before program participation and 62.3 ± 8.9 mmHG at follow-up (p=0.014). No significant change in systolic blood pressure. 7. Mean total cholesterol level decreased from 169 ± 26 to 154 ± 27 mg/dl, for a mean change of 14.4 mg/dl (p<0.0001). 8. Paired t-tests showed a difference in LDL cholesterol levels from baseline to follow-up of -3.4 (p=0.01) and in HDL cholesterol levels of -5.4 (p<0.0001). 9. The average glucose value decreased from 96 ± 13 to 93 ± 13 mm/dl (p=0.01).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Young, Phillips (2006) Maryland	School policy to maximize physical activity for girls in physical education classes including: 1. Teaching units that were active in nature (e.g., soccer instead of softball)f 2. Skills training in small group activities 3. Games in small groups ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Health education including goal setting, problem solving, communication skills, reinforcement of goal achievement and learning from relevant role models. 2. Family workshop 3. Monthly newsletter 4. Adult-child homework assignments	***DESIGN:*** Before and after study ***DURATION:*** 8 months ***SAMPLE SIZE:*** 221 ninth grade girls (116 intervention, 106 control) from one high school in Maryland ***PRIMARY OUTCOME:*** Physical activity ***MEASURES:*** 1. Anthropometric variables (height, weight, waist and hip circumferences) 2. 7-day physical activity recall (amount of time during the day spent sleeping and physically active) – validated instrument 3. Fitness test (cardio respiratory fitness) 4. Questionnaire (sedentary activities) 5. Clinical variables (resting blood pressure, total cholesterol, high-density lipoprotein cholesterol, and low-density lipoprotein cholesterol) 6. System for Observing Fitness Instruction Time -SOFIT (student physical activity) ***DATA COLLECTION:*** Measurements were obtained in September (baseline) and at follow-up, during the last 2 months of the spring semester (April and May). Measurements were obtained primarily during physical education class, although assessments were also made before and after school and during lunch. The 7-day physical activity recall was interviewer-administered and used to estimate daily energy expenditure. A sub maximal 3-stage step test was used to assess cardiovascular fitness. Resting blood pressure was measured in the non-dominant arm using an automated blood pressure monitor in a seated position after 5 minutes of rest. Three blood pressure measurements were made with a 1 minute interval between measures. Three 30 sec peripheral pulse rates were also obtained. Cholesterol levels were obtained from a venous blood sample drawn after a 12-hour fast. ***LIMITATIONS:*** Study was conducted in 1 high school (limits generalizability); only about 50% of eligible participants chose to enroll; intervention was delivered by a teacher hired by the project, rather than using a school staff member; physical activity was self-reported; there may not have been sufficient cultural targeting to result in substantial out-of-class physical activity participation	14-18 year olds Female 83% African American (evaluation sample), which was consistent with the demographics of the school ***ELIGIBILITY:*** Students were excluded if they were excused from meeting the Maryland state physical education requirement, pregnant or breastfeeding, planning to leave the geographic area, or had a sister enrolled in the trial. Parent/ legal guardian informed consent was required. ***EXPOSURE/ PARTICIPATION:*** All ninth-grade girls enrolled in the required physical education classes were exposed to the intervention.	***LEAD AGENCY:*** Researchers from the University of Maryland and Johns Hopkins University ***THEORY/ FRAMEWORK:*** Social Action Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Researchers from the University of Maryland and Johns Hopkins University designed the study. A teacher hired by the project implemented the intervention. The intervention was designed to be congruent with the school's physical education curriculum – 1 semester of individual sports and 1 semester of team sports taught 5 days per week. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Teacher for physical education classes 2. Recruitment materials for orientation meetings, mass mailings, classroom presentations 3. Newsletters 4. Videotapes for family workshop 5. lHomework assignments ***FUNDING:*** National Heart, Lung and Blood Institute, National Institutes of Health. ***STRATEGIES:*** Not applicable – pilot study	***OVERWEIGHT/OBESITY:*** 1. Mean body mass index, waist-hip ratio, waist circumference, blood pressure, total cholesterol or lipoprotein level did not differ from baseline to follow-up by treatment status. 2. There were significant improvements from baseline to follow-up in waist-hip ratio for both groups (intervention mean Δ= -0.02; p=0.001 and control mean Δ= -0.01; p=0.05). ***PHYSICAL ACTIVITY:*** 3. Intervention physical education classes spent significantly more time (46.9%) walking or active than control physical education classes (30.5%, p< 0.001). 4. There was no significant difference between the intervention and control group for mean daily energy expenditure (p=0.93), moderate-intensity energy expenditure (p=0.77), or hard to very hard energy expenditure (p=0.69). 5. There were significant improvements from baseline to follow-up in submaximal heart rate for the intervention (-7.1; p< 0.001) and control group (-7.4; p< 0.001). ***SCREEN TIME:*** 6. The proportion of students who spent 3 or more hours viewing television during school days declined 5.3% from baseline to follow-up in the intervention group, with no change in the controls (p=0.03).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Shaw-Perry, Horner (2007) Texas	NEEMA - Health and physical education classes 5 days a week for 45 minutes/day, including four days of physical activity and one day of health education. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School Food Service Program: 1. Weekly lessons (15 minutes) for food service staff to improve nutrition knowledge 2. Weekly lunch visits to encourage students to eat healthier foods. *Complex:* 1. Health Club: Meetings held once a week on a weekday for 45 minutes during school or for one hour after school that promoted leisure-time physical activity (e.g., aerobics, dancing) 2. Family Fun Fair: Meetings held in conjunction with Parent Teacher Association meetings that promoted healthy choices for the whole family (e.g., cooking demonstrations, family games, health screenings)	***DESIGN:*** Before and after study ***DURATION:*** 7 weeks ***SAMPLE SIZE:*** 58 African American students from 6 elementary schools in the San Antonio Independent School District ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index) 2. Bioelectric impedance analysis (% body fat) 3. Fasting capillary glucose (FCG) test (blood glucose) 4. 20-meter shuttle run test (20-MST) to measure physical fitness 5. Semi-structured interviews (overall health of students, program diffusion, product identity, cultural appropriateness) ***DATA COLLECTION:*** Anthropometric measures were taken at baseline and follow-up. Interviews were conducted with 10 physical education teachers at the end of 7 weeks of the intervention. Interviews were face-to-face and recorded, transcribed and analyzed for frequency by the study staff. Responses with at least three occurrences per teacher were recorded. The 20-MST was administered at baseline and follow-up to 15 students at a time by 2 study staff members. The number of laps finished was recorded at the end of the test. Study staff measured FCG levels by collecting a drop of blood from each student's finger. ***LIMITATIONS:*** The study lacked randomization and a control group; small sample size; BMI may not be an accurate measure for prepubertal children; inconsistent implementation of the intervention due to lack of time; large classes and adverse influences from school administration and state education agencies	9-10 year olds 90% of the 4th graders from the six elementary schools were from economically disadvantaged households and 60% were African American ***ELIGIBILITY:*** Schools needed to have ≥ 40% African-American enrollment and could not be an alternative school. All fourth grade students were eligible to participate in the intervention, but only those with assent and parental consent were included in the study. ***EXPOSURE/ PARTICIPATION:*** All of the 269 fourth-graders enrolled in the 6 elementary schools were exposed to the intervention.	***LEAD AGENCY:*** The research team from the University of Texas San Antonio Social and Health Research Center and the schools ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** NEEMA was adapted from the Bienestar Health Program to be more compatible with African American family life and culture. ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** A translation team with experience developing and implementing the Bienestar Health Program modified the curriculum to be more representative of the African American culture and experience. The research team developed instructor manuals for the physical education teachers, food service staff, and parents. The research team also conducted the weekly lessons for food service staff and encouraged students to eat healthier foods. Physical education teachers carried out curriculum components. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. School personnel (teachers, food staff) 2. Instructor's manual for physical education classes and health club 3. Student workbooks 4. Parent manuals and handouts for the fun fairs 5. Instructor's manual and workbooks for the food service program ***FUNDING:*** San Antonio Area Foundation ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Percent body fat and body mass index (BMI) moved in opposite directions. From baseline to follow-up, % body fat decreased from 27.26 ± 12.89% to 26.68 ± 11.67% (paired sample t=0.62, df=57, p=0.518) and BMI increased from 20.30 ± 5.29 kg/m^2 to 20.81 ± 5.57 kg/m^2 (t[57]=-3.06, p<0.003). ***PHYSICAL ACTIVITY:*** 2. The laps completed in the 20-meter shuttle run test increased from 16.4 ± 9.98 at baseline to 23.72 ± 14.79 at follow-up (t[57]= -4.96, p<0.001). ***OTHER:*** 3. Fasting capillary glucose decreased from 89.17 ± 10.05 units to 83.50 ± 11.26 units between baseline and follow-up (paired sample t=3.73, df=57, p<0.0001). 4. Among students with complete data, the number who screened positive for pre-diabetes decreased from 16% at baseline to 3% at follow-up.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Stevens, Murray (2005); Young, Johnson (2006); Gittelsohn, Steckler (2006); Webber, Catellier (2008); Elder, Shuler (2008); Young, Steckler (2008) United States	Trial of Activity in Adolescent Girls (TAAG) – school policy to increase physical activity in girls by requiring at least 50% of physical education class time to be spent in moderate to vigorous physical activity (MVPA). ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Health Education (6 lessons) for 7th and 8th graders that promoted development of behavioral skills associated with physical activity 2. Community-led physical activity programs and events before and after school (e.g., step aerobics, open gym, basketball camp) 3. Media and promotional events to promote awareness of and participation in activities. Passport promotion activity for girls where they received stamps for completing physical activity.	***DESIGN:*** Before and after study ***DURATION:*** 3 years ***SAMPLE SIZE:*** 36 schools Spring of 2003= 1603 girls Spring of 2005= 3085 girls Spring of 2006= 3378 girls ***PRIMARY OUTCOME:*** Overweight/ obesity and physical activity ***MEASURES:*** 1. Height and weight 2. Accelerometers (physical activity) 3. System for Observing Fitness Instruction Time (SOFIT) to measure class-level physical activity ***DATA COLLECTION:*** Measurements were taken from 6th grade participants at baseline (spring 2003), 8th grade students at endpoint (after 2yr intervention/spring 2005) and at follow-up (1 yr after endpoint/ spring 2006). TAAG staff members were blinded to study outcomes. Accelerometers were worn during waking hours for 7 consecutive days. Data were collected for 3-4 weeks in each school, with different girls measured each week. Girls with at least 1 full day of data out of the 6 expected days were included. For SOFIT, a minimum of 4 physical education lessons were observed at each of three visits to each intervention and control school during the three measurement semesters. ***LIMITATIONS:*** Cannot determine causality due to cross-sectional study design; limited formative data; study design did not account for individual school variation; length of exposure differed between girls measured at 2005 and 2006; school self selection and differential recruitment of girls could have led to volunteer bias limiting external validity; minimal process evaluation conducted in control schools; TAAG intervention goals were only completely met for 18 of 56 specified intervention goals over the 2 years	Female 11-14 year olds 53.6% racial/ethnic populations (evaluation sample) ***ELIGIBILITY:*** TAAG schools had to represent the demographic and socioeconomic make-up of their school districts. Schools were excluded if they were unwilling/ unable to respond to and report medical emergencies during student participation in school-sponsored activities, had plans to close or merge with another school within 3 years, had less than 90 girls in 8th grade, had an expected transience rate ≥28% in any given year or ≥35% over 2 years, did not offer physical activity for all grades each semester, had less than 2 (yr round) or 3 (semester-based) physical education classes per week, participated in pilot testing of the study materials, and/or were unwilling to accept random assignment of the schools. Students were excluded if they were unable to comprehend English, advised to avoid exercise by their doctor, had specific medical conditions (e.g., heart problems, high blood pressure), had parents who were unwilling/ unable to give informed consent, and/or were unwilling to assent to measurements. *(continued next page)*	***LEAD AGENCY:*** The seven research centers, schools and program champions ***THEORY/ FRAMEWORK:*** The TAAG intervention incorporated Operant Learning Theory, Social Cognitive Theory, Organizational Change Theory and the Diffusion of Innovation Model in a social-ecological framework. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** : School district administrators and principals approved TAAG activities and allowed the school staff to implement the intervention. School physical education teachers attended workshops, received instructional materials and regular on-site support to conduct the physical education lessons. Health education, physical education, science or homeroom teachers taught the 6 health education lessons. Collaborations were created between schools, community agencies, and the TAAG universities to increase activity programs inside and outside of school. Program Champions (PCs) were recruited to foster sustainability after the 2 year staff directed intervention. During the third year the PCs continued existing intervention activities and developed new programs where possible with minimal TAAG staff support. Control schools received a delayed intervention after all measurements were obtained. *(continued next page)*	***RESOURCES:*** 1. Recruitment materials (e.g., postage, permission-to-contact post cards) 2. Personnel (teachers and Program Champions) 3. Physical education instructional materials 4. Health and physical education lessons 5. Incentives (gift certificates, food for parties) 6. Promotional materials (e.g., pedometer, passport, posters, flyers) 7. Stipend for TAAG PCs 8. Meeting space for activities and programs ***FUNDING:*** The National Heart, Lung, and Blood Institute (NHLBI) ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. There were no differences in body mass index, percent body fat or triceps skinfold thickness at either 8th grade time-point. ***PHYSICAL ACTIVITY:*** *Spring 2005:* 2. After the staff-directed intervention (the first 2 years), there were no differences (mean=-0.4, 95% CI=-8.2 to7.4) in adjusted metabolic equivalent (MET)-weighted MVPA between 8th grade girls in schools assigned to intervention or control. 3. The average daily minutes of MET-weighted minutes of MVPA declined from 146 (+/-81.8) in 6th-grade girls to 136 (+/-74.3) in 8th-grade girls in 2005. *Spring 2006:* 4. Following the Program Champion-directed intervention, girls in intervention schools were more physically active than girls in control schools (mean difference 10.9 MET-weighted minutes of MVPA, 95% CI=0.52-21.2, p=0.03). 5. The decrease in MET-weighted minutes of MVPA in intervention schools from 6th grade to 8th grade in 2006 was only 6%, or less than half that observed in the control schools. 6. Girls in intervention schools had 13.5 (95% CI=0.3 to 26.7) additional MET-weighted minutes of weekday MVPA and 1.6 (95% CI=-5.9 to 9.1) additional MET-weighted minutes of weekend MVPA than did girls in control schools. For weekday MVPA, about half of the difference, 7.3 MET-weighted minutes (95% CI=3.1 to 11.5) was reflected during the afternoon period (2:00 – 5:00 PM) 7. A significant difference between intervention and control schools was noted for minutes of MVPA (p=0.049), but not for minutes of total PA. 8. The girls in the control schools had 8.2 more minutes of daily sedentary activities (p=0.050) than girls in the intervention schools. ***OTHER:*** 9. For each semester of the first 2 intervention years, the average number of programs created from linking schools with community agencies was 4.7, 7.6, 6.3 and 5.9 programs per school. 10. The percentage of time devoted to moderate-to-vigorous physical activity (MVPA) during physical education class was about 4% greater in the intervention than control schools at both 8th grade periods (p=0.025).

(Continued from previous study)						
			EXPOSURE/ PARTICIPATION: 1. All 6th through 8th grade students (girls and boys) at the intervention schools received the intervention. 2. Average program attendance per session by semester was 18.1, 11.5, 16.1, and 13.9 attendees/ session. 3. Between 86% and 96% of teachers attended yearly health education and physical education training workshops and additional booster sessions	***FORMATIVE EVALUATION:*** 1. School principal interviews (physical activity, physical education and health education requirements, internet usage). 2. Community Agency Survey (types of physical activity programs offered, typical attendance by girls, marketing methods, staff) 3. Parent Survey (daughter's physical activity levels, access to physical activity resources and programs, barriers to participating in physical activity) 4. Girls' Activity Checklist (activities girls participated in the prior 7 days, activities that were most appealing) 5. Girls' semi-structured Interviews (favorite physical activities, attitudes about physical activity, barriers to being physically active) 6. Focus groups with girls, boys and physical education teachers (perceptions about girls physical activity, participation in physical education class and after school physical activity) 7. Focus groups with 7th and 8th grade girls of diverse ethnic/ racial groups (ideas for promotional contests, message channels for intervention materials, reactions to potential logos, graphic design elements, and taglines). ***PROCESS EVALUATION:*** Structured observations, surveys, semi-structured interviews, and logs were developed to assess fidelity, dose, reach, and exposure of the intervention components. Trained observers visited health and physical education classes yearly to assess which lessons were being fully taught and which intervention concepts were addressed		

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Pangrazi, Beighle (2003) Arizona	Promoting Lifestyle Activity for Youth (PLAY) –school policy providing children with 15 minutes of extra physical activity (PA) in school each day ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Group randomized trial (analysis post-intervention only) ***DURATION:*** 12 weeks ***SAMPLE SIZE:*** 606 fourth graders from 35 schools PLAY & Physical Education (PE) Group: 10 schools (n=185) PE Only Group: 10 schools (n=178) PLAY Only Group: 9 schools (n=150) No Treatment Group (control): 6 schools (n=93) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Student survey (types of physical activity) 3. PLAY log sheet (physical activity after school for the PLAY & PE and PLAY only students); students in the No Treatment and PE Only group were given a similar sheet, and recorded "Things I Do After School" 4. Pedometers (physical activity) ***DATA COLLECTION:*** Data collection was completed three weeks after the last day of the intervention. Participants wore pedometers for four consecutive weekdays. Students were instructed to wear the pedometer all day, with the exception of water activities and sleeping. Pedometers were turned in each morning and a trained researcher unsealed the pedometers, recorded the step counts and returned the pedometers to the students within one hour. After turning in the pedometers, students completed a brief survey to confirm pedometer use and to determine the type of physical activity. During the 8 week period, students in the intervention groups filled out the PLAY log sheet. Students in the control groups filled out a similar sheet during this time period and recorded "things I do after school." ***LIMITATIONS:*** Limited number of pedometers for students; potential influence of physical education on the physical activity level and BMI of students could not be disregarded (even though quality of physical education programs was not assessed)	9-12 year olds ***ELIGIBILITY:*** The study was limited to fourth graders to ensure that participants had no previous exposure to PLAY. Informed consent and informal assent were required. ***EXPOSURE/ PARTICIPATION:*** All children in grades 4-6 in the PLAY schools were exposed to the intervention.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Researchers planned the intervention. Teachers promoted and implemented PLAY for two groups. Teachers received training from Arizona Health Department county health coordinators on PLAY. County health coordinators visited schools to monitor intervention and assist teachers. PLAY was implemented in three phases: 1. Promote play behavior (1 week): teachers discussed the importance of physical activity and students engaged in 15 minutes of physical activity each day 2. Introduce Teacher-Directed Activities (3 weeks): teachers introduced a variety of physically active games and activities the students participated in for 15 minutes each day (total 15 activities were taught). 3. Encourage Self-Directed Activity (8 weeks): students were encouraged to become self-directed in achieving 30 minutes or more of daily physical activity independent of the teacher. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Pedometers 2. PLAY teaching materials 3. County health coordinators to assist teachers 4. Materials for teacher training ***FUNDING:*** Arizona Department of Health Services ***STRATEGIES:*** PLAY is implemented by the Arizona Department of Health and is offered to all children in grades 4 to 6. 24,000 students have participated each year in PLAY since 1996.	***OVERWEIGHT/OBESITY:*** 1. No significant differences in BMI by group were found. ***PHYSICAL ACTIVITY:*** 2. Results showed boys had higher mean step counts than girls (13,287 vs. 12,222 for PLAY &PE; 13,758 vs. 11,429 for PLAY only; 12,951 vs. 11,899 for PE only; and 13,050 vs. 9,945 for No Treatment) 3. Students participating in PLAY (PLAY & PE, PLAY Only) accumulated more steps and recorded lower BMI values (PLAY & PE: steps (mean)=12,763, BMI (mean)=18.89; PLAY Only steps (mean)=12,598, BMI (mean)=18.76; PE Only steps (mean)=12,401, BMI (mean)=19.35; No Treatment steps (mean)=11,180, BMI (mean)=19.92). 4. One-way analysis of variance (ANOVA) showed a significant difference between groups for steps and BMI [F (2, 605) =3.552, p=0.014]. 5. Tukey post hoc tests revealed significant differences in step counts between the PLAY & PE and No Treatment group (mean difference= 1,583 steps, $p<0.01$) and the PLAY only and No Treatment group (mean difference = 1,418 steps, $p<0.05$). 6. When groups were analyzed by gender, one-way ANOVAs showed significant differences for girls [$F(3,314)= 5.36$, $p<0.001$]. Tukey post hoc tests indicated significant differences in girls' step counts between the PLAY & PE and No Treatment groups (mean difference = 2,277 steps, $p<0.001$) and the PE only and No Treatment groups (mean difference = 1,954 steps, $p<0.01$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Kelder, Springer (2009) Texas	Implementation of Texas state Senate Bill 19 -state policy requiring elementary school children to participate in 30 minutes of daily physical activity (PA) or a total of 135 minutes per week. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Bill required the Texas Education Agency to recommend coordinated school health programs (classroom curriculum, physical activity, child nutrition services, parent involvement) and required that schools adopt and receive implementation training in "approved" programs by 2007.	***DESIGN:*** Prospective cohort ***DURATION:*** Ongoing state policy ***SAMPLE SIZE:*** 169 schools that were part of the 2004-2005 School Physical Activity and Nutrition survey and a subsample of schools (Texas Public Health Regions 10 and 11) from the Texas-Mexico border (1226 students) ***PRIMARY OUTCOME:*** Extent of implementation of Texas State Senate Bill 19 examining overweight/obesity and physical activity ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Telephone key informant interviews (n=169 schools) to assess awareness of Senate Bill 19, weekly minutes of school-scheduled physical activity, and school adoption and implementation of a coordinated school health program 3. 5-day physical activity log (regions 10 & 11) to capture teacher-reported weekly minutes and location of physical activity in schools 4. System for Observing Fitness Instruction Time [SOFIT, regions 10 & 11] (direct observations of student physical activity levels in physical education classes) 5. The School Physical Activity and Nutrition Questionnaire [regions 10 & 11] (self-administered questionnaire on nutrition and physical activity behaviors) ***DATA COLLECTION:*** The research team contacted the 171 schools measured during the 2004-2005 School Physical Activity and Nutrition survey and conducted a telephone interview (n=169 schools) to assess awareness, adoption and implementation of Senate Bill 19. Fourth grade classroom teachers in Regions 10 and 11 were asked to complete a 5-day log on structured physical activity programmed for their students during the 2006-2007 school year. Direct observations of physical activity were conducted in Regions 10 (spring 2008) and 11 (spring 2007) using SOFIT. Three assessments per school were carried out, one at each grade level (3rd-5th grades). Questionnaires (completed by 4th grade students) and height and weight measures were administered by trained data collectors during the spring semester in 2007. ***LIMITATIONS:*** Self reported survey data; use of single-group, pretest/posttest study design results in several potential threats to internal validity, including history, maturation, and statistical regression	5-13 year olds Children in regions 10 and 11 were lower-income (>75%) and largely Hispanic (>90%) ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All elementary schools in Texas were required to comply with Texas State Senate Bill 19.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Not reported ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Materials for coordinated school health programs 2. Materials for school implementation training ***FUNDING:*** Robert Wood Johnson Foundation, National Center on Minority Health and Health Disparities and the Michael & Susan Dell Foundation. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. In schools from Region 10, the prevalence of obesity increased from 16.1% to 21.3% between 2004 and 2007 (p=0.04). Although no significant changes in BMI were observed for Region 11, the high prevalence of obesity (~30%) was maintained. The percentage of obese children was 10% to nearly 15% higher in Region 11 compared to Region 10 (2004 and 2007, both p<0.05). ***PHYSICAL ACTIVITY:*** 2. At every grade level, students in Region 10 met the Healthy People 2010 benchmark of 50% of available physical education class time devoted to moderate-to-vigorous physical activity. Students in Region 11 scored considerably lower in moderate and vigorous PA among 3rd grade students (p=0.033) and overall (p=0.029), 19.75% and 9.4%, respectively. ***OTHER:*** 3. The average minutes of structured student physical activity per week at the state level was 179, exceeding the 135 minutes required by the statute. 4. Roughly half of the schools reported that their school district had not formed a school health advisory committee as mandated in Senate Bill 19, and only 33% of schools had formed a school-level health advisory committee. 5. At the time of the telephone interview, only 40% and 27% of schools, respectively, had included the physical activity minutes and coordinated school health program requirements in their campus improvement plans. 6. Regions 10 &11 compared to the state of Texas averaged 46 more minutes per week of physical education (p=0.001) and nearly double the rate of adoption of coordinated school health programs (85% compared to 43%, p=0.0004). 7. Based on data from 3 sources (interviews, 5-day logs, questionnaire), both regions exceeded the minimum required physical activity minutes per week (135), with Region 11 offering between 14 (telephone survey, p=0.26) and 22 (5-day log, p=0.05) fewer minutes per week. 8. The 5-day log indicated a dramatic difference in recess, with 18.9 min/ week in Region 11 and 79.4 min/week in Region 10 (p=0.0001).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Datar, Sturm (2004) United States	Fluctuations in physical education class time ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 9751 kindergarteners from 1000 schools nationwide from the Early Childhood Longitudinal Study - Kindergarten Class (ECLS-K) data, 1998-99 ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity ***MEASURES:*** 1. Height and weight (calculated body mass index -BMI) 2. Questionnaire (number of times per week and minutes per day children exposed to physical education instruction) ***DATA COLLECTION:*** The ECLS-K data was taken over the course of one year. Children with increased exposure to physical education class were examined before and after additional exposure. Height and weight measures were taken for BMI calculations in the fall and spring of both kindergarten and 1st grade. Questionnaires were also administered to teachers and schools in the spring of kindergarten and 1st grade. ***LIMITATIONS:*** Observational study design increased concern of internal validity threats; authors controlled for fixed factors correlated with physical education and BMI, but were unable to control for unobserved characteristics correlated with BMI or physical education; low statistical power for subgroup comparisons	5-7 year olds The ECLS-K study uses a nationally representative sample. ***ELIGIBILITY:*** Exclusion criteria included children missing follow-up data; non-response by parents, teachers or school administrators on questionnaires; and children with inconsistent data over time ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** The ECLS-K study team and researchers from the RAND corporation ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** National Institute for Health Care Management ***STRATEGIES:*** Not applicable	***OVERWEIGHT/OBESITY:*** 1. One additional hour of physical education in first grade compared with the time allowed for physical education in kindergarten reduces BMI among girls who were overweight or at risk for overweight in kindergarten (BMI change coefficient = –0.317, 95%CI: -0.459, -0.174, p<0.001). 2. One additional hour of physical education in first grade compared with the time allowed for physical education in kindergarten has no significant effect on BMI among overweight or at-risk for- overweight boys (BMI change coefficient = -0.068, p=0.25) or among boys (BMI change coefficient=0.04, p=0.31) or girls (BMI change coefficient=0.01, p=0.80) with a normal BMI. 3. Although not quite statistically significant, it was estimated that White girls who were overweight or at risk for overweight may benefit more from an increase in physical education instruction time compared with other overweight or at risk for overweight girls (estimated BMI Δ= -0.22, p=0.05). ***PHYSICAL ACTIVITY:*** 4. There was a significant increase in the average minutes per week of physical education between kindergarten and 1st grade (difference=8.2 min/week; p<0.001). The median increase was much larger, from 34.5 min/week in kindergarten to 68.2 min/week in 1st grade. 5. Overall, 37% of the children experienced an increase in physical education instruction time between kindergarten and first grade and 44% maintained their kindergarten level of physical education. About 8% went from no physical education in kindergarten to some physical education during the week in first grade. 19% of children saw a reduction in minutes per week of physical education, with only 2% of those who had physical education in kindergarten not receiving physical education in first grade.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Cawley, Meyerhoefer (2007) United States	State physical education (PE) requirements for all 50 states ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 36,844 students from the 1999, 2001, and 2003 surveys of the Youth Risk Behavior Surveillance System (YRBSS) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity ***MEASURES:*** 1. Youth Risk Behavior Surveillance System data (weight and height [body mass index], state identifiers) 2. Shape of the Nation Report [SONR] (state PE regulations) ***DATA COLLECTION:*** The authors pooled YRBSS data from the 1999, 2001 and 2003 surveys; each of these collected data on participation in PE classes, physical activity, weight and height. State PE regulations from the SONR were matched to respondents using the state identifiers that are available in the YRBSS restricted use data. The three outcome measures for physical activity were chosen by the CDC to monitor progress toward Healthy People 2010 goals: the number of days/week in which the student exercises for 20 min or more, the number of days/week in which the student engages in strength-building activity, and the number of days/week in which the student engages in light activity for 30 min or more. The authors studied 2 outcomes concerning student weight: body mass index (linear measure) and clinical weight classifications (indicator for overweight and at risk of overweight). The SONR data provided cross-state variation in minimum PE requirements. The key variable used was the state requirement for high school PE coursework. States differed in how they defined a 'unit' of PE, so the authors converted all state PE requirements into fractions of academic years and used the term 'unit' to refer to a year of instruction. ***LIMITATIONS:*** PE policies were not randomly assigned as states chose their policies; unable to separate private school (not legally bound to comply with state regulations) from public school students; SONR instrument limitations were that students who were bound by the PE requirement for the entire year were combined with those only bound for half of the school year, the number of classroom minutes required per unit varied by state and in some states the number of minutes was not specified and there was only data on PE requirements for a single cross-section of time; YRBSS measures were self-reported	14-18 year olds The YRBSS is a nationally representative sample of high school students in the United States. ***ELIGIBILITY:*** Observations from the YRBSS were dropped if height, weight, or PE time were not recorded, or if the BMI was implausible (greater than 59). ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Researchers from Cornell University, Agency for Healthcare Research and Quality and the International Monetary Fund ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** Not reported ***STRATEGIES:*** Not applicable	***OVERWEIGHT/OBESITY:*** 1. Using logit models there was no evidence that active PE time lowers BMI or reduces the risk of overweight. ***PHYSICAL ACTIVITY:*** 2. Students bound by PE requirements reported more time spent physically active in PE class: an additional 26.9 minutes per week for boys and 37 minutes per week for girls, F statistic for the instrument = 24.30 for boys and girls pooled, 14.26 for boys, and 33.46 for girls. Each exceeds the generally accepted minimum F of 10 for instruments in IV estimation (Stock et al., 2002). 3. Based on the IV model, 100 extra minutes of active PE time raised the number of days with vigorous exercise reported by girls by 1.017 ($p<0.01$). In other words, for girls to spend an additional day with at least 20 min. of vigorous exercise requires an extra 98 min. of active PE time/week, or 20 more minutes per school day. 4. Based on the IV model, 100 extra minutes spent active in PE class raises the number of days in which girls engaged in strength-building activities by 0.83 ($p<0.05$). In other words, for girls to spend an additional day engaged in strength-building activity requires an extra 120 min. of active PE time/week, or 24 more minutes per school day. 5. For boys, there was no impact of active PE time on any of the measures of physical activity.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Scruggs, Beveridge (2003) Location not reported	School policy incorporating playground equipment and three recess breaks into the school day: a daily morning recess, daily lunch recess, and structured fitness breaks (over 3 consecutive days). ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Non-comparative study ***DURATION:*** 1 month ***SAMPLE SIZE:*** 27 fifth grade students ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Heart rate monitors (participants' physiological response to physical activity) 3. Pedometers (step counts) 4. 2-item questionnaire (participants' attitudes towards recess and fitness breaks) ***DATA COLLECTION:*** All data were collected over a 3-day period. Heart rate was measured during the entire school day in 15-second intervals. Physical activity measures were considered to meet the measurement criteria if the entire recess and fitness break periods were recorded on the same day and the heart rate monitor data were free from electrical interference. All 27 participants obtained usable physical activity measures. Participant's stature and body mass were measured using an electronic scale and measuring tape before each fitness break. On data collection days, participants completed the 2-item questionnaire. ***LIMITATIONS:*** The use of two objective physical activity measures provided mixed findings in this study, which is likely the result of the instrument measurement nature; generalizations from these data are limited due to the single intact 5th grade class, sample size, and limited data collection period	10-12 year olds ***ELIGIBILITY:*** Students with signed parental consent were allowed to participate in the study. ***EXPOSURE/ PARTICIPATION:*** The 27 fifth grade students that received parental consent to participate were exposed to the morning recess, lunch recess, and structured fitness breaks.	***LEAD AGENCY:*** The research team from Miami University and University of Utah ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** School staff supervised the daily recesses. The structured fitness break entailed a 400 meter obstacle course that covered the black top area, a portion of the football field, and a mini-playground area. An elementary physical education specialist supervised and offered feedback but did not prompt students to be active or increase their activity levels. The fitness breaks were implemented for 3 consecutive days during the last hour of the school day. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. School staff 2. Elementary physical education specialist 3. Resources for fitness break obstacle course 4. Playground equipment ***FUNDING:*** Not reported ***STRATEGIES:*** Not applicable	***PHYSICAL ACTIVITY:*** 1. Students had a significantly higher % of break time spent in the moderate to vigorous heart rate zone ($F[2,50]=90.41$, $p=0.0001$), % of break time spent in the vigorous heart rate zone ($F[2,24]=41.19$, $p=0.0001$]) and steps/minute ($F[2,24]=43.02$, $p=0.0001$) values during structured fitness break sessions compared to morning recess and lunch recess sessions. 2. Boys had significantly higher steps/minute values than girls during morning recess (mean= 66.76 vs. 36.68, $p=0.001$), lunch recess (mean= 72.45 vs. 48.43, $p=0.003$), and fitness break sessions (mean= 127.27 vs. 93.18, $p=0.016$). Only during fitness break sessions did boys have a significantly higher % of break time spent in the vigorous heart rate zone than girls (mean= 64.30 vs. 31.53, $p=0.011$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Physical Activity Policies-International						
Haerens, Deforche (2006); Haerens, Deforche (2006); Haerens, De Bourdeauduij (2007); Haerens, De Bourdeauduij (2007); Haerens, Cerin (2007); Haerens, Cerin (2008) Belgium	Physical activity (PA) component to increase levels of moderate to vigorous physical activity (MVPA) to at least 60 min/ day. Activities included PA during breaks using varied content to reach all students, provision of extra sports materials, encouragement of active transportation to school, and a computer-tailored PA classroom lesson. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School policy to increase healthy food choices by: 1. Selling fruit at school for a very low price or for free at least once a week 2. Pricing water lower than soft drinks 3. Offering fruit for dessert during lunch 4. Offering water for free through drinking fountains *(continued next page)*	***DESIGN:*** Group randomized trial ***DURATION:*** 2 school years ***SAMPLE SIZE:*** 2434 7th and 8th grade students in 15 schools (5 schools= parent component; 5 schools= no parent component; 5 schools= no intervention); 2287 students included in 2 year sample ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity, and nutrition ***MEASURES:*** 1. Height and weight (body mass index) 2. Flemish PA questionnaire [FPAQ] (physical activity) 3. Accelerometers (N= 258) 4. PA diary (activities done without accelerometer) 5. Self-administered questionnaire (fat intake) 6. Food frequency questionnaires (fruit, water, soft drink intake) 7. Implementation questionnaire (implementation of the intervention activities) ***DATA COLLECTION:*** Students completed the questionnaires once a year. BMI was measured at baseline, 1 year, and 2 years. A subsample of students wore the accelerometer for four weekdays and two weekend days. Students recorded their activities in the diary. One workgroup member from each intervention school completed the implementation questionnaire at the end of the 2 year intervention. ***LIMITATIONS:*** Self-reported data; high attrition rate (25%); risk for clustering of outcome variables within schools due to randomization at the school level; schools not matched on key characteristics resulting in a gender disparity across conditions; accelerometers only used in a subsample of 7th graders; not possible to determine which component of the intervention had significant effects	11-18 year olds 68% lower income (evaluation sample) ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children in the 10 intervention schools were exposed to the healthy eating and physical activity policies; all children in the 5 intervention with parent schools were exposed to the parent component.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** The study builds off previous successful interventions that targeted the environment and computer-tailored physical activity interventions. The current study combines these two approaches. ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team developed the intervention (including the intervention manual). In year one the research team led a work group composed of school staff that help to guide the intervention delivery. The school staff made changes to the food environment, physical activity environment, and led the parent component. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Computers 2. CD-ROM for the adult computer intervention 3. Sports materials (jump ropes, balls etc.) 4. Funds for subsidizing fruit and water 5. Materials for meetings with parents 6. Newsletters for parents ***FUNDING:*** Federal Flemish government funds ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** *After Two Years* 1. For girls there was a significantly lower increase in BMI in the intervention with parent group (from 20.23 ± 3.95 to 21.34 ± 3.83), compared to control (from 19.12 ± 3.50 to 20.78 ± 3.66, F=12.52; p<0.05). 2. For girls there was a significantly lower increase in BMI z score in the intervention with parent group (from 0.24 ± 1.11 to 0.24 ± 1.06), compared to control (from -0.03 ± 1.05 to 0.14 ± 1.00; F=8.61, p<0.05). 3. There was a significantly lower increase in BMI z score in the intervention with parent group (from 0.24 ± 1.11 to 0.24 ± 1.06), compared to intervention no parent group (from 0.28 ± 0.97 to 0.35 ± 0.96; F= 2.68, p=0.05). 4. Tn boys, no significant positive intervention effects were found. 5. BMI z-score increased significantly more in schools with low levels of implementation, when compared with schools with medium (F=5.03, p<0.05) and high (F=2.80, p<0.05) levels of implementation. After 2 years of the intervention, BMI z-score increased with 0.12 units in the schools with low levels of implementation and with 0.06 and 0.09 units, respectively, in schools with medium and high levels of implementation. 6. For all analyses, variance at the school level was not significant (all z< 1.59). ***PHYSICAL ACTIVITY:*** *After One Year* 7. Based on the physical activity questionnaire, the intervention with parent group increased their total physical activity by 9.0 min per day more than the control group (95% CI: 2.9, 15.2; p=0.004). 8. Based on the physical activity questionnaire, school related PA increased significantly in the two intervention groups (+6.4 min/day, d=0.40 with parent support group; +4.5 min/day, d=0.29 without parent support group) compared to controls [no change], (p<0.05 for both). 9. Based on the physical activity questionnaire, girls leisure time active transportation remained stable in the no parent intervention group, while it decreased on average 4 minutes daily in the control group (F=12.1, p<0.001, d=0.28). In boys, there were no significant differences. *(continued next page)*

(Continued from previous study)						
	Complex: 1. Computer-tailored classroom lesson on fat and fruit intake 2. Parent component including interactive meeting on healthy living, newsletters/ school paper 3 times/yr and adult computer-tailored intervention for fat intake and PA					10. Based on the physical activity questionnaire, significant differences were found between the intervention with parent group and the control group on changes in active transportation to/from school (2.1 min day-1, 95% CI: 0.6, 3.6; p=0.006) and changes in school-related sporting activities (2.1 min day-1, 95% CI: 0.5, 3.7; p=0.012). No significant differences were found between the control group and intervention with no parent group. 11. Based on accelerometry data, MVPA increased an average of 4 minutes per day in the intervention with parent group, and decreased 7 minutes per day in the control group (F=5.1, p≤ 0.05; d=0.46).12. Ba 12. Based on accelerometer data, PA of light intensity decreased an average of 21 minutes per day in the intervention with parent group and decreased 57 minutes on average per day in the control group (F=5.1, p≤ 0.05; d=0.54). *After Two Years* 13. In boys, school-related physical activity increased significantly more in the intervention groups (from 18.3 ± 18.7 to 25.2 ± 21.4) compared with the control group (from 22.6 ± 14.8 to 23.8 ± 16.5; F=3.4, p<0.05). 14. For boys, accelerometer data revealed a trend for significant lower decreases in physical activity of light intensity in the intervention groups (-6 min/day) compared with the control group (-39 min/day; F=8.6, p<0.001). 15. Based on accelerometer data for boys, MVPA remained stable in the intervention group, but significantly decreased (-18 min/day) in the control group (F=3.5, p<0.08). 16. In girls, time spent in physical activity of light intensity decreased significantly less in the intervention groups (-2 min/day) compared with controls (-20 min/day; F=4.6, p<0.05). ***NUTRITION:*** *After One Year* 17. The intervention was not effective in increasing self reported fruit intake and water consumption or decreasing soft drink consumption. 18. Fat intake decreased significantly more in girls in the intervention with parent group, compared to the intervention no parent group (F=6.1, p<0.05) and control group (F=17.3, p<0.001). 19. Percentage of energy from fat also decreased significantly more in girls in the intervention with parent group, compared to the intervention no parent group (F=3.9, p<0.05) and control group (F=16.7, p<0.001). 20. No significant effect for fat intake or percentage of energy from fat among boys. *After Two Years* 21. In year 2 for girls, decreases in fat intake were higher in the intervention groups (-20g/day) when compared to control group (-10g/day), F=5.8, p<0.05. Percentage of energy from fat decreased by 9% in the intervention group and 5% in the control group (F=13.3, p<0.001).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Bayer, von Kries (2009) Germany	TigerKids Intervention - Provided at least 30 min/day vigorous physical activity. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. School policy for kindergartens to replace high energy density snack foods and sugared beverages with fruits and vegetables, water and non-sugared drinks. *Complex:* 1. Parent materials, newsletters and "TippCards" 2. An internet platform with supporting information was established for teachers and families. 3. Teachers were provided with materials and modules for Kindergarten and a CD with songs for use in the day cares.	***DESIGN:*** Group randomized trial ***DURATION:*** 12-24 months ***SAMPLE SIZE:*** 64 kindergartens (42= Intervention, 22= Control). 2 samples containing different children were analyzed at time intervals of 5.7±2.4 and 17.6±2.3 months after the start of the intervention. Sample 1 n=1318 (Intervention=850, Control=468); Sample 2 n=1340 (Intervention=872, Control=468) ***PRIMARY OUTCOME:*** Physical activity and nutrition ***MEASURES:*** 1. Anthropometric measures (height and weight) 2. Parent Questionnaire (eating habits [consumption of fresh fruit and vegetables, water and non-sugared drinks]) 3. Motoric testing ***DATA COLLECTION:*** Eating habits were assessed by questions embedded in a parental questionnaire of the Bavarian Health Survey. Anthropometrics and motoric testing were carried out during the obligatory school entrance health examination offered to all children in the state of Bavaria. ***LIMITATIONS:*** Absence of ascertainment of diet habits both before and after the intervention; motoric testing might have been a poor surrogate marker for increased physical activity	3-6 year olds ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children at the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** The research team and the schools ***THEORY/ FRAMEWORK:*** Concept of age-appropriate social learning of health promoting behavior by imitation of superiors and peers and adoption of the behavior of these role models ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The researchers developed the low cost behavioral intervention for use in the kindergarten setting. The kindergarten teachers and families helped in some preparation of the materials and implemented the intervention. At the start of the intervention the teachers participated in a 2-day training workshop to learn about implementation of the TigerKids intervention. The AOK Verlag Remagen designed and produced the materials for the intervention. ***FORMATIVE EVALUATION:*** Experts in preschool education, sport and nutrition science, and pediatrics developed and tested modules for kindergarten settings in two daycare centers. ***PROCESS EVALUATION:*** Kindergarten staff reported on implementation of the intervention.	***RESOURCES:*** 1. Materials, folder, and CD for Kindergarten teachers 2. Newsletters 3. TippCards 4. Web staff 5. Telephone hotline personnel ***FUNDING:*** Bavarian Ministry of Environment, Health and Consumer Protection and the charitable Stiftung Kindergesundheit Child Health Foundation. ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. Intervention students in the first sample had a significantly higher number of side to side jumps than the control students (24.9, 95% CI: 24.4-25.3 vs. 24.0, 95% CI: 23.4-24.6; p=0.0056). ***NUTRITION:*** 2. There was a significantly higher consumption of fruits in the first sample intervention group (66.6%, 95% CI: 63.3-69.8 vs 55.7%, 95% CI: 51.0-60.3; p<0.0001) and the second sample intervention group (66.7%, 95% CI: 63.4-69.9 vs 56.3%, 95% CI: 51.6-60.9; p=0.0002) compared to the control. 3. There was a significantly higher consumption of vegetables in the second sample intervention group (42.7%, 95% CI:39.4-46.1 vs. 33.6%, 95% CI: 29.2-38.1; p=0.0013) compared to the control. 4. There was a lower consumption of high caloric drinks while watching TV observed in the sample one intervention compared to the control (60.4%, 95% CI: 56.6-64.2 vs. 47.7%, 95% CI: 42.4-52.9; p<0.0001). In sample 2, the proportion of children with a low consumption of high caloric drinks increased in the intervention group; a greater increase in the control group rendered the difference between groups non-significant.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Marcus, Nuberg (2009) Sweden	STOPP study- Physical activity: Teachers increased non-sedentary behavior in the classroom (goal = increase physical activity by 30 min/day); toys from home that encouraged sedentary behaviors were prohibited; students were not allowed to play computer games at the after school care center for more than 30 minutes. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School nutrition policies that included: 1. Offering a variety of vegetables to students prior to the main course at school meals 2. Substitution of white bread with whole-grain bread, or a similar product 3. Reduction of sugary meals and snacks 4. Offering lower-fat milk options in place of high-fat products 5. Requiring low-fat sandwich ingredients *Complex:* 1. Dietary component: Teachers encouraged children to increase vegetable intake. 2. Schools were encouraged to eliminate sweets including those brought from home. Parents were encouraged to not send sweets from home. 3. Newsletter twice a year for parents and school staff. 4. School nurses received education about obesity-related problems.	***DESIGN:*** Group randomized trial ***DURATION:*** August 2001 – June 2005 ***SAMPLE SIZE:*** 2838 students (1538 exposed, 1300 unexposed) from 10 schools (5 intervention, 5 control) ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Anthropometry (height and weight) 2. Accelerometer [n=1293] (physical activity) 3. 14-item parental questionnaire (frequency of food items served at home) 4. Children's Eating Attitude Test (ChEAT) ***DATA COLLECTION:*** Trained research assistants measured height and weight yearly in the fall (and spring during the final year –2005). BMI was calculated and overweight and obesity were defined according to IOTF recommendations. Ten random children were chosen weekly from both conditions to wear accelerometers for 7 consecutive days on their non-dominant arm continuously. No child participated more than once. Parents completed the questionnaire at the end of the study. Teachers administered ChEAT to students prior to their completion of the project in grade 4. ***LIMITATIONS:*** Researchers had no control over children's diets over school breaks which could have negatively impacted BMI; parental questionnaires were not validated; control schools reported taking some measures to increase healthiness of school lunches/snacks, which may have reduced differences between the two conditions; teachers' reports on the physical activity component may have been inaccurate	6-10 year olds ***ELIGIBILITY:*** Schools were invited to participate. All assenting children were eligible for inclusion in the evaluation if they participated in at least one year of the intervention and if they participated in at least one occasion of height and weight assessment. ***EXPOSURE/ PARTICIPATION:*** All students at the 5 intervention schools were exposed to the intervention.	***LEAD AGENCY:*** The schools and researchers at the Karolinska Institute in Stockholm, Sweden and Addenbrooke's Hospital in Cambridge, UK. ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The intervention was developed by the researchers. The schools carried out all intervention activities. School personnel met with research staff every term to increase their awareness of the intervention. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Researchers observed schools throughout the intervention and discussed deviations with school staff in an effort to make corrections.	***RESOURCES:*** 1. Newsletter 2. Educational material for school nurses 3. Funds for healthier foods ***FUNDING:*** Intervention activities were funded by the intervention schools. The evaluation was funded by Stockholm County Council, Swedish Council for Working Life and Social Research, Swedish Research Council, Freemasons in Stockholm Foundation for Children's Welfare and Signhild Engkvist Foundation ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. There was a significant difference between intervention and control with respect to prevalence of overweight & obese children in grades 2-4 and 3-4 from baseline to follow-up (difference= -6.0%, 95% CI: -10.6,-1.3%, $p<0.05$; difference=-9.2%, 95% CI: -16.9,-3.3, $p<0.01$, respectively). 2. For boys, the prevalence of overweight and obesity in the intervention schools was significantly reduced, whereas it increased in control schools from 2001-2005. The difference between the two groups was -7.7% (95% CI: -14.1,-1.2; $p<0.05$). No difference was found among girls. 3. There was an increase in the proportion of normal weight children in the intervention group, compared to the control group (2.3 vs 1.1%). The corresponding proportions of children who shifted from overweight or obese to normal weight were 14% and 7.5%, respectively ($p=0.017$). ***PHYSICAL ACTIVITY:*** 4. After adjustment for cluster of schools, there were no statistically significant differences between intervention and controls for levels of total physical activity and physical activity in after school care. ***NUTRITION:*** 5. Intervention families with 3rd and 4th grade children reported healthier eating habits at home compared to controls with significant differences in consumption of high-fat dairy products ($p=0.001$), sweetened cereals ($p=0.02$), sweet products ($p=0.002$) [data not shown]. ***UNINTENDED POSITIVE RESULTS:*** 6. Researchers observed that families from the intervention schools reported healthier eating habits, which indicated that the change in attitudes and rules at school may have facilitated parental selection of healthier foods at home.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Manios, Kafatos (1998), Manios, Moschandreas (1999), Manios, Kafatos (1999), Manios, Moschandreas (2002), Kafatos, Manios (2007); Kafatos, Manios (2005); Manios, Kafatos (2006); Manios, Kafatos (2006) Crete	The "Cretan Health and Nutrition Education program"- school policy to increase physical activity and fitness during two 45 minute physical education (PE) sessions per week that include: 1. Activities to increase fitness (e.g., skipping, fitness stations, aerobic group games) 2. Classroom sessions (4-6 hours per year) to increase knowledge and goal setting ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Health education -13-17 hours of instruction annually to develop behavioral capability, expectations and self-efficacy for healthful eating, physical activity and physical fitness. Teacher manuals, audio-taped stories, posters and student workbooks were provided to assist teachers. 2. Parent meetings held twice annually at each school. *(continued next page)*	***DESIGN:*** Group randomized trial ***DURATION:*** 6 years ***SAMPLE SIZE:*** 831 students (457 intervention, 374 control) ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Triceps, biceps, subscapular and supra-iliac skinfold thickness 3. Biochemical screening tests (triacylglycerols, total cholesterol, HDL cholesterol, LDL cholesterol) 4. Sit and reach test (physical fitness) 5. Sit-ups (physical fitness) 6. Handgrip test (physical fitness) 7. Standing broad jump test (physical fitness) 8. 20m shuttle run test (cardiovascular fitness) 9. Parent Questionnaire (age, occupation, years of education, personal health habits and knowledge, child's health habits and knowledge, child's physical activity) 10. Parent food frequency questionnaire (child's food frequency consumption over 3 day period) 11. Physical activity questionnaire [child's moderate-to-vigorous physical activity (MVPA) outside of school] 12. Health knowledge questionnaire (knowledge regarding diet and physical activity) ***DATA COLLECTION:*** Both intervention and control students were examined at baseline (academic year 1992-1993), after 3 years of the intervention (academic year 1994-1995) and at the end of the 6 year intervention period (academic year 1997-1998). The final re-examination of both groups took place 4 years after the end of the program (academic year 2001-2002) when pupils were in the tenth grade. A full medical examination (anthropometric measures and biochemical screening tests) took place on all of the children at baseline, interim (3 yrs) and follow-up. *(continued next page)*	5-12 year olds 49.8% of children were from urban areas and 50.2% were from rural areas ***ELIGIBILITY:*** Students had to be registered in one of the three targeted counties and parental consent was required for participation. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention primary school were exposed to the intervention (recruited as first graders and received the intervention for 6 years)	***LEAD AGENCY:*** The Preventive Medicine and Nutrition Clinic of the University of Crete ***THEORY/ FRAMEWORK:*** Social Learning Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** The intervention was based on the health profile component of the American Health Foundation's 'Know Your Body' program and was adapted, modified and supplemented to suit the target population. ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team designed the intervention and both the research team and the schools carried out the intervention. The research team developed teaching aids and multi-component student workbooks for the health education component. The classroom teacher conducted the health education sessions. PE instructors carried out the physical fitness and activity portions of the intervention during two 45 minute PE classes per week. The researchers facilitated the parent meetings. Classroom teachers attended orientation seminars annually. *(continued next page)*	***RESOURCES:*** 1. Teacher manuals 2. Audio-taped stories 3. Posters 4. Student workbooks 5. Parent booklets 6. Materials for parent meetings 7. Materials for teacher orientations ***FUNDING:*** European Union, Europe Against Cancer program, Mediterranean Integrated Program of Crete, General Secretary of the Periphery of Crete, Greek Ministry of Education, Greek Ministry of Sports, and Kellogg Europe. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** *3 years* 1. Control group students had a significantly higher change in mean BMI than intervention students [adjusted mean gain 1.8 kg/m^2 (SE=0.1) vs. 0.7 kg/m^2 (SE=0.1), p=0.001)] and suprailiac skinfold [2.9mm (SE=0.3) vs. 0.8mm (SE=0.2), p<0.05]. *6 years* 2. At the end of the intervention, control pupils had a significantly higher change in mean BMI [adjusted mean gain 4.28 kg/m^2 (SE=0.16) vs. 3.68 kg/m^2 (SE=0.16), p<0.05] and both bicep and tricep skinfolds [adjusted mean changes 4.47mm (SE=0.24) vs. 2.97mm (SE=0.24), p<0.001 and 7.90mm (SE=0.39) vs. 6.46mm (SE=0.38), p<0.05 respectively] than intervention students. *10 years* 3. At the 4 year follow-up after the end of the intervention, former intervention children had on average 0.7 kg/m^2 (SE=0.28) lower BMI than control children (p=0.019), after controlling for gender (p=0.024), baseline BMI values (p<0.001) and parental education status (p=0.60). 4. Using multivariate analysis, the odds of being overweight 4 years after follow-up was not significantly influenced by being in the intervention vs. control group (OR=0.84 95% CI: 0.52-1.35). ***PHYSICAL ACTIVITY:*** *3 years* 5. The amount of time spent in MVPA outside of school significantly improved for both the intervention and control groups (N=348) (F=41.3, p<0.0005), however the degree of improvement was higher in the intervention group compared to controls (F=8.4, p<0.005). 6. While improvement in physical fitness scores occurred in both intervention and control groups, there was a significantly higher rate of improvement in the intervention group compared to controls in standing broad jump (F=13.0, p<0.0005), sit ups (F=36.4, p<0.0005), sit and reach (F=6.2, p=0.02) and endurance run test (F=18.0, p<0.005). *6 years* 7. After 6 years, the intervention group had significantly increased their MVPA outside of school from 1 hour per week at age 6, to about 5.5 hours per week at age 12 (p<0.05). 8. Intervention students had a significantly greater increase in time spent in MVPA outside of school over the 6 year period, compared to control students [adjusted mean increases of 281.3 (SE=22.0) vs. 174.5 (SE=25.7) min/week, p<0.05]. *(continued next page)*

(Continued from previous study)						
	3. Parent booklets provided nutrition guidelines and information on physical activity.	The health knowledge and parent questionnaires were completed at each evaluation period. Parents of a random sample of 30% of the baseline cohort provided a weighted record of all foods consumed by their children over a 3 day period. An assessment of children's moderate-to-vigorous physical activity out of school was assessed through a questionnaire completed by parents at baseline and students after 6 years. Pre- and post-intervention evaluations of physical fitness were based on the EUROFIT Tests protocol. ***LIMITATIONS:*** Evaluation participation rates were low for some of the follow-up measures (physical activity, biochemical screening tests); parent and self-reported data; potential differential implementation by teachers; no software available to apply multilevel modeling or generalized estimating equations to take account of any within-school clustering		***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Periodic monitoring of teacher delivery of the program by the research team		9. MVPA levels outside of school were significantly higher for males in the intervention group than the control group at post-intervention (510.2±404.6 vs. 350.7±308.0 min/week, p<0.001). There was no significant difference between intervention and control MVPA for girls. 10. Intervention students significantly increased the time they devoted to MVPA outside of school from baseline to 10 year follow-up compared to controls [38.3 (SE=11.7) vs. -13.2 (SE=10.9) min/week, p=0.038]. 11. MVPA levels outside of school were significantly higher for males in the intervention group than the control group at 10 year follow up (112.3±78.9 vs. 96.3±67.0 min/week, p=0.029). There was no significant difference between intervention and control MVPA for girls. ***NUTRITION:*** 12. During the 6 year intervention period, control students compared to intervention students, had a significantly greater intake of daily energy [mean Δ= 367 (SE=58) vs. 179 (SE=66) kcal, p<0.05], monounsaturated fatty acids [8.7 SE(1.7) vs. 2.7 (SE=2.0) g, p<0.05], polyunsaturated fatty acids [2.0 (SE=0.5) vs. 1.0 (SE=0.5) g, p<0.005], saturated fatty acids [5.1 (SE=1.2) vs. 0.8 (SE=1.3) g, p<0.01] and protein [16.9 (SE=2.4) vs. 11.2 (SE=2.7) g, p<0.05]. ***OTHER:*** 13. Total cholesterol and low-density lipoprotein (LDL) cholesterol were lower in the intervention group after 3, 6 and 10 years compared to the control group (data not shown).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Angelopoulos, Milionis (2009) Greece	Two 45 minute physical education sessions per week; playgrounds and school yards at intervention schools accessible after the end of the curricular program. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Daily provision of fresh fruits and juices in school cafeterias *Complex:* 1. Nutrition component: Parents were encouraged to have more fruits and vegetables at home. 2. Class curriculum component: 1-2 hours/week was integrated into existing school curriculum including self-esteem, body image, nutrition, physical activity, fitness and environmental issues. 3. Parental component: Fruit and vegetable bazaars were held where parents were given results of children's medical and nutritional assessment.	***DESIGN:*** Group randomized trial ***DURATION:*** 12 months ***SAMPLE SIZE:*** 646 5th grade students (321 exposed, 325 unexposed) from 26 schools; 13 intervention and 13 control (8 urban and 5 rural in each group). ***PRIMARY OUTCOME:*** Overweight/ obesity, physical activity, and nutrition ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Blood pressure 3. 24-hour Recall (dietary assessment) 4. Questionnaire (physical activity assessment) ***DATA COLLECTION:*** BMI and BMI z-scores were calculated using the Nutstat module of EpiInfo and the CDC 2000 growth charts. Blood pressure was measured during a 5 minute rest using an automated sphygmomanometer. Students completed the 24 H recall for 2 consecutive week days and 1 weekend day by describing the type and amount of food and beverages consumed during the previous day. Data was analyzed using the nutritionist V diet analysis software which included traditional Greek recipes. Children completed the standardized questionnaires for 2 consecutive weekdays and 1 weekend day. The researchers trained the teachers and 24 H recall interviewers, and conducted the outcome evaluation. ***LIMITATIONS:*** Not reported	Lower income 10-11 year olds Intervention schools: 90.3% Greek, 9.7% immigrant Control schools: 88% Greek, 12% immigrant 75% Urban population, 25% rural population (evaluation sample) Loannina (site of the intervention) is one of the poorest prefectures in Greece with some of the highest obesity rates. ***ELIGIBILITY:*** Urban and rural schools, located in Loannina ***EXPOSURE/ PARTICIPATION:*** All 5th graders at the 13 intervention schools were exposed to the intervention. The mean rate of parent attendance at meetings was 86%.	***LEAD AGENCY:*** Research team from University of Athens ***THEORY/ FRAMEWORK:*** Theory of Planned Behavior ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team from the University of Athens conducted formative research and developed the intervention. The school teachers delivered the curriculum intervention. School food staff ensured that fresh fruit and freshly made juices were available in the school canteens throughout the whole intervention. ***FORMATIVE EVALUATION:*** Four focus groups (information on the effect of children's behavioral, normative and control beliefs of certain health behaviors such as diet and exercise), the results from which the questionnaire was developed. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Classroom curriculum 2. Funds to organize fruit and vegetable bazaars 3. Funds to provide fresh fruit and fruit juices in the intervention schools 4. Materials for physical education sessions 5. Staff to supervise school yards after the curriculum program ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. The mean BMI increase observed in the control children (+0.1, 95% CI -0.03 to 0.2) was significantly different compared to the decrease observed in intervention children (-1.1, 95% CI -1.2 to -0.9), p=0.047. ***PHYSICAL ACTIVITY:*** 2. There was an increase in the intervention group for mean time spent in moderate to vigorous physical activity [MVPA] (+2.2, 95% CI -2.6 to 7.1) compared to decreases in MVPA in the control group (-16.4, 95% CI -21.1 to -11.7), p=0.041. ***NUTRITION:*** 3. Mean daily consumption of fruits increased in the intervention group (0.4, 95% CI 0.1 to 0.7) but decreased in control group (-0.2, 95% CI -0.4 to 0.1), p<0.05. 4. Intervention children decreased mean consumption of total fat/oils and sweets/beverages (fats and oils -1.6, 95% CI -2.4 to 0.9; sweets and beverages -0.8, 95% CI -1.3 to -1.4), while increases were found for control children (fats and oils +0.7, 95% CI 0.05 to 1.4; sweets and beverages +0.2, 95% CI -0.2 to 0.6). p<0.05 for all. 5. Intervention children decreased mean consumption of dairy products (-0.2, 95% CI -1.4 to 0.1), while increased consumption was found for control children (0.2, 95% CI 0.02 to 0.5), p=0.008. ***OTHER:*** 6. Mediating variable analysis revealed that the effect of the intervention on BMI, systolic blood pressure (SBP) and diastolic blood pressure (DPB) was no longer significant (β=-0.08, p=0.123; β=-0.11, p=0.065; β=-0.13. p=0.053, respectively) after controlling for possible mediators, such as the changes observed in MVPA, food intake and BMI. 7. SBP and DSP levels increased in the control children (systolic +1.9, 95% CI 1.0 to 2.9); diastolic +2.3, 95% CI 1.6 to 3.1) and decreased in the intervention children (systolic -1.6, 95% CI -2.7 to -0.6; diastolic -0.5, 95% CI -1.3 to 0.3), p=0.016 and p=0.005, respectively. 8. The significant associations between the change observed in BMI and the changes observed in fruit intake and fats and oils intake indicate that the effect of the intervention on BMI mediated via the changes in fruits, fats and oils intakes. 9. Similarly, the significant associations between the change observed in BMI and the changes in SBP and DBP indicate that the effect of the implemented intervention on SBP and DBP was mediated by the change induced in BMI.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Simon, Wagner (2004), Simon, Wagner (2006), Simon, Schweitzer (2008) France	Intervention Centered on Adolescents' Physical Activity and Sedentary Behavior (ICAPS) - school policy to provide new opportunities for non-competitive physical activity (e.g., informal games, dancing) during school hours (e.g., recess, lunch, breaks). ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Health education focused on physical activity (PA) and sedentary behaviors 2. Organized sporting events for students 3. Bicycle and on-foot school transfers 4. Annual gathering to meet other students and learn about intervention activities 5. Advocacy activities focused towards policymakers to promote PA outside of schools (e.g., low-cost or free of charge entry to recreation facilities/pool, development of bikeways around schools)	***DESIGN:*** Group randomized trial ***DURATION:*** 4 years ***SAMPLE SIZE:*** 954 students (479 intervention, 475 control) from 8 schools (4 intervention, 4 control) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], waist and hip circumference) 2. Bioelectrical impedance analysis (body composition) 3. Biomedical data (systolic and diastolic blood pressure, heart rate) 4. Questionnaire adapted from the "Modifiable Activity Questionnaire for Adolescents" (MAQ) to measure frequency and duration of physical activity and time spent in sedentary activities 5. Questionnaire previously used in the Stanford Adolescent Heart Health Program (self-efficacy, social support, intentions towards physical activity) 6. Parent questionnaire (socioeconomic data) ***DATA COLLECTION:*** Surveys took place at baseline before initiation of the intervention (between September and October 2002) and annually at the end of each of the 4 school years of the intervention (between May and June). Fasting blood was sampled at baseline and every 2 years. Each annual survey, which lasted half a day for each group of 50-60 students, was performed within 1 month. ***LIMITATIONS:*** Potential recall bias (may have differentially affected intervention and control students over time); potential response bias; impossible to determine which intervention components were effective and whether all components were necessary; baseline differences between intervention and control for high socio-occupational status (23.6% vs. 15.5%, p<0.05) and participation in leisure organized physical activity (63.5 vs 54.7%; p<0.05)	11-15 year olds Intervention: 13.7% lower-income Control: 14.7% lower-income ***ELIGIBILITY:*** Schools were eligible if they had between 100 and 200 first-level students. Parent consent was required. ***EXPOSURE/ PARTICIPATION:*** All sixth graders in the intervention schools were exposed to the intervention. About 50% of the students in the intervention participated in at least one weekly activity.	***LEAD AGENCY:*** The research team from Louis Pasteur University of Strasbourg, France and the schools ***THEORY/ FRAMEWORK:*** The intervention used a socio-ecological perspective. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team developed the intervention. Sport qualified instructors hired by the intervention staff organized the physical activity opportunities during recess, lunch and breaks. Intervention staff organized and conducted the educational lessons, annual gatherings and school transfers. The intervention staff also worked with policymakers to increase supports for physical activity in the community. Regular visits to the intervention schools were conducted by intervention staff to inquire about difficulties and to help resolve material or personnel needs. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Trained sport qualified staff to carry out the organized physical activity 2. Staff to conduct education sessions and work with policymakers 3. Materials for physical activity and education sessions ***FUNDING:*** Regime Local of the Caisse Regionale d'Assurance Maladie d'Alsace Moselle (CRAMAM), French National Plan for Nutrition and Health (PNNS), INSERM and INRA, French Public Authorities within the National Nutritional Health Program and the Youth and Sports Dept., Conseil General of Bas-Rhin, The International Longevity Center, Communes of Drusenheim, Illkirch-Graffenstaden, Obernai and Schiltigheim and Masterfoods. ***STRATEGIES:*** The intervention was specifically designed to be integrated into the community environment, which may facilitate sustainability at the institutional level.	***OVERWEIGHT/OBESITY:*** 1. Intervention students had a lower increase in age and gender adjusted BMI (p<0.02) over time than controls. The difference across groups (intervention – controls) for the adjusted BMI changes (95% confidence interval) were -0.26 (-0.43,-0.08) kg/m^2 at 2 years, -0.29 (-0.51,-0.07) kg/m^2 at 3 years and -0.25 (-0.51, 0.01) kg/m^2 at 4 years. 2. In initially non-overweight participants the overall effect of age- and gender-adjusted BMI was significant throughout the study (p<0.001). The differences across groups for the adjusted BMI changes were -0.33 (-0.55,-0.12) kg/m^2 at 3 years and -0.36 (-0.60,-0.11) kg/m^2 at 4 years. 3. At 4 years, 4.2% of the initially non-overweight students were overweight in the intervention schools, compared to 9.8% in the control schools (OR= 0.41, 95% CI: 0.22 – 0.75, p<0.01). ***PHYSICAL ACTIVITY:*** 4. At 6 months, after adjustment for covariables, leisure organized physical activity significantly increased among the intervention students compared to controls, both in girls (OR 3.38; p<0.01) and in boys (OR 1.73; p=0.01). 5. At 6 months, after adjustment for covariables, there was a significant reduction in high sedentary behavior among adolescents, both in girls (OR=0.53; p<10^{-3}) and in boys (OR=0.52; p<10^{-3}). 6. At 4 years, 79% of the intervention students practiced at least one supervised physical activity outside school physical education classes as compared with 47% of the controls (OR= 2.34, 95% CI: 1.66 - 3.31). 7. After 4 years, supervised leisure physical activity increased in intervention students and slightly decreased in controls. The difference across groups was 66 minutes at 4 years (p<0.0001). 8. Intervention students also had a greater reduction over time of TV/video viewing than controls, with a difference across groups of -16 minutes/per day at 4 years (p<0.01). ***OTHER:*** 9. After 6 months, intervention girls had higher levels of self-efficacy (adjusted difference = 3.9±0.8, p<0.10-4) and intent (adjusted difference= 1.8±0.7, p<0.04) towards physical activity than control girls. 10. Irrespective of their initial weight status and independently of their body fat, compared to controls, intervention participants had a higher increase of high-density lipoprotein cholesterol concentrations at 4 years (+3.43 mg per 100 mL, 95%CI: 1.73 – 5.13, p<0.001).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Lazaar, Aucouturier (2007) France	School policy to increase the amount of time children spend physically active by requiring children to participate in additional physical activity after class, twice a week for one hour. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Group randomized trial ***DURATION:*** 6 months ***SAMPLE SIZE:*** 425 students aged 6-10 years from 19 schools (14 intervention, 5 control) Four intervention groups: 1. Non-obese Intervention Group (n=138) - intervention group composed of non-obese children who received the additional physical activity sessions. 2. Obese Intervention Group (n=58) - intervention group composed of obese children who received the additional physical activity session. 3. Non-obese Control Group (n=187) - control group composed of non-obese children who did not receive the additional physical activity sessions. 4. Obese Control Group (n=41) - control group composed of obese children who did not receive the additional physical activity sessions. ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Waist circumference 3. Biceps, triceps, subscapular and suprailiac skinfold thicknesses 4. Cardio-frequency meter (intensity of the physical activity sessions) 5. Observation grid (duration of physical activity) ***DATA COLLECTION:*** Data were collected at baseline before the intervention and at follow-up. Trained professionals performed the anthropometric measurements. During a physical activity session, two children were randomly selected to wear a cardio-frequency meter. From the meter recording, the average intensity of the sessions was estimated as a function of a percentage of the theoretical heart rate peak according to Robergs and Lanwher: 215.4 – (0.9147 x age). In parallel, an observation grid was supplemented in order to quantify the total duration of physical activity. ***LIMITATIONS:*** BMI as a measure lacks specificity, as BMI can change due to alterations in height, bone density, muscle, fat, or water; study did not account for daily dietary intake.	6-10 year olds ***ELIGIBILITY:*** Children had to be enrolled in the 1st and 2nd grades of elementary school, participating in scheduled physical education classes, participating in less than 3 hours of extra school sports activity per week, free from disease and not participating in any other studies. Parent and child written formal consent was required. ***EXPOSURE/ PARTICIPATION:*** All 1st and 2nd grade children in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team developed the intervention. Eighty students, tutored by physical education teachers, from the Sports Science University Department were in charge of supervising the additional physical activity sessions. A range of activities were offered and the intensity and duration of the activities increased throughout the study. All physical activity sessions aimed at meeting the same double objective: a playful physical practice and 45 minutes of dynamic exercise within one hour of physical activity. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Trained physical activity instructors 2. Materials for physical activity sessions ***FUNDING:*** French National Plan for Nutrition and Health (PNNS), the Comite Regional Executif des Actions de Sante d'Auvergne (CREAS), the Caisse Regionale d'Assurance Maladie d'Auvergne (CRAMA), the Appert Institutes, the town of Clermont-Ferrand and schools' governing bodies of Clermont-Ferrand. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. A larger proportion of obese children became overweight from baseline to follow-up in the intervention groups compared to control groups; 16.3% ($p<0.05$) vs. 9.3% ($p<0.05$), respectively. In contrast, the proportion of non-obese children becoming obese or overweight was greater in the control groups than intervention groups; 14.8% ($p<0.05$) vs. 2.6% (p=non-significant [ns]), respectively. *Girls* 2. There was a significant difference in the change in BMI between the obese intervention and obese control groups (-1.4% vs. 0.9%, $p<0.05$) and the non-obese intervention vs. non-obese control groups (-0.2% vs. 2.1%, $p<0.001$). 3. Waist circumference decreased in the intervention groups, while it increased in the control groups (-3.3% versus 2.8%, $p<0.001$). 4. BMI z-score declined significantly in all groups except for the obese control group. This decrease was greater in the obese intervention vs. obese control (-6.8% vs. -2.4%, $p<0.001$) and non-obese intervention vs. non-obese control (-3.1% vs. -1.8%, $p<0.01$). 5. Skinfold thickness decreased significantly over time in the obese intervention group and the non-obese intervention group (-4.4% and -3,2%, $p<0.001$, respectively). There was no change in the control groups. 6. Fat-free mass improved in all groups, with greater improvements in the obese intervention vs. obese control (5.2% vs. 2.4%, $p<0.001$) and non-obese intervention vs. non-obese control (4.0% vs. 0.6%, $p<0.05$). *Boys* 7. BMI z-score declined significantly only in the intervention groups. This change was significantly different between the obese intervention vs. obese control groups (-2.8% vs. 1.5%, $p<0.05$) and non-obese intervention vs. non-obese control groups (-2.4% vs. 2.6%, $p<0.01$). 8. Fat-free mass improved over time for both the intervention and control groups, with higher changes in the intervention groups (obese 6.4%, $p<0.001$; and non-obese 3.5%, $p<0.001$) than the control groups (obese 1.3%, p=ns; and non-obese 0.7%, p=ns) *Girls and Boys* 9. Girls from the obese intervention group had a decline in BMI z-score higher than boys from the obese intervention group (-6.8% vs. -2.8%, $p<0.001$). Similar results were observed with waist circumference for both obese intervention (-3.3% vs. -0.5%, $p<0.01$) and non-obese intervention (-3.1% vs. -0.1%, $p<0.001$). Boys from the obese intervention group had a lower drop in skinfold thickness than did girls (-2.9% vs. -4.4%, $p<0.05$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Plachta-Danielzik, Pust (2007); Danielzik, Pust (2007); Danielzik, Pust (2005); Muller, Asbeck (2001) Germany	The Kiel Obesity Prevention Study (KOPS) – 15 minute "activity breaks" provided to 1st grade children during a 6 hour nutrition and physical education course ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Parent night reinforcing messages about healthy eating and keeping active 2. Face-to-face counseling for families with overweight or obese children or parents	***DESIGN:*** Group randomized trial ***DURATION:*** 4 years ***SAMPLE SIZE:*** 1764 students (344 intervention, 1420 control). Random assignment of schools to the intervention and control groups occurred every year. 14 of the 32 schools in Kiel served as intervention schools. ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Anthropometric data (height and weight [body mass index (BMI)], skin folds, waist circumference) 2. Bioelectric impedance analysis (body composition) 3. Validated parent questionnaire (diet, physical activity, height, weight, education and nationality) 4. Food frequency questionnaire (dietary intake) 5. Activity questionnaire (physical activity) 6. Indirect calorimetry (energy expenditure, fitness) 7. 24 hr heart rate monitoring (energy expenditure, fitness) 8. Spiroergometry (energy expenditure, fitness) 9. Risk, comorbidities (birth weight, duration of pregnancy, lactation, development of weight and height in children, smoking, alcohol, parent drug use, blood pressure, blood cholesterol, triglycerides, child glucose, family diseases) ***DATA COLLECTION:*** Data was collected at 3 points in time: 1) Baseline data was collected from 5-7 year old children recruited between 1996 and 2001; 2) 4 year follow-up data (2000-2005) was collected from 9-11 year old children; and 3) 8 year follow-up data (results not available yet) from 13-15 year old children. ***LIMITATIONS:*** Limited generalizability due to low percentage (~7%) of racial/ethnic populations; high attrition (higher among overweight and low socioeconomic status children); stratification may have reduced study power (a higher power in control because of higher number)	Lower income, 6-7 year olds ~42% low socioeconomic status There were few differences between the children included in the study and the total number of children entering first grade between 1996-2001 (representative sample) ***ELIGIBILITY:*** Willingness to participate; parent informed written consent required ***EXPOSURE/ PARTICIPATION:*** First grade students (5-7 years old) from the 14 intervention schools received the nutrition and physical education course including the activity breaks.	***LEAD AGENCY:*** The schools and the research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Teachers and a skilled nutritionist delivered the classroom education. The 6 hr (6 one-hour units) nutrition and physical education course was delivered to all primary school children within their first year. Every alternating year schools changed and the 'control' schools became 'intervention' schools and vice versa. Families participating in the counseling received 3-5 visits at home. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Nutritionist and teachers to carry out the educational course and activity breaks 2. Materials for the education course 3. Counselors for the family counseling sessions 4. Materials for parent night ***FUNDING:*** Grants from Deutsche Forschungsgem-einschaft, Wirtschaftltliche Vereinigung Zucker, Precon and WCRF UK. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** *After 1 year* 1. During 1 year there was a significant change in fat mass in both groups. When compared with children in the intervention schools, children in the control schools showed disproportionate increases in the median triceps skinfold (mean values= 13.0mm vs. 11.3 mm at 1 yr follow-up, $p<0.01$) as well as in percentage fat mass of overweight children (% increase= 1.6 vs. 0.4, $p<0.05$) *After 4 years* 2. No significant difference in prevalence or incidence of overweight and obesity between the intervention and control groups. 3. The 4 year incidence of overweight was reduced in the intervention group compared to the control group (36.5% vs. 41.7%, respectively). Comparing boys and girls, the effect was only seen in girls (-13.4% girls, +2.8% boys, p=ns). 4. The cumulative 4 year remission of overweight (moving from overweight to normal weight) was higher in the intervention group compared to the control group and reached significance for triceps skinfold thickness (39.3% vs. 22.6%; adjusted OR 2.09, 95% CI:1.20-3.62, p=0.0087).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Bonhauser, Fernandez (2005) Chile	School policy adding two sessions (90 minutes each) of physical education (PE) to the curriculum for a total of three 90 min. sessions a week ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Group randomized trial ***DURATION:*** 40 weeks ***SAMPLE SIZE:*** 198 students (98 exposed, 100 unexposed) from 4 ninth grade classrooms (2 intervention, 2 control) in one high school ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Blood pressure (mercury sphygmomanometer) 3. Maximum oxygen consumption (YoYo intermittent recovery test) 4. Questionnaire (sociodemographic characteristics, regular physical activity outside of school) 5. School records (academic performance) 6. 30-m speed test on a track using a photoelectric ergotester (jump performance and muscular strength) 7. Hospital Anxiety Depression Scale (HADS) (mental health: anxiety, depression) 8. Tennessee Self Concept Scale (self-esteem) ***DATA COLLECTION:*** All measures were taken from students in the intervention and control groups at baseline and post-intervention. ***LIMITATIONS:*** HADS instrument hasn't been validated in a Chilean population; small sample size prevents application of the results to other settings or school environments; study did not explore the type of physical activity students performed outside school at follow-up; small number of classes included in the selection process and the lack of accurate intraclass correlation coefficients did not allow the authors to use a cluster randomization design or to analyze the data considering a cluster effect	Lower-income, 14-16 year olds 65.3% lower income (exposed), 53.0% lower income (unexposed) ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** Students in 2 of the 6 ninth grade classrooms in the school were exposed to the intervention. 81% of pupils in the intervention group completed the full program.	***LEAD AGENCY:*** Researchers from the Family and Community Medicine Program of the Catholic University and local school authorities collaborated. Researchers were also from the Fred Hutchinson Cancer Research Center. ***THEORY/ FRAMEWORK:*** Intervention was developed using social planning and organizational change principles. The educational model used in the intervention was based on the "adult learning approach" which assumes that adults decide what they want to learn and are active decision-makers in the learning process. ***EVIDENCE-BASED:*** The intervention was based on evidence found through the systematic review of school-based physical activity interventions conducted by the Centers for Disease Control and Prevention Task Force on Community Preventive Services in 2002. ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** The school board of directors changed the 2001 curriculum and added 2 extra PE sessions per week. ***IMPLEMENTATION:*** Teachers and students designed the intervention and decided on the best way to implement it. PE teachers taught the extra sessions (180 min. per week). Each PE session consisted of three steps: minimum activity, weight transfer activities that incorporated dynamic large muscle movements (fast walking, running, jumping), and sport practice. In total, 4 units of 30 sessions were implemented, each lasting 10 weeks. Control classes continued to have one 90 minute session of PE per week. ***FORMATIVE EVALUATION:*** School teachers developed a survey to assess students' preferences for the activities to be included in the intervention. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Stipend for teachers to teach extra sessions ($6 per extra hour) 2. Exercise equipment ***FUNDING:*** Not reported ***STRATEGIES:*** The intervention was specifically designed to be integrated into the community environment, which may facilitate sustainability at the institutional level.	***PHYSICAL ACTIVITY:*** 1. There was a significant improvement in the intervention group compared with the control group in the three indicators used to assess physical performance. Maximum oxygen consumption improved by 8.5% in the intervention group and 1.8% in the control group ($p<0.0001$). Speed and jump performance increased by 10.3% and 9.8%, respectively, in the intervention group and only 6.9% and 2.4% in the control group ($p<0.01$). ***OTHER:*** 2. A significant improvement of 13.7% in the anxiety score was observed in the intervention group compared with a 2.8% reduction in the control group ($p<0.0001$). 3. The self esteem score increased by 2.3% in the intervention group but decreased by 0.1% in the control group ($p<0.001$). 4. No differences in depression symptom scores were observed.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Graf, Koch (2008), Graf, Koch (2005) Germany	The Children's Health International Trial (CHILT) project – school policy to increase physical activity and improve motor skills by: 1. Requiring physical activity (PA) at least once each morning during lessons for at least five minutes (e.g., coordination, posture and balance) 2. Providing opportunities for physical activity during leisure periods 3. Revising the physical education curriculum to optimize motor skills ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. One extra health education lesson per week (20-30 min)	***DESIGN:*** Group randomized trial ***DURATION:*** 4 years ***SAMPLE SIZE:*** 651 students (460 intervention, 191 control) from 17 primary schools (12 intervention, 5 control) in the Cologne area of Germany ***PRIMARY OUTCOME:*** Overweight/ obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Six minute run to test physical endurance – found to be valid in school children 3. Body coordination test to measure gross motor development (included 4 tests: balancing backwards, one-legged obstacle jumping, lateral jumping, and sideways movements)) ***DATA COLLECTION:*** Initial performance capacity and anthropometric data of the children were obtained in classes at the beginning of the school year 2001-2002 (baseline). Intermediate data were collected in June-July 2003, at which point children were at the end of their second year. Final data were obtained in their fourth year in the spring/summer of 2005 (final examination). Results from the body coordination tests were added together for an overall motor quotient. ***LIMITATIONS:*** The measures were not implemented by the teachers as required; the authors did not examine the nutritional habits of the children and their families	5-10 year olds ***ELIGIBILITY:*** Parent/ guardian informed consent was required. 15 children were excluded because they took part in programs for overweight and obese primary school children. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools received the intervention.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Theory of Planned Behavior and The Precaution Adoption Process model ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team developed the intervention. The teachers were responsible for implementing the physical activity sessions and the extra health education sessions. Training for teachers on all aspects of the intervention was provided at baseline and yearly thereafter. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** In the first year, site visits were made to all schools to ensure that all aspects were being applied as designed.	***RESOURCES:*** 1. Materials/ equipment for the physical activity sessions 2. "My Body" curriculum and other health education classroom materials 3. Materials for teacher training ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** *2 years* 1. There were no differences in body mass index (BMI) between intervention and control schools at baseline or 2 year follow-up. *4 years* 2. There were no differences in body mass index (BMI) at baseline or final examination between the intervention and control groups. 3. The increase in BMI from baseline to follow-up was higher in the intervention group compared to the control group (mean difference = 0.7, p<0.001). 4. The overweight and obese children had the highest increases in BMI (overweight: 3.9 kg/m^2 intervention and 3.0 kg/m^2 control; obese: 5.6 kg/m^2 intervention, 5.0 kg/m^2 control, p<0.001). ***PHYSICAL ACTIVITY:*** *2 years* 5. Girls in the intervention school had higher results in the lateral jump from baseline to 2 year follow-up (from 51.9±11.2 to 54.0±10.8, p=0.034). In addition, the increase in jumps was significantly higher in girls than boys (17.9±9.3 vs. 20.2±9.5, p=0.010. 6. In control schools, the increase in jumps was significantly higher in girls than in boys (11.5±9.2 vs. 14.3±9.2, p=0.040). 7. Multivariate regression showed that the mean increase in the lateral jump was 6.3 jumps higher in the intervention schools than in the control schools (F=24.953, p<0.001). 8. Multivariate regression showed that the mean increase in the 6 minute run test was 30.7 meters higher in the intervention schools than in the controls (F=3.346, p=0.020). *4 years* 9. The increase in endurance performance in the intervention group was higher than the control group at final examination after adjustment for age, sex, pre-intervention value and BMI classification at final examination (mean difference = 21.7, p=0.055). 10. Each item on the body coordination test for children improved in the intervention and control groups (adjusted for age, sex, pre-intervention value and BMI classification at final examination), but the mean difference between intervention and control groups was only significant in balancing backwards (mean difference=3.0; p=0.007) and lateral jumping (mean difference=3.1; p=0.005). 11. The overweight and obese children had the worst results for all motor tests in both the intervention and control schools and the lowest increase independent of participation in the intervention or control group.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Sahota, Rudolf (2001); Sahota, Rudolf (2001) Leeds, United Kingdom	APPLES program (Active program promoting lifestyle education in schools) Developing and implementing action plans to promote physical activity ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. School policies to promote healthy modification of school meals. 2. Development and implementation of school action plans to promote healthy eating *Complex:* Not reported	***DESIGN:*** Group randomized trial (delayed intervention) ***DURATION:*** September 1996 – July 1997 ***SAMPLE SIZE:*** 636 students (314 intervention, 322 comparison) from 10 state primary schools in Leeds (5 intervention, 5 control) ***PRIMARY OUTCOME:*** Overweight/ obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Growth measures (height and weight) 2. 24-hour food recall 3. 3-day food diaries 4. Lunch observations 5. Parent surveys 6. Teacher questionnaire (quality of the teachers' training, usefulness and appropriateness of resources, adequacy of support offered) 7. Focus Groups with children (knowledge and attitudes towards healthy living) 8. Physical activity questionnaires 9. Psychological measures 10. Monthly menu monitoring ***DATA COLLECTION:*** All measures were collected at baseline and follow-up. Teacher questionnaire and focus groups were conducted at follow-up only. ***LIMITATIONS:*** Inadequate sample size; 600 children participated but the unit size was only 5 schools in each arm; measurements of students' growth, diet, physical activity, and psychological state could not be obtained blind to the schools' intervention status; accurate dietary assessment is particularly difficult in children; 24 hour recall and 3-day diary cannot assess quantities accurately, therefore the authors relied more on the quality of food reported; reports of physical activity levels are even harder to quantify	8-10 year olds Lower income The schools had 1 to 42% children from ethnic minorities and 7 to 29% entitled to free school meals, (compared with 11% and 25%, respectively, for Leeds children as a whole) Sociodemographic measures suggested that the sample populations generally reflected the Leeds school aged population, although there was a slight bias towards more advantaged children. (representative of target population) ***ELIGIBILITY:*** Data had to be completed before they left primary school to be eligible for the study. ***EXPOSURE/ PARTICIPATION:*** All children in the 5 intervention schools were exposed to the intervention. 19 out of 20 teachers attended the training sessions.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** The Health Promoting Schools philosophy ***EVIDENCE-BASED:*** Study based on similar school-based primary prevention interventions aimed at all students, which have been successful in the US. ***REPLICATION/ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Each intervention school developed their own plan for implementing this intervention with the help of the intervention team. The intervention team was composed of a dietician, community pediatrician, health promotion specialist, psychologist, obesity physician and nutritional epidemiologist. The intervention teamed trained the teachers and provided resources and support. ***FORMATIVE EVALUATION:*** Surveys administered to all school staff and parents of year 4 and 5 students to assess the views about the importance of education on nutrition and physical activity. The questionnaires were used to develop an intervention plan. ***PROCESS EVALUATION:*** Regular staff meetings were held and monitored; surveys of packed lunches, snacks, and playground activities assessed to determine the program's progress.	***RESOURCES:*** 1. Dietitian 2. Pediatrician 3. Health promotion specialist 4. Psychologist 5. Nutritional epidemiologist 6. Funds for conducting school action plans (e.g., playground facilities) 7. Funds for teacher training ***FUNDING:*** The Northern and Yorkshire Region Research and Development Unit ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. No significant difference for overweight (weighted mean difference= -0.07, 95% CI: -0.22 to 0.08) or obese (weighted mean difference= -0.05, 95% CI: -0.22 to 0.11) between intervention and control children at follow-up. ***PHYSICAL ACTIVITY:*** 2. No significant difference in amount of physical activity or sedentary behavior between intervention and control schools. ***NUTRITION:*** 3. Intervention children had higher vegetable intakes than control children at follow-up (weighted mean difference= 0.3, 95% CI: 0.2 to 0.4) 4. Overweight intervention children had higher vegetable intakes than overweight control children at follow-up (mean difference= 0.3, 95% CI: 0.1 to 0.5), when comparing the 24-hour food recall. 5. Obese intervention children had higher vegetable intakes than obese control children at follow-up (mean difference = 0.3, 95% CI: -0.1 to 0.6) 6. Obese intervention children had lower fruit intakes than obese control children at follow-up (mean difference= -1.0, 95% CI: -1.8 to -0.2), when comparing 24 hour recall. 7. According to the 3-day food diaries, overweight intervention children had higher intakes of foods and drinks high in sugar than overweight control children (mean difference= 0.8, 95% CI: 0.1 to 1.6). No other differences in dietary consumption were found using the 3-day diaries.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Ho, Gittelsohn (2008); Rosecrans, Gittelsohn (2008); Ho, Gittelsohn (2006) Canada	Zhiiwapenewin Akino'maagewin: Teaching to Prevent Diabetes (ZATPD) program - physical activity breaks during lessons ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Schools were encouraged to adopt policy of no soda and chips in school and review breakfast and lunch programs for nutritional content *Complex:* 1. Community component: mass media (e.g., posters, flyers, local access cable, radio), cooking demos and taste tests in band offices and community events (e.g., walking challenges, family fun nights) 2. Recipe cards, posters, newsletters and letters; 4 family action packs sent home over the year. 3. Store component: Promotion of healthier alternatives through shelf labels, posters, flyers, and cooking demos or taste tests; managers encouraged to stock low-sugar, low-fat and high-fiber foods. *(continued next page)*	***DESIGN:*** Non-randomized trial (delayed intervention) ***DURATION:*** 9 months (Sept. 2005 – June 2006) ***SAMPLE SIZE:*** 95 people from 4 First Nations sites (2 intervention, 2 comparison) The comparison sites received the intervention the following year. ***PRIMARY OUTCOME:*** Overweight/obesity, physical activity (PA), and nutrition ***MEASURES:*** 1. Anthropometric measurements (height and weight [body mass index], percent body fat) 2. Accelerometers (physical activity) 3. Food frequency questionnaire (dietary intake) 4. Adult impact questionnaire (knowledge, self-efficacy, outcome expectation, intentions for specific food-related behaviors, healthy food acquisition, food preparation) 5. Questionnaire to assess independent variables (age, marital status, education, employment, material style of life, household size, self-reported diabetes or impaired glucose tolerance) ***DATA COLLECTION:*** 13 trained individuals (5 community members, 3 research staff, and 5 students) collected data at baseline and follow-up. Interviews were conducted at the respondent's house or the local band or health office. Independent variables were assessed at baseline for adjustment in analyses. Trained local Ojibwe-speaking research assistants administered the impact and food frequency questionnaires. Accelerometers were used at baseline and follow-up for at least 3 days including both weekend and weekdays. Anthropometric measures were collected using a stadiometer and a scale/bioimpedence analyzer. *(continued next page)*	100% Native American/ Alaskan Native Intervention group average age = 40.3; Control group average age = 44.7 ***ELIGIBILITY:*** Communities were selected from those that responded to invitations to participate. Participants had to provide written informed consent and have both baseline and follow-up data. Pregnant women, women who had a live birth in the past 6 months, and people who had not been living in the community for the last 30 days were excluded at baseline. ***EXPOSURE/ PARTICIPATION:*** All intervention school students were exposed to the school lunch menu changes, but only 3rd and 4th grade students received the physical activity and education component. *(continued next page)*	***LEAD AGENCY:*** Researchers at Johns Hopkins Bloomberg School of Public Health ***THEORY/ FRAMEWORK:*** Social Cognitive Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** School curriculum was based on the Sandy Lake School Diabetes Prevention program curriculum and the store component was adapted from the Apache Healthy Stores program. ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Researchers developed 5 intervention phases (coordinated across each component – school, store and community), each lasting 6-10 weeks that targeted specific behaviors: 1. Starting the day with healthy foods and exercise 2. Reducing fat) 3. Healthier beverages 4. Shopping wisely and including five servings of fruits and vegetables a day 5. Healthier snacks and daily activities The field supervisor and project coordinator provided on-the-job support and site visits. The program assistants were local community members that received training from the research staff on nutrition, physical activity, diabetes, health education strategies, and program-specific instructions on how to implement activities. *(continued next page)*	***RESOURCES:*** 1. Physical activity lessons for breaks 2. School component resources (recipe cards, school newsletter, posters, letters, family action packs) 3. Resources for store component (shelf labels, posters, flyers, materials for cooking demos/ taste tests) 4. Posters, flyers and messages for mass media 5. Materials for community cooking demos or taste tests 6. Materials for community events (walking challenges, family fun nights) 7. Community program assistant, project coordinator, and field supervisor ***FUNDING:*** Canadian Institutes for Health Research (formative evaluation); an American Diabetes Association Clinical Research Award and a US-Canada Fulbright Award (intervention); an American Diabetes Association Clinical Research Award and the Canadian Institutes of Health Research (process evaluation) *(continued next page)*	***OVERWEIGHT/OBESITY:*** 1. After adjustment for baseline values and other covariates, there was no significant difference in change in BMI between intervention and comparison groups. 2. On average, intervention respondents gained 1.8kg (range: -9.4, 37.5 kg) and comparison respondents gained 0.1kg (range: -15.1, 14.4kg). ***PHYSICAL ACTIVITY:*** 3. Total activity counts decreased for both intervention and comparison, whereas minutes of sedentary activity increased for both groups. There were no significant differences in changes in minutes of light physical activity/day, moderate physical activity/day or vigorous physical activity/ day across the 2 groups even after adjustment for covariates. ***NUTRITION:*** 4. At follow-up, intervention respondents had significantly higher healthy food acquisition scores than comparison respondents after adjustment for baseline scores and other covariates (β=0.947, p=0.003; adjusted R^2= 0.4058). 5. There were no significant differences between groups in the healthiness of food preparation score and food intention scores.

(Continued from previous study)						
	4. 16 lessons in 3rd grade and 17 lessons in 4th grade promoting healthy eating and physical activity.	***LIMITATIONS:*** Non-random assignment of communities; the response rate in some communities was fairly low; respondents lost to follow-up were more likely to have diabetes, reside in comparison and remote communities and have lower knowledge scores at baseline; the availability and affordability of foods at stores of different sizes and locations varied considerably, and data from the large supermarket skewed percentages of food availability; the process data were recorded by several program assistants and were sometimes inconsistent; the intervention focused on food-related behaviors, and therefore the weakness of the physical activity component may have caused the lack of impact on activity; the intervention period was short and may have lacked ability to penetrate further into the community and have greater impact; the ZATPD training in diabetes and nutrition was inadequate; food stores differed in eagerness and willingness to participate; and only one intervention site had access to local radio and cable TV, which was minimally utilized	Family pack return logs (40% completed and returned); attendance tracking (572 participated in cooking demonstrations, 122 attended kickoff feasts)	The assistants were supported by a field supervisor for the first 6 months of the intervention and then by phone and a site visit from the project coordinator. The program assistants worked with existing health and social service programs in conducting the community component. Classroom teachers conducted the school component and store owners were responsible for implementing the store component. ***FORMATIVE EVALUATION:*** 1. Review of the Sandy Lake Health and Diabetes Project 2. Survey with adult band members (sociodemographics, health history, food preparation and consumption, physical activity, and preferences for intervention methods) 3. Direct observations at stores and of students (eating, purchasing, activity patterns and available food selections) 4. Community forums (health concerns and resources) 5. Visits to existing elders' group activities and luncheons (appropriateness of intervention strategies) 6. In-depth interviews 7. Piloting of potential intervention strategies to groups and in public places ***PROCESS EVALUATION:*** 1. Teacher interviews (lesson implementation) 2. Checklist form (store food stock, store poster placement) 3. Record of media publications and radio and cable TV spots during each phase (mass media evaluation) 4. Interviews with teachers, school staff, families, store owners, human services employees, and ZATPD employees (assessment of acceptability, feasibility, and sustainability)	***STRATEGIES:*** At the end of the program, most store owners agreed to continue stocking healthier foods, and some stated they would post shelf labels and posters if given the materials. All communities expressed a willingness to continue program activities if supplied with materials, but there was no plan made for such continuation.	

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Kain, Leyton (2008) Chile	School policy requiring 90 minutes of additional weekly physical education classes. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Nutrition education for 8-11 hours (grades 4 to 6) or 5-6 hours (grade 7) during year 1, and 4 hours (grades 5 to 8) in year two. 2. Two educational lessons for parents (year one) 3. One group meeting to advise parents of obese children (year 2) 4. Active recess provided by schools for 4 months during year 1, but discontinued in year 2.	***DESIGN:*** Non-randomized trial ***DURATION:*** 21 months (2 school years) ***SAMPLE SIZE:*** 2039 students (1466 exposed, 573 unexposed) from 3 intervention schools in Casablanca, Chile and 1 comparison school in Quillota, Chile. ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Broad jump, modified shuttle run, and the mile test (physical fitness in 1st through 4th graders) 2. 20 m shuttle run test (physical fitness in 5th through 7th graders) 3. Anthropometric measures (height and weight [body mass index], waist circumference, triceps skinfold thickness) ***DATA COLLECTION:*** Anthropometric measurements were taken on all children by two trained nutritionists. Weight was taken without shoes and with light clothing and recorded to the nearest 0.1kg. Height was measured to the nearest 1mm. BMI percentile was calculated based on the Centers for Disease Control and Prevention 2000 Growth Charts. Skinfold thickness was measured to the nearest 1 mm based on the average of 3 consecutive measurements. All data were collected at the beginning of each school year (March or April) and repeated at the end of the school year (November). Each measure was taken 4 times in total. ***LIMITATIONS:*** Inconsistent implementation of the intervention (time constraints, funding, admin. restrictions); control children from only one school; unable to assess home environment; seasonality may contribute to the time-related changes in the effects of the intervention; intervention delivered at the same time as another national chronic disease prevention initiative;15% of participants lost at follow-up	6-13 year olds 32% participated in the School Lunch Program in the intervention schools, 36% participated in the School Lunch Program in the control school (poverty) ***ELIGIBILITY:*** Children 7th grade or younger (to allow for the necessary 2 years of follow-up) ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools (1st through 8th grade) were exposed to the intervention.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team planned the intervention. Teachers and school staff were trained by the research staff on how to implement the intervention activities. A nutritionist taught the educational lessons for the parents and conducted the group meeting for parents of obese children. ***FORMATIVE EVALUATION:*** Intervention was piloted at one of the schools in Casablanca for a shorter time period prior to the intervention. Most of the activities were satisfactorily tested by the research team during the previous school year. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Resources for teacher trainings 2. Materials for nutrition education sessions and parent meeting ***FUNDING:*** Tresmontes Lucchetti (Chilean company) ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. For boys, BMI z-score decreased significantly in the intervention group during the 1st period (from 0.62 to 0.44, $p<0.05$), and increased by 0.12 in the 3rd period ($p<0.05$). The difference between baseline and follow-up in period 3 was still significant ($p<0.05$). 2. BMI z-score for boys in the control group remained unchanged during the 1st two periods but increased significantly during the 3rd period (from 0.65 to 0.72, $p<0.05$). There was a significant difference between baseline and follow-up in period 3 for control boys ($p<0.05$). 3. Comparisons between intervention and control boys found that BMI z-score decreased among intervention boys during the 1st period, while there was no change in control boys. During period 2 (summer recess) there was no changes between either group, and in period 3 BMI z-score increased in both groups with the rise significantly greater for controls in the youngest age category. 4. The mean triceps skinfold thickness increased from 12.2 mm to 14.2 for boys in the intervention group ($p<0.05$) and from 13.0 mm to 15.6 for the control group ($p<0.05$) from the 1st to the 3rd period. 5. BMI z-score for girls in the intervention group declined from 0.64 to 0.51 ($p<0.05$) in the 1st period and increased to 0.58 ($p<0.05$) in the 3rd period. The difference between baseline and follow-up in period 3 was still significant ($p<0.05$). 6. BMI z-score for girls in the control group declined from 0.69 to 0.64 (non-significant) in the 1st period and increased to 0.72 ($p<0.05$) in the 3rd period. 7. Comparisons between the intervention and control girls found that BMI z-score declined (not significant) in the intervention girls during the 1st period, remained unchanged in both groups during period 2, and increased non-significantly in both groups in period 3 across all age categories. 8. Obesity prevalence in boys in the intervention group declined significantly during the 1st period (17.0% to 11.4%, $p<0.05$) compared to the control group (21.6% to 19.7%). In girls, the decline in obesity prevalence during period 1 was similar between groups. Changes during period 3 for both genders were similar between groups

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Sollerhed, Ejlertsson (2008) Sweden	School policy to increase physical education classes from 1-2 classes to 4 classes per week at 40 minutes each. Day 5 allowed children to participate in activities outside for 1 hour. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Obese children were offered a voluntary lesson per week to increase motor skills and self-esteem.	***DESIGN:*** Non-randomized trial ***DURATION:*** 3 years ***SAMPLE SIZE:*** 132 students (58 intervention, 74 control) from two schools (1 intervention, 1 control) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], waist and hip circumferences) 2. Physical tests taken from the EUROFIT test battery (sit-ups, standing broad jump, bent arm hang, hand grip, sit and reach, plate tapping, shuttle run) 3. 6 minute run (endurance performance) 4. Rope skipping and ball bouncing (motor skills) ***DATA COLLECTION:*** Annual measurements were taken from each student in November and December of 2000 (baseline) and 2003 (follow-up). The test battery was used to measure aerobic fitness, muscular strength in the upper body, hands, abdomen and legs, flexibility, balance and motor skills. The 6 minute run test was performed indoors on a track about 70 m in circumference and was used to measure endurance performance. To assess motor skills students skipped for 30 seconds and bounced a ball for 30 seconds. The number of correct skips and bounce catches were counted. Anthropometric measures were used to calculate BMI (cut-off point for overweight or obesity by gender and age according to Cole et al. 2000) and waist-to-hip ratio. ***LIMITATIONS:*** Small sample size and lack of information on individual socioeconomic status limited generalizabilty of study	6-12 year olds Rural ***ELIGIBILITY:*** Schools were chosen based on similarities in size, appearance, structure, children's socioeconomic background and rural locale. Parents' informed consent was required for participation. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** Researchers with the Department of Humanities and Social Sciences, and the Department of Health Sciences at Kristianstad University along with individuals from the Department of Clinical Sciences at Lund University ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The researchers designed the intervention and the schools implemented the intervention. Physical education in the intervention school was taught partly by a physical education teacher (half-time) and partly by ordinary classroom teachers who were not specially trained for physical education teaching. One physical education class a week was performed with boys and girls separated, and the other lessons with both groups together. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Physical education teacher 2. Classroom teachers 3. Materials for physical education classes ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Changes in BMI were significantly better for the intervention school compared to the control school [mean (standard deviation) = -0.32 (1.442) vs. 0.25 (1.576); p=0.033]. ***PHYSICAL ACTIVITY:*** 2. Children in the intervention school compared to controls had more positive changes in physical performance [mean= 1.09 (4.009) vs. -1.19 (4.179), p=0.003], endurance performance [mean= 1.42 (2.153) vs. -1.16 (2.213); p<0.001] and motor skill performance [mean= 0.57 (2.730) vs. -0.65 (2.496); p=0.010]. 3. There were no differences in strength performance between the intervention and control schools.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Jurg, Kremers (2006) Netherlands	JUMP-in - school policies establishing regular breaks for physical activity (PA), relaxation, and posture exercises during classroom lessons and sports activities during school and after-school (sport clubs) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Pupil follow-up system: Physical education (PE) teachers monitor students once a year to stimulate students in their fitness development 2. Card game to raise awareness of the importance of PA for health 3. Parental information services: information given (in parents' language) about PA and their role in child's health. 4. Activity week: brings together the components of JUMP-in during a special activity week	***DESIGN:*** Non-randomized trial ***DURATION:*** One school year; August 2002 – June 2003 ***SAMPLE SIZE:*** 510 students in grades 1-6 (369 exposed, 141 unexposed) from 4 intervention schools in 2 districts (2 schools per district) and 1 control school in a different city ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Questionnaires (minutes of physical activity/day, self-reported rating of PA level, perceived (dis)advantages, family support for exercise, frequency of family members' exercise, self-efficacy, intentions, and habit) ***DATA COLLECTION:*** Data on physical activity and its determinants were gathered by questionnaires completed at school by the students at baseline and post-intervention. ***LIMITATIONS:*** Intervention and control group differed significantly regarding ethnicity; physical activity was self-reported; weekend PA was not measured; schools were not randomized to conditions; potential baseline differences between schools; no intensive reliability/validity testing for questionnaires; evaluation population only consisted of students grades 4-6 (9-12 year olds) because the younger children couldn't complete the questionnaire accurately	Lower income, 5-13 year olds 72% foreign origin (intervention sample), 93% foreign origin (control sample) ***ELIGIBILITY:*** Schools needed to have a trained physical education teacher, pupils with low socio-economic status, and a location where school sport activities could be organized in the school or in the vicinity. Parent consent was required. Students absent from school on questionnaire administration day or had missing values on key variables were excluded from the analysis. ***EXPOSURE/ PARTICIPATION:*** 1. In 2 of the intervention schools, school sport activity participation was less than 50%, in the 3rd school it was 57% and in the 4th school it was 82%. 2. In two of the intervention schools 29 and 31 parents participated in the information service.	***LEAD AGENCY:*** The research team (from Municipal Health Service Amsterdam and Maastricht University), municipal authorities, local sport services, primary schools and local sports clubs ***THEORY/ FRAMEWORK:*** Theory of Planned Behavior (Ajzen 1988), intervention mapping protocol (Bartholomew 2001), the model of physical exercise and habit formation (Aarts 1997), the Precaution Adoption Process model (Weinstein, Sandman 1992), the social ecological model of physical activity (Pikora 2003), and the Service Quality Model (Parasuraman 1985). ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** JUMP-in was systematically developed as a joint project involving municipal authorities, local sport services, primary schools and local sport clubs. ***IMPLEMENTATION:*** The research team and other community lead agencies developed the intervention. PE teachers delivered the school sports activities and the pupil follow up system. Other teachers trained by the research team, delivered the classroom PA component. Specially trained information officers delivered parental info sessions. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Semi-structured interviews, observations, and document analysis were used. Questionnaires assessed how often teachers taught the exercises.	***RESOURCES:*** 1. Personnel 2. Class PA activity materials (calendars) 3. Card game materials 4. Funds to organize activity week and parental information service ***FUNDING:*** The Public Health fund (Fonds OGZ) and Ministry Of Health, Welfare, and Sport supported both the intervention and evaluation. ***STRATEGIES:*** Plans in place to disseminate JUMP-in across a larger area in the Amsterdam region.	***PHYSICAL ACTIVITY:*** 1. Overall, students in the intervention group were 1.63 times more likely to meet the recommendation for exercise than those in the control group (OR=1.63, 95%CI: 1.02, 2.61; p<0.05). Most of this effect was seen in the 6th grade, with 4 times greater odds of meeting recommendations for intervention children compared to control (OR=4.33; 95%CI: 1.82-10.32; p<0.001). 2. Children in the control group in grade 6 were less physically active after the intervention compared to before by 26.49 min/day (p<0.01), while those in 6th grade in the intervention group decreased by 3.52 min/day (p= not significant).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Liu, Hu (2008) China	Happy 10 program: 10 minutes of classroom-based physical activity at least once per day ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Posters and stickers used to track progress in each class	***DESIGN:*** Non-randomized trial ***DURATION:*** 8 months ***SAMPLE SIZE:*** 753 students aged 6-12 years (328 exposed, 425 unexposed) from 2 elementary schools (1 intervention, 1 control) in Beijing ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. 7-day physical activity questionnaire (physical activity patterns) – validated tool 3. Physical activity monitor (Zhi-Ji UX-01) ***DATA COLLECTION:*** The questionnaire was interview-administered for grades 1-2 and self-administered for grades 3-5. The average energy expenditure and duration of total physical activity per day were calculated from the questionnaire. Information on age, gender, height, and weight were collected before and after the intervention. Height and weight were measured by trained investigators following standardized procedure. Physical activity monitors measured the energy expenditure of each session. 80 students were selected in the intervention school and were evaluated for 5 consecutive schooldays. The monitors were worn just before each session of Happy 10 and removed after the session was over. ***LIMITATIONS:*** The absence of significant differences in overweight/ obesity data may be related to other factors, such as the short intervention duration, concurrent dietary practice, and relatively small sample size	6-12 year olds ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All children in grades 1-5 in the intervention school were exposed to the Happy 10 program.	***LEAD AGENCY:*** School administration and teachers and research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The teachers organized and implemented the intervention in grade 1-5 classrooms. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Teachers 2. Classroom physical activity materials 3. Tracking poster ***FUNDING:*** International Life Science Institute Focal Point China ***STRATEGIES:*** The Happy 10 program is supported by the National Institute for Nutrition and Food Safety, Chinese Center for Disease Control and Prevention and has been implemented in urban Beijing since 2004.	***OVERWEIGHT/OBESITY:*** 1. The BMI of boys increased significantly after the intervention in both the intervention (0.86 kg m^{-2}) and control schools (0.72 kg m^{-2}), $p<0.05$ for both. Difference in BMI between groups was not significant at follow-up. 2. The BMI of girls in the control school increased significantly after intervention (+0.66 kg m^{-2}), while the BMI of girls in the intervention school decreased significantly (-0.47 kg m^{-2}), $p<0.05$ for both. There was a significant difference in the change in BMI between the intervention and control girls at follow-up, $p<0.05$. 3. The prevalence of overweight and obesity decreased in the intervention boys from 20.9% to 17.1% and 15.0% to 14.6%, respectively, and decreased in intervention girls from 15.3% to 12.0%, and 16.9% to 11.3% respectively. This contrasted with the prevalence of overweight and obesity in the control school which increased by 0.6-4.5% during the same time period. However, there was no significant difference in the change in prevalence of overweight and obesity between the intervention school and the control school. ***PHYSICAL ACTIVITY:*** 4. There were significant increases in the average daily physical activity energy expenditure (from 15.0 kcal/kg-1 to 18.2 $kcal/kg^{-1}$) and duration (from 2.8 hours to 3.3 hours) among students in the intervention school post- intervention ($p<0.05$ for both). This was compared with significant decreases in these 2 variables in the control school over the same timescale (from 24.3 $kcal/kg^{-1}$ to 14.7 $kcal/kg^{-1}$, and from 4.4 hours to 2.9 hours, respectively; $p<0.05$). 5. The change in energy expenditure and duration of physical activity between the intervention and control schools was significantly different ($p<0.05$). 6. The average caloric expenditure per session of each grade ranged from 25.0 to 35.1 kcal. After adjustment for body weight, the average METS value per session of each grade ranged from 4.8 to 6.2 $kcal/kg^{-1}h^{-1}$.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Saksvig, Gittelsohn (2005); Gittelsohn, Harris (1995); Hanley, Harris (1995) Canada	Sandy Lakes Diabetes Prevention Curriculum (adapted from CATCH and Kahnawake School Diabetes Prevention curricula) included brief physical activity breaks during the class curriculum ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. School wide ban of high fat and high sugar snack foods and adoption of healthy breakfast snack program that offered each kindergarten through 5th grade student a glass of 1% milk, fruit, cheese and rice cake. A healthy school lunch program was developed and tested, but never adopted. *Complex:* 1. Family component: Parents/families received healthy eating/physical activity messages through local radio, information booths at parent teacher nights, and newsletters. 2. Peer component: opportunities for peers to act as role models (e.g., children's video cooking club) 3. Class curriculum component: taught in grades 3-5 for 45min/lesson for 16 weeks	***DESIGN:*** Before and after study ***DURATION:*** 1 academic school year (1998-1999) ***SAMPLE SIZE:*** 122 students in grades 3 to 5 in one school ***PRIMARY OUTCOME:*** Overweight/obesity and nutrition ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], percentage body fat) 2. 24-hour recall and interview (dietary intake) 3. Health knowledge and behavior questionnaire developed from CATCH tool (psychosocial factors, dietary intention, dietary fat knowledge, behavioral capabilities, dietary self-efficacy, and outcome expectancies). 4. Parent questionnaire (family characteristics and influence of parent knowledge, perceptions, behavior and exposure to the intervention) ***DATA COLLECTION:*** Anthropometric measurements were taken in the spring of 1998 and 1999. The percent of body fat was estimated by bioelectrical impedance using a body composition analyzer. A 24-hour recall was conducted with each student at baseline and follow-up. Students were trained to use a non-quantitative 1 day food diary to track the foods and drinks they consumed during the recall period. Plastic food models and 2 dimensional models were used to assist students in recalling types and quantities of food and beverages during the interview. The health questionnaire was developed and adapted from the CATCH health behaviors questionnaire and the Kahnawake school diabetes prevention program classroom questionnaire, and administered in the fall of 1998 and spring of 1999. ***LIMITATIONS:*** Maturation controlled with 1 year time frame of study; selection bias controlled by exposing all possible participants to program	7-14 year olds 100% Native Canadian ***ELIGIBILITY:*** Parental consent, student assent and completion of all measurements required ***EXPOSURE/ PARTICIPATION:*** All students in the school were exposed to the school wide ban of high fat and high sugar snacks and the health breakfast snack program. All 3rd, 4th and 5th graders in the school were exposed to classroom curriculum, physical activity breaks and family and peer components.	***LEAD AGENCY:*** The research team and the school ***THEORY/ FRAMEWORK:*** Ecological model and Social Cognitive Theory ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The researchers developed the intervention. The teachers delivered the curriculum component and the school administration implemented the policies. ***FORMATIVE EVALUATION:*** 1. Key informant and systematic interviews (commonly eaten foods, beliefs about foods, leisure and other activities, health beliefs) 2. Direct observations 3. Review of existing written materials 4. Individual/household surveys (demographics, health beliefs and knowledge, food frequency, dietary recall, substance use, activity recall, concepts of body image, family history of diabetes, food preparation) 5. Physical exams (% body fat, BMI, etc) ***PROCESS EVALUATION:*** Implied but no measures specified.	***RESOURCES:*** 1. Newsletters 2. Resources for peer component (e.g. cooking club videos) 3. Relationships with local media 4. Materials for information booths 5. Breakfast snacks (milk, fruit, cheese, rice cakes) ***FUNDING:*** National Institutes of Health, Ontario Ministry of Health, Health Canada, Kraft Foods, Eli Lilly, US Fullbright scholarship. ***STRATEGIES:*** Authorities overseeing the healthcare services of the first nations in Canada requested the curriculum to use in other communities.	***OVERWEIGHT/OBESITY:*** 1. Mean BMI increased significantly between baseline (20.5, SD=4.3) and follow-up (21.5, SD=4.8, $p<0.001$). 2. Students who were obese at baseline had a greater mean change in BMI than students who were not ($p<0.05$). 3. Percent of body fat also increased significantly from baseline (29.8, SD=10.7) to follow-up (31.0 SD=10.8, $p<0.001$). ***NUTRITION:*** 4. The percent of energy from total fat was reduced from baseline (mean 33.8, SD=7.9) to follow up (mean 31.9, SD=8.3), $p<0.05$. It decreased for boys (from 34% to 31%, $p<0.05$), but not for girls (from 34% to 33%, $p<0.2$). 5. Dietary intention change in girls from baseline to follow-up (from 3.9 to 4.7, $p<0.001$) and boys (from 3.2 to 3.7, $p<0.001$) and for students who were obese at baseline (from 3.5 to 4.2, $p<0.001$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Wardle, Brodersen (2007) England	Frequency of physical education (PE) class in an average week ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Prospective cohort study ***DURATION:*** 5 years ***SAMPLE SIZE:*** 2727 students from 36 secondary schools from year 7 and year 11 of the Health and Behavior in Teenagers (HABITS) cohort study ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Height and weight [body mass index] and waist circumference 2. Teachers' and students' reports of PE and games classes per week 3. Townsend index (area-based measure of family socio-economic deprivation) ***DATA COLLECTION:*** Anthropometric data were collected by trained researchers who visited the schools annually for 5 years at the same time of year. Body mass index (BMI) was calculated and overweight and obesity status was established from International Obesity Task Force criteria. A waist to height ratio was calculated as the ratio of waist divided by height. PE in the school timetable was established from teachers' and students' reports of the number of PE and games classes a week in year 11. Where available (29 schools) teacher's reports were used to classify schools by number of PE sessions; in the remaining 5 schools the modal student report was used to classify the school. Students reported their postal codes, which were matched to enumeration districts to derive an area-based measure of family socio-economic deprivation. ***LIMITATIONS:*** Study lacked random allocation; researchers can only contribute circumstantial evidence due to the nature of ecological data that takes advantage of naturally occurring differences in exposure	11-16 year olds 60.6% White, 25.3% Black, 11.1% Asian, 3.0% other ethnicity (averages for evaluation sample) ***ELIGIBILITY:*** All students registered in the designated school year at the time of data collection were eligible to participate. Informed parental consent and child assent were obtained. ***EXPOSURE/ PARTICIPATION:*** Not reported	***LEAD AGENCY:*** Researchers from the Cancer Research United Kingdom Health Behavior Unit, Department of Epidemiology and Public Health, University College London ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Not reported ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:***Not reported ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. After adjustment for age, initial values of waist circumference, and SES, mean waist circumference in year 11 for boys attending schools with one, two or three sessions of PE a week was 78.79 cm (SE=0.30), 78.07 cm (SE=0.63), and 75.05 cm (SE=0.81), respectively. Boys from schools with three weekly PE sessions had significantly smaller waists than boys from other schools (p=0.001). 2. After adjustment for age, initial values of waist circumference, and ethnic group, mean waist circumference in year 11 for girls attending one PE session compared to 2 sessions was not significant. Adjusted means were 74.47 cm (SE=0.35) vs 73.38 cm (SE=0.76), respectively (p=0.235). 3. There were no significant effects of school PE on changes in BMI or in BMI standard deviation scores in either boys or girls, or among overweight and obese compared with normal-weight pupils. School PE had a negligible and non-significant effect on the probability of becoming obese. ***OTHER:*** 4. 25 schools reported 1 weekly session of PE, 9 schools reported 2 sessions and 2 boys' schools reported 3 weekly PE sessions.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Trudeau, Shephard, Bouchard (2003); Trudeau, Laurencelle (2004); Trudeau, Shephard, Arsenault (2003); Trudeau, Shephard (2001); Trudeau, Espindola (2000) Canada	School policy requiring 5 hours of physical education (PE) per week taught by a specialist for primary school children. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 166 adults from a childhood study ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index (BMI)], subscapular, triceps, suprailiac, and abdominal skinfolds, waist and hip diameters, biacromial and biiliac diameters [sliding anthropometer]) 2. Physiological indicators (cholesterol, systolic and diastolic blood pressure) 3. Physical work capacity and grip force (Monark 814E ergometer and Preston-Smedley grip dynamometer) 4. Abdominal endurance (number of sit-ups in 1 minute) 5. Balance (flamingo balance test) 6. Lower back flexibility (sit and reach test) 7. Physical activity (PA) diaries (type, intensity, and duration of PA) 8. Parent questionnaires (height , weight and physical activity during winter and summer months) 9. Physical activity questionnaires - French translation of the revised Physical Activity Readiness Questionnaire (current PA levels) ***DATA COLLECTION:*** Associations for this study were made using data from individuals from two different periods. Baseline data were gathered during 1970-1977 when subjects were 10-12 years old. Follow-up measures were taken when participants were about 35 years old from 1996-1998. At baseline, teachers helped students complete physical activity diaries and parents completed questionnaires. At follow-up, participants completed a physical activity questionnaire. Height, weight, and blood pressure were measured at baseline and follow-up. Physical work capacity (PWC/kg), grip force, balance and flexibility were measured according to the Eurofit fitness protocol at baseline and follow-up. Baseline measurement for sit-ups was conducted according to the CAHPER test battery. *(continued next page)*	Adults 272 students received the intervention. ***ELIGIBILITY:*** Consent was required. Subjects who completed activity diaries in the original study were eligible to participate, except those living outside the Province of Quebec. Adopted children and their adoptive parents were not included in the study. ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Research team from 1970-77 and the current research team from the Universite du Quebec a Trois-Rivieres and the University of Toronto ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** Fonds d'animation de la recherche, Universite du Quebec a Trois-Rivieres and Canadian Fitness and Lifestyle Research Institute ***STRATEGIES:*** Not applicable	***OVERWEIGHT/OBESITY:*** 1. There were no significant differences between intervention and control groups with respect to any of the body composition or body dimension variables. ***PHYSICAL ACTIVITY:*** *All subjects* 2. There was a significant but weak association between adult PA and the time spent in PA as a child (total PA, Pearson r=0.20; intense PA, r=0.18; light organized PA, r=0.12; non-organized PA, r=0.19), p<0.05 for all. With the exception of the non-organized PA, these associations were due entirely to students who had been assigned to the enhanced primary school PE program. 3. Those active as adults had a greater childhood participation than their inactive peers in intense PA (1.16 ± 0.12 hrs/week-1 vs 0.81 ± 0.09 hrs/week^{-1}) and organized PA (0.41 ± 0.07 hrs/week-1 vs 0.20 ± 0.04 hrs/week-1), but less participation in organized intense PA (0.27 ± 0.05 hrs/week-1 vs 0.14 ± 0.03 hrs/week^{-1}). 4. There were no differences in flexibility, sit-ups, or maximal work rate between intervention and control samples. 5. Flamingo balance test scores were better for the intervention groups of women and men than for the controls. The average number of trials needed to complete the test was 2.67 for the intervention and 5.44 for the control subjects (F=7.303; df=1, 129; p<0.01). *Females* 6. Active adult females were more likely to have participated in intense PA (1.3 ± 0.2 hrs/week-1 vs 0.54 ± 0.08 hrs/week-1), intense organized PA (0.29 ± 0.10 hrs/week-1 vs 0.08 ± 0.03 hrs/week-1), intense non-organized PA (0.27 ± 0.05 hrs/week-1 vs 0.14 ± 0.03 hrs/week- 1), and intense recreational PA (0.16 ± 0.03 hrs/week-1 vs 0.09 ± 0.02 hrs/week-1) as children. 7. The weekly PA of adult control females was significantly associated with the time spent in non-organized intense PA as a child (r=0.48, p<0.01). No other significant associations were found in women. *Males* 8. The PA of adult males was significantly correlated with the weekly time spent in organized PA as a child (r=0.26, p<0.05). 9. Control males showed an inverse association between their current PA and the time that they had spent in low-intensity recreational PA during childhood (r= -0.40, p<0.05). *(continued next page)*

(Continued from previous study)						
		Follow-up measurement for sit-ups was conducted according to the Canadian Home Fitness Test protocol. Skinfolds were tested in a smaller group of subjects (60 women and 52 men) at baseline and follow up. ***LIMITATIONS:*** Secular change in the definition of physical activity is a problem for longitudinal studies; study uses two different methods to measure physical activity (diary at baseline and questionnaire at follow-up), so it is not possible to compare results; self-reported data (parent height and weight, children physical activity); difficult to assess blood pressure in children, which decreased reliability of the measure; potential recall bias				10. In males in the intervention group, adult PA was significantly correlated with both total organized PA (r=0.34) and low-intensity organized PA (r=0.32) as a child, $p<0.05$ for both. 11. In males, a stepwise multiple regression analysis revealed that participation in organized PA as a child significantly predicted current weekly PA (R^2=0.071, SEE=0.375, F=5.43; df=1; $p<0.05$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Cleland, Dwyer (2008) Australia	School policy requiring higher levels of compulsory school physical activity ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Retrospective cross-sectional ***DURATION:*** Not applicable ***SAMPLE SIZE:*** ~1,865 adults aged 26-36 years followed-up from the 1985 Australian Schools Health and Fitness survey. During the 1985 survey, participants were 7-15 year old children from 109 primary and secondary government, Catholic, and independent schools ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. School reports (compulsory school PA) 3. Questionnaires (duration and frequency of school physical activity and non-school activity during the past week) 4. Bicycle ergometer test (cardio-respiratory fitness) 5. Pedometer (daily steps) 6. International Physical Activity Questionnaire (IPAQ-L) 7. Australian Bureau of Statistics index of relative socioeconomic disadvantage from the 1981 population census (area-level socioeconomic status) ***DATA COLLECTION:*** At baseline in 1985, senior school personnel reported minutes of compulsory school PA in physical education and school sports, and from this data the average weekly minutes of compulsory PA was calculated. Children aged 9-15 years (n=6,412) completed the physical activity questionnaire in small groups with a trained data collector. Body mass index was derived from measured height and weight (n=6,554). Children aged 9, 12, and 15 years (n=2,595) completed a bicycle ergometer test to estimate cardiorespiratory fitness. At follow-up in 2004-2006, participants (aged 26-36 years) were asked to wear a pedometer for 7 days. Those who recorded daily steps for a minimum of 8 hours per day for 4 days were included in the analysis (n=1,786). 2,082 participants also completed the IPAQ-L. Body mass index was derived from measured height and weight (n=1,865). Cardiorespiratory fitness was estimated from a bicycle ergometer test (n=1,624). Physical measurements were conducted at study clinics held around Australia. ***LIMITATIONS:*** Self-reported data (child PA, school reports); the IPAQ-L may overestimate PA; pedometers are unable to capture non-ambulatory activities; school-reported PA and child-reported PA were not well-correlated; only 28% of the original sample had follow-up measurements; unmeasured factors such as school resources, interest, and parental expectations may have contributed to schools' 1985 compulsory PA policies, potentially confounding the association between school PA provision and outcomes	7-15 year olds (baseline) 26-36 year olds (follow-up) The Australian Schools Health and Fitness Survey was a nationally representative survey. The prevalence of overweight and obesity in the current study at follow-up (64% of men, 40% of women) was similar to that found in 25-34 year olds in another large Australian population-based sample and to that found in a national health survey. ***ELIGIBILITY:*** Had to be a participant in the1985 Australian Schools Health and Fitness Survey. Pregnant women were excluded from follow-up analyses. ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** The research team that conducted the 1985 Australian Schools Health and Fitness Survey and the current research team from the University of Tasmania ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** The National Health and Medical Research Council and the National Heart Foundation ***STRATEGIES:*** Not applicable	***OVERWEIGHT/OBESITY:*** 1. There was no association between school physical activity provision and body mass index or the prevalence of overweight at baseline or follow up in males or females. ***PHYSICAL ACTIVITY:*** 2. No significant differences were found in the median physical activity or fitness at follow-up across schools that provided low, medium or high levels of compulsory physical activity. 3. There was no association between compulsory school physical activity provision at baseline and the prevalence of being in the top quarter of physical activity or fitness at follow-up.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Environment Policies-United States						
Ritenbaugh, Teufel-Shone (2003); Teufel, Ritenbaugh (1998) New Mexico	Zuni Diabetes Prevention Program included school policies to: create a youth fitness center open during lunch and after school; new exercise equipment and climbing wall; sponsored classes, tournaments, and other activities. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Replace sugary soft drinks with diet beverages in school vending machines; ban unhealthy snacks and sugary beverages from the wellness center; increase fruits and vegetables (F&V) and decrease fat in school lunches; provide palatable water in 5 gallon water coolers *Complex:* 1. Diabetes prevention curriculum: 9 weeks of physical education (PE) class devoted to orientation to wellness center and diabetes prevention; biology and food service class learning units; new elective on diabetes prevention. 2. Posters, school announcements and radio PSAs 3. Social network component: Efforts to develop 3 supportive social networks; Teen Task Force (6-12 youth)	***DESIGN:*** Time series study ***DURATION:*** 4 years ***SAMPLE SIZE:*** Average of 125 Native American juniors and seniors (at each interval) from 2 high schools. 38 Anglo youth from another high school were used as comparison. ***PRIMARY OUTCOME:*** Facility use and dietary consumption ***MEASURES:*** 1. Biological measures (plasma insulin and glucose levels) 2. Family medical history (presence of diabetes) 3. Height and weight (body mass index [BMI]) 4. Staff record-keeping (number of facility users per day, names and frequency of individual users) 5. In-school soft drink vending machine sales (sugar-sweetened beverage consumption) ***DATA COLLECTION:*** Biological measures were drawn after an 8hr fast and 30 minutes after a 75g glucose load (OGTT), with the 75th percentile used for outcome measure comparisons. Family history was asked at the time of the OGTT. Three cross sectional evaluations of biological markers were conducted in Yr 0 (baseline), Yr 1.5, and Yr 3. Sales were tracked over the 4 years of the intervention. ***LIMITATIONS:*** Impact evaluation in year 3 is based on OGTTs from 44% of participants; factors predisposing youth to volunteer for study may also bias outcome; intervention effects cannot be extrapolated to represent all Zuni high school youth	14-18 year olds 100% Native American ***ELIGIBILITY:*** Enrollment as a high school student at Zuni high school, parental consent for 16-18 yr olds, student assent. Students aged <16 years were excluded from invasive evaluation measurements and youth with elevated fasting glucose levels were excluded from analyses. ***EXPOSURE/ PARTICIPATION:*** All students in the high school classes of 1999 and 2000 were exposed to the intervention.	***LEAD AGENCY:*** Pueblo of Zuni, the Zuni Public School District and the University of Arizona ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** The lead agencies included several members of the community and the reservation. Over the course of 6 years (1991-97), these groups developed the intervention. ***IMPLEMENTATION:*** Members of the various lead agencies and the reservation implemented the intervention. Teachers and researchers developed course specific diabetes education units. Fitness center staff were trained on use of equipment, first aid, and as certified instructors. The Teen Task Force was trained during the 1st 6 months of employment and helped to collect data, planned events and monitored activities for the center. Food service personnel completed a 3 hour workshop on healthy recipes and were given a list of alternative food vendors. ***FORMATIVE EVALUATION:*** 1. Focus groups with high school youth (understanding of healthy eating, diabetes, PA) 2. Interviews with high school faculty, staff, and administrators (current biology, PE, and health requirements; strengths/limitations of the school lunch program) 3. 24-hr dietary recalls from high-school aged youth to assess food choices/serving sizes 4. Questionnaire for youth (knowledge and attitudes about the existing wellness center and other facilities) ***PROCESS EVALUATION:*** Program progress reports were provided periodically at faculty meetings.	***RESOURCES:*** 1. Space/ funds for fitness center 2. Director and staff for the fitness center 3. Wages for Teen Task Force members 4. Purified water coolers 5. Food service training packet 6. Healthy recipes 7. Diabetes prevention curriculum 8. Posters and time on local radio station for promotion ***FUNDING:*** National Institutes of Health, University of Arizona ***STRATEGIES:*** Not reported	***NUTRITION:*** 1. By year 3 the 400 students of Zuni high school were consuming virtually no sugared soft drinks at school (down from 800 12-ounce cans/week/400 students). 2. Environmental change accounted for a decrease in consumption of sugared soft drinks of about 4.8 ounces/day/student. ***FACILITY USE:*** 3. Increased use of the wellness facility over the first 3 years of operation. 8.5% of the total high school student population used the wellness center per day in Yr 1, while 28% used it daily in Yr 3. ***OTHER:*** 4. Fasting glucose levels varied little over the 3 years, with levels for most youth well within the normal range. 5. The fasting insulin levels for Zuni females and males showed a significant downward trend over 3 years both at the median (Coeff= -12, p=0.03 females, Coeff= -18, p<0.001 males) and at the 75th percentile (Coeff= -27, p<0.05 females, Coeff= -39, p<0.001 males). By Year 3, neither Zuni males nor females were different from the appropriate Anglo comparison group. 6. 30-min insulin levels for Zuni females and males showed downward trends at both the median (Coeff= -261, p=0.0001 females, Coeff= -135, p=0.05 males) and the 75th percentiles (Coeff= -260, p=0.0001 females, Coeff= -342, p=0.0001 males) over the 3 years. However, at year 3 levels for Zuni females remained higher than Anglo girls. In year 3 Zuni males were not different from the Anglo males.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Cradock, Melly (2007) Massachusetts	School campus characteristics including size of the campus, play and building areas ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 256 seventh and eight grade students from 10 middle schools in 4 communities in the Boston metropolitan area ***PRIMARY OUTCOME:*** School time physical activity ***MEASURES:*** 1. Height and weight (body mass index) 2. Accelerometers (physical activity level) 3. Survey (demographics, days per week of physical education participation) 4. School characteristics (campus area, play area, building area, and area densities per student) assessed using geographic information system (GIS) data, site visits, archival records (land-use data, architectural plans, site maps), and aerial photos ***DATA COLLECTION:*** Students completed surveys in 1997. Body mass index was calculated from measurements collected by trained project staff in 1997. Students wore accelerometers to record measures of minute-by-minute physical activity during the school day. Students were assigned to wear accelerometers for either one or two 4-day sessions conducted by the schools between February and May of 1997. School campus characteristics were assessed retrospectively in 2004-2005. Researchers consulted with school staff to verify school characteristics. ***LIMITATIONS:*** Seasonality; data was not collected from schools simultaneously; physical activity was averaged over 15-minute intervals, however newer analytic methods could provide better statistical power to analyze the relatively rare outcomes of moderate and vigorous physical activity among youth as well as address issues of missing data; inconsistency in how school spaces were defined for study purposes and the use of the spaces during the time of data collection; time lapse between collection of accelerometer data and school characteristics; not possible to account for practices of schools that promote or restrict movement (e.g., block scheduling, quality of physical education programming) and organizational or school characteristics (e.g., provision of equipment, supervision, quality of play spaces)	12-15 year olds Population density per square mile ranged from 2,664 to 18,868. Proportion of households living in poverty ranged from 2% to 16%. 42% Female; 56% White; 11% Black; 14% Hispanic; 11% Asian; 8% Other (evaluation sample) ***ELIGIBILITY:*** This research was conducted using data collected during a larger study. ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Researchers from the Harvard School of Public Health and the University of Texas ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** This research was funded by the Robert Wood Johnson Foundation and the National Institutes of Health/National Cancer Institute. ***STRATEGIES:*** Not applicable	***PHYSICAL ACTIVITY:*** 1. Having a larger school campus area per student (β=0.2244, p<0.001), building area per student (β =2.1302, p<0.05), and play area per student (β=0.347, p<0.01) was associated with increased physical activity in middle school students (adjusted for student age, gender, race/ethnicity, BMI, physical education days/week, day of the week, and time of day). 2. An approximate increase of 20% to 30% in magnitude of physical activity was associated with the difference in total campus, school and play areas per student. These increases translated into approximately 34 kcal/day, walking an extra 96 m/hour over an average school day, or walking 2 extra miles (3.2 km) weekly. 3. In each regression model, a positive association was observed between the number of days of physical education class and increased physical activity, although this association only reached statistical significance in one of the three final models after controlling for campus variables (β =0.1257; p<0.01).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Colabianchi, Kinsella (2009) Ohio	"School Ground as Community Parks" school grounds renovations (e.g., playground equipment, learning garden, safety improvements) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 20 neighborhood elementary schools in Cleveland, Ohio (10 intervention, 10 matched controls); ***PRIMARY OUTCOME:*** Physical activity (PA) and playground use ***MEASURES:*** 1. System for Observing Play and Leisure Activity in Youth (SOPLAY) used to directly observe the number of people on school grounds, their physical activity levels (sedentary, walking, vigorous), and presence of supervised or organized activity (reliable and valid instrument) 2. Environmental Assessment of Public Recreation Spaces (characteristics of the playground area) ***DATA COLLECTION:*** Intervention and matched schools were observed at the same time to control for factors that could affect utilization of the school grounds (e.g., weather). Each school pair was observed 10 times (5 times in the early evening from 4:30-6:00pm or 6:30-8:00pm and 5 times on the weekend from 10:30am-12:00pm, 12:30-2:00pm, or 2:30-4:00pm). All observations took place during daylight hours. Each observation period was 90 minutes long. Target areas were scanned every 10 minutes by observers, and activity levels were coded for each individual in the target area. Separate scans were completed for girls, boys, men, and women in each target area. Observers were trained through classroom lectures, video practice sessions, and field practice sessions. The environmental assessment measured the presence of ten different play feature categories and safety features. ***LIMITATIONS:*** Post-test only design; some of the matched unrenovated playgrounds had relatively new and/or well maintained equipment, which attenuated the structural differences between playgrounds; SOPLAY was used to collect physical activity levels of adults though it has not been validated in adults	General population Urban (414,500 city residents); 53.8% African American, 38.7% White, 1.5% Asian, 7.7% Hispanic, 4.5% other races; 39% of children under the age of 17 that lived near the school grounds lived in poverty ***ELIGIBILITY:*** Renovated sites were selected based on the availability of an appropriate match school. ***EXPOSURE/ PARTICIPATION:*** 466 students attended the schools with renovated grounds and were potentially exposed (along with their families) to the renovated playgrounds.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Not reported ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Materials for playground renovation 2. Contractors to renovate playground 3. Average renovation cost per site = $200,000 ***FUNDING:*** Robert Wood Johnson Foundation Active Living Research Program ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. On average, more people utilized the renovated playgrounds (2.34 persons) compared to the not-yet-renovated playgrounds (1.62 persons), p=0.03. 2. The proportion moderately-to-vigorously active was not significantly different between renovated and unrenovated playgrounds. 3. Among all vigorously active people, children overall and boys were more likely to be vigorously active at the renovated playgrounds relative to the not-yet-renovated playgrounds (median values=0.333 vs. 0.170 and 0.333 vs. 0.205, respectively; p<0.05 for both). There was no significant difference in vigorous activity among girls at the renovated playgrounds versus the not-yet-renovated playgrounds. 4. Girls at the not-yet-renovated playgrounds were more likely to be moderately active compared to girls at the renovated playgrounds (median renovated=0.162; median not-yet-renovated=0.243; p<0.05). ***ENVIRONMENT CHANGE:*** 5. The total number of play features was three times as high at the renovated playgrounds compared to the not-yet-renovated playgrounds (mean=45.2 and mean=15.5, respectively; p=0.001). The renovated playgrounds also had more safety features than the not-yet-renovated playgrounds (p=0.05).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Environment Policies-International						
Stratton, Leonard (2002); Stratton (2000) England	Placement of brightly colored markings on the school playground surface ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Provision of a single foot-ball on the playground (no other equip-ment)	***DESIGN:*** Group randomized trial ***DURATION:*** 8 weeks ***SAMPLE SIZE:*** 47 children (27 intervention, 20 control) in grades 1-2 in 2 elementary schools (1 intervention, 1 control) ***PRIMARY OUTCOME:*** Overweight/obesity and physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Short-range radio telemeters (heart rate, duration, and intensity of physical activity) 3. Oxygen consumption (measured using meteorological balloons, face masks, dry gas analyzers, mechanical dry gas meters and a 350 liter Tissot spirometer) ***DATA COLLECTION:*** Heart rates during sleep were recorded minute by minute over one night to determine a baseline resting heart rate. Heart rates were recorded during 3 playtimes throughout the day before and after marking the playground. Heart rates provided researchers with intensity levels of physical activity. The measurement of physical activity lasted for 4 weeks before and 4 weeks immediately after the playground was painted. Three children from each school (1 from each year group) were monitored on the same day. The percentages in playtime and actual time in minutes spent in heart rate zones and the overall mean heart rate were calculated for each individual. This procedure was repeated for 20 days (more or less, depending on the weather). The same procedure occurred in the control school. To measure energy expenditure, children's oxygen consumption was measured during periods of rest and exercise. Height and weight were measured before and after the intervention. ***LIMITATIONS:*** The time spent in MVPA could be inflated because students knew they were being studied (possible Hawthorne effect); small sample size; study did not collect information on the mode of activity; study cannot provide information about playground markings that were more or less effective in prompting physically active play	5-7 year olds Urban ***ELIGIBILITY:*** All children in the reception, first, and second grades were eligible to participate. Parents had to provide informed consent, and children with incomplete data were excluded. ***EXPOSURE/ PARTICIPATION:*** All children participating in morning and afternoon playtimes in the intervention school were exposed to the playground markings.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Children in the intervention school designed the markings. Magical Markings, a business in Castleford, England, placed the markings on the playground. The control school had no playground markings, but allowed limited equipment on the playground. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Local business to place markings on the playground 2. Funds to mark the playgrounds 3. Football for the playground ***FUNDING:*** Not reported ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Height and weight in both groups changed little over the intervention. ***PHYSICAL ACTIVITY:*** 2. In the intervention group the % of playtime in MVPA (HRR50) increased from 35.1% to 46.2% after the intervention compared to a decrease from 40.5% to 39.1% in the control group. Differences in MVPA between schools increased after the intervention period. ANOVA analysis found a significant interaction for MVPA [$F(1,278)=9.71$; $p \leq 0.01$] and the main effect of the intervention [$F(1, 278)= 5.73$; $p \leq 0.05$]. There was no significant main effect difference between the intervention and control groups. 3. Vigorous physical activity (HRR75) almost doubled in the intervention group (5.3% of playtime to10.0%) compared to a small decrease in the control group (7.0% to 6.8%). ANOVA analysis found a significant interaction for HRR75 [$F(1,278)= 6.0$; $p \leq 0.01$] and the main effect of the intervention before and after the intervention [$F(1,278)= 4.92$; $p \leq 0.05$], but not between groups. 4. The duration of play during the intervention phase exceeded that of the pre-intervention phase in the control and experimental school by almost 7 min. and 6 min., respectively. ANOVA found a significant effect for duration of playtime [$F(1,272)= 9.51$; $p \leq 0.01$] with significant main effect differences in play duration before and after the intervention [$F(1,272)= 25.67$; $p \leq 0.01$]. There were no significant differences in play duration between intervention and control schools. ***ENVIRONMENT CHANGE:*** 5. There was a significant increase in recess duration as a result of the intervention period from 73.8 (± 35.2) to 93.1 (± 28.5) minutes ($F=25.1$; $p \leq 0.01$). ***ENERGY EXPENDITURE AND HEART RATE:*** 6. The mean rate of energy expenditure increased by 6.1% during the intervention, and the rate of energy expenditure in the intervention group exceeded that in the control group by 7.8% [$F(1, 84)= 5.81$; $p \leq 0.02$]. 7. Total energy expenditure during play was 17% higher in the intervention group compared to the control group, and increased by 35% during the intervention [$F(1,84)= 5.79$, $p \leq 0.02$]. 8. The mean heart rate of the intervention group increased by 7 beats min-1 during the intervention compared to little change in the control group. ANOVA analysis found a significant interaction for mean heart rate [$F(1,278)= 6.00$, $p \leq 0.01$) and a significant main effect for the intervention [$F(1,278)= 8.09$, $p \leq 0.01$), but no significant main effect between the intervention and control groups.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Verstraete, Cardon (2006) Belgium	Game equipment and activity cards provided to school classrooms for use during recesses and lunch breaks ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Group randomized trial ***DURATION:*** 3 months ***SAMPLE SIZE:*** 235 students (122 intervention in 7 class groups; 113 control in 6 class groups) from 7 elementary schools (4 intervention, 3 control) ***PRIMARY OUTCOME:*** Moderate, moderate-to-vigorous, and low intensity physical activity ***MEASURES:*** 1. Accelerometers (children's physical activity levels) ***DATA COLLECTION:*** Children's physical activity levels in the intervention and control groups were measured before and 3 months after providing the game equipment in the intervention schools. A research staff member put the accelerometers on in the morning and collected them the same day after the lunch break. The accelerometer data from morning recess and lunch break were used. To prevent the children from increasing their activity level as a result of wearing the accelerometer, they were only informed about the purpose of the measurement after the posttest measurement. Pretest and posttest measurements were organized on days with dry weather conditions, allowing the children to play outdoors. A one-minute sampling interval of accelerometer data was used. ***LIMITATIONS:*** The influence of the teacher's encouragement to be active using the game equipment was not investigated	10-12 year olds ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** All 5th and 6th grade classrooms in the intervention school were given a set of game equipment and activity cards.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Researchers designed and implemented the study. A research staff member introduced the toys and activities to the children. Teachers were asked to encourage the children to play with the game equipment and were also advised to divide the game equipment into different sets and to exchange those sets regularly to prevent children losing interest in the equipment. Children were only allowed to play with the equipment of their own class group. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Activity cards 2. Game equipment (e.g., jump ropes, flying discs, badminton racquets) 3. Research staff members to introduce the game equipment 4. Teachers ***FUNDING:*** Flemish Government ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** *During morning recess:* 1. The time spent on moderate-to-vigorous intensity activities decreased significantly more in the control group from 55.92 ± 22.87 to 43.37 ± 27.62 min, compared with the intervention group from 56.58 ± 29.37 to 53.40 ± 25.63 min (F=6.5, p<0.01). 2. The time spent on moderate intensity activities decreased in the control group from 41.10 ± 18.99 to 33.90 ± 21.14 min, while it increased in the intervention group from 41.05 ± 22.74 to 45.16 ± 21.55 min (F=10.6, p<0.01). 3. The time spent on low intensity activities increased significantly more in the control group from 43.20 ± 22.43 to 54.54 ± 26.37 min, compared with the intervention group from 42.10 ± 28.29 to 45.82 ± 24.93 min (F=4.73, p<0.05). 4. When including gender, the intervention was found to only be effective in girls during morning recess. In girls, the time spent on moderate-to-vigorous intensity activities significantly increased in the intervention group from 35.07 ± 24.38 to 38.95 ± 23.21 min, while it decreased in the control group from 48.50 ± 22.43 to 29.94 ± 19.95 min (F= 6.48, p< 0.01). In boys, the time spent on moderate-to-vigorous intensity activities decreased in both groups. 5. In girls, the time spent on moderate intensity activities significantly increased in the intervention group from 27.50 ± 19.82 to 36.39 ± 21.17 min, while it decreased in the control group from 38.99 ± 18.81 to 27.51 ± 18.46 min (F= 6.77, p< 0.01). In boys, no change was found in moderate intensity activities. 6. In girls, the time spent on low intensity activities decreased in the intervention group from 61.99 ± 23.44 to 59.49 ± 22.57 min, while it increased in the control group from 50.09 ± 22.17 to 67.44 ± 19.14 min (F= 12.64, p< 0.01). In boys, the time spent on low intensity activities increased in the intervention and control groups. *During lunch break:* 7. The time spent on moderate-to-vigorous intensity activities increased significantly in the intervention group from 47.86 ± 24.43 to 60.72 ± 21.95 min. while it decreased in the control group from 54.93 ± 23.89 to 44.74 ± 21.89 min (F=44.2, p<0.001). 8. The time spent on vigorous intensity activities increased significantly in the intervention group from 9.67± 12.43 to 11.17 ± 14.92 min while it decreased in the control group from 10.90 ± 14.14 to 5.46 ± 8.76 min (F=13.09, p<0.001). 9. The time spent on moderate intensity activities increased significantly in the intervention group from 38.19± 18.67 to 49.56 ± 17.68 min while it decreased in the control group from 44.03 ± 18.45 to 39.29 ± 17.82 min (F=28.34, p<0.001). 10. The time spent on low intensity activities decreased in the intervention group from 50.55 ± 23.46 to 37.81 ± 20.46 min while it increased in the control group from 43.21 ± 22.36 to 53.81 ± 21.28 min (F=50.50, p<0.001). 11. No significant gender differences were found for the accelerometer data during lunch break.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Loucaides, Jago (2009) Cyprus	School policy providing playground markings (e.g., hopscotch, animals, clock face, smiley face, trails), long and short jump ropes and game court allocation during school breaks. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Students were taught rules for proper and safe equipment use.	***DESIGN:*** Group randomized trial ***DURATION:*** ~4 weeks ***SAMPLE SIZE:*** 232 5th-6th grade students (164 intervention; 68 control) from 3 inner city schools (1 full intervention, 1 court allocation only, 1 control) in Cyprus. ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Pedometers measured children's steps (found to be a valid and reliable instrument, Eston et al., 1998) ***DATA COLLECTION:*** Physical activity was measured in all three schools for 4 days prior to the implementation of the intervention. Physical activity was measured again for 4 days, 4 weeks after the intervention began. Children self-reported their steps as shown on the pedometers just before the break, just after the break, at the end of the school day, and just before bed. ***LIMITATIONS:*** Self-reported data; this study did not account for seasonality	10-12 year olds ***ELIGIBILITY:*** Informed consent was required from participants ***EXPOSURE/ PARTICIPATION:*** 5th and 6th grade children in the intervention schools were exposed to the game courts and all children in the intervention schools were exposed to the playground markings and jump ropes.	***LEAD AGENCY:*** Research team (implementation and evaluation) was from the Ministry of Education and Culture in Cyprus, the Open University of Cyprus, and the University of Bristol ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Teachers were instructed not to encourage children to participate in the activities. During the 20 minute activity break, children were free to choose between playing organized games on the courts or playing with the jump ropes and markings. The school's courts were allocated to 5th or 6th grade students on alternate days of the week for team activities. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Playground markings 2. Playground equipment (jump ropes) 3. $359 total cost ***FUNDING:*** This research was conducted as part of an elementary school research competition "MERA", supported by the Cyprus Research Promotion Foundation. ***STRATEGIES:*** Not applicable – pilot study	***PHYSICAL ACTIVITY:*** 1. For school breaks, there was a significant interaction between school and gender [$F(2,222)=7.16$, $p<0.01$]. Boys in the two intervention schools had higher mean step counts [full intervention = 1650 (SD=498) steps; court allocation only= 1643 (SD= 609) steps] than boys in the control school [1179 (SD= 392) steps]. Girls in the full intervention school [mean steps = 1150 (SD= 339)] had higher step counts than girls in the other two schools [court allocation only = 1004 (SD= 525) steps; control = 962 (SD= 466) steps]. 2. For school breaks, there was also a significant time by school interaction [$F(2,222)=3.08$, $p<0.05$]. While there were no differences in mean step counts at pre-intervention between intervention and control schools, there were significant differences at post-intervention. Mean step counts in both intervention schools [full intervention = 1427 (SD= 499) steps; court allocation only = 1331 (SD= 651) steps] were higher than the control school [1053 (SD=447) steps], $p<0.001$ and $p<0.01$, respectively. 3. There were no significant differences between intervention and control groups for mean steps during after-school activity. Boys had higher step counts after school in comparison to girls ($\eta 2$ effect size = 0.12, $p<0.001$).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Stratton, Mullan (2005) Wales, England	Multi-color markings on the playgrounds ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Non-randomized trial ***DURATION:*** Not reported ***SAMPLE SIZE:*** 99 children (67 intervention, 32 control) from 8 schools in areas of deprivation in Northeast Wales ***PRIMARY OUTCOME:*** Overweight/obesity and moderate-to-vigorous and vigorous intensity physical activity ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Heart rate telemeters (heart rate and play duration during recess) ***DATA COLLECTION:*** Baseline data were collected for 4 weeks immediately prior to playgrounds being painted. After painting, data were collected for 4 continuous weeks. Weight and height were collected at baseline and follow-up. Heart rate measurements took place during morning, lunch, and afternoon play periods on 3 separate days during the same week. Prior to playtime, children's resting heart rates were recorded for 15 minutes at least 2 hours after eating. ***LIMITATIONS:*** Missing data; other factors may influence physical activity (season, social relationships, equipment, adult prompting, curriculum) that were not assessed in this study; principal research tool used to measure physical activity, heart rate telemetry, has limitations (results may differ depending on an individual's emotional state and level of fitness and the recording interval used); potential novelty effect for the new playground markings	4-11 year olds Lower- income ***ELIGIBILITY:*** All children and parents were required to provide written informed consent to participate. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention early primary (4-7 year olds) and late primary (7-11 year olds) schools were exposed to the intervention.	***LEAD AGENCY:*** Research team (evaluation), schools (intervention) ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Previous studies reported increased physical activity with playground markings. ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Intervention schools were provided with a grant to paint multi-color markings on playgrounds. Playground markings were painted in bright fluorescent colors. Early primary school markings included castles, dragons, clock faces, mazes, trails, hopscotch, letter squares, and snakes and ladders. Late primary school markings included targets and sports markings for netball, soccer, and tennis. Each school employed 2 supervisors who were not informed of the aims of the research or trained in promoting physical activity. Small pieces of sports equipment, such as skipping ropes and balls, were available in all (intervention and control) school playgrounds. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. 800£ for each school to paint playground markings 2. Bright, fluorescent paint 3. Playground marking templates ***FUNDING:*** Health Promotion Wales provided the schools with funding for playground markings. Health Promotion Department of Welsh Assembly supported the evaluation. ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. There were no significant differences in body mass or stature between girls and boys, or control and intervention groups, before or after the intervention. ***PHYSICAL ACTIVITY:*** 2. Moderate-to-vigorous physical activity increased in the intervention group from 36.7% (±23.9) to 50.3% (±28.9) of playtime compared to a decrease from 39.9% (±21.1) to 33.4% (±18.4) in the control group ($F1,204 = 13.7$; $p<0.01$). 3. Vigorous physical activity increased in the intervention group from 7.9% (±10.9) to 12.4% (±15.8) compared to little change from 8.0% (±10.1) to 8.0% (±10.9) in the control group ($F1,204 = 4.05$; $p<0.03$). 4. For intervention schools, children aged 4-7 years increased their moderate-to-vigorous physical activity (40.9% to 43.3%) and vigorous physical activity (7.5% to 9.1%), although not significantly. 5. For intervention schools, children aged 8-11 years increased their moderate-to-vigorous physical activity (33.5% to 40.4%) and vigorous physical activity (8.8% to 12.9%), although not significantly. 6. For intervention schools, boys increased their moderate-to-vigorous physical activity from baseline to follow-up from 40.6% to 44.8% and girls from 35.2% to 39.8%, although not significantly. 7. For intervention schools, boys increased their vigorous physical activity from baseline to follow-up from 9.8% to 12.6% and girls from 5.9% to 7.9%, although not significantly.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Ridgers, Stratton (2007); Ridgers, Stratton (2007) England	Redesign of playground (markings and physical structures) to include three colored zones: sports, fitness/ skills, and "chill-out" area ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Schools were encouraged to explain the aims of the zones to children during class time and reinforce aims during recess periods.	***DESIGN:*** Time series study with control group ***DURATION:*** Permanent environment change ***SAMPLE SIZE:*** 394 children from 26 schools (15 intervention; 11 control) in deprived, urban communities in England ***PRIMARY OUTCOME:*** Moderate-to-vigorous (MVPA) and vigorous intensity physical activity (VPA) ***MEASURES:*** 1. Height and weight (body mass index -BMI) 2. Accelerometer (recess physical activity) 3. Heart rate monitor (recess physical activity intensity) 4. School records (demographic data) 5. Direct observation (recess duration) ***DATA COLLECTION:*** Measures were collected on one school day at each measurement point (baseline, 6 weeks, 6 months). A researcher recorded the time that the school bell rang to start and end each recess period. Accelerometers and heart rate monitors were worn on one school day at each measurement point. Accelerometers quantified physical activity every 5 seconds. ***LIMITATIONS:*** Missing data at both follow-up measurement points; did not control for seasonality, day of data collection, or amount of equipment available; method of recess supervision not assessed; combining heart rate and accelerometer to quantify physical activity produced differing results	5-10 year olds Lower-income The schools in the study were located in one of the most deprived areas in the country. ***ELIGIBILITY:*** Children in the last year of elementary school were excluded, as they would not be available for longitudinal studies. Parents signed an informed consent form. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention elementary schools were exposed to the intervention.	***LEAD AGENCY:*** Research team (evaluation); schools (intervention) ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Playground markings, obstacle course, and equipment provision shown to produce short-term increases in physical activity ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** Each intervention school received 20,000 pounds for new multicolor playground markings and physical structures to divide the playground into three zones. School staff members were encouraged to explain the aims of the zones to children and encourage active recess. Sports equipment was available for use in all schools (including control). School staff supervised the recesses. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Playground design plans 2. Playground equipment 3. Fencing 4. Colored markings 5. 20,000 English Pounds ***FUNDING:*** The National Sporting Playgrounds' initiative provided the funding for the intervention (playground improvement). The evaluation was funded by Liverpool City Department for Long Life Learning and Sport England. ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. At 6 weeks post intervention, analyses of accelerometer data (n=242) indicated a statistically significant effect, with the intervention group engaging in 5.95% (CI: 0.14 to 11.77) more MVPA during recess than the control group (crude analysis). After adjusting for potential confounders, the difference was not significant. Boys engaged in 7.2% more MVPA than girls in recess [β=7.14 (SE=1.42); p<0.0001]. In addition, as BMI increased, recess MVPA decreased (ß=-0.55 [SE=0.24]; p=0.024). 2. At 6 weeks post intervention, accelerometer data (n=242) indicated a statistically significant effect, with the intervention group engaging in 1.7% (CI: 0.01 to 3.39) more VPA during recess than the control group (crude analysis). After adjusting for potential confounders, the difference was not significant. Boys engaged in 3.1% more VPA than girls during recess (β=-3.05 [SE=0.66]; p=0.001). 3. At six weeks post intervention, the intervention effect was stronger for younger children for recess MVPA (β=-3.03 [SE=2.75]; p=0.01) and VPA [β=-0.82 (SE=0.48); p=0.09]. Analysis also indicated that the more daily recess time available, the stronger the intervention effect on recess MVPA (β= 0.25 [SE=0.14]; p=0.07). 4. At 6 months post intervention, analysis using heart rate data (n=394) showed that intervention school children engaged in 4% more MVPA (β=4.03 [CI: 0.15 to 7.91]; p=0.04) and 2.4% more VPA (β=2.43 [CI: 0.06 to 4.80]; p=0.05) over time during recess than control children. Analysis using accelerometer data (n=280) indicated that intervention school children engaged in 4.5% more MVPA (β=4.53 [CI=0.59 to 8.47]; p=0.03) and 2.3% more VPA (β=2.32 [CI=0.71 to 3.93]; p=0.005) over time than control children. 5. At 6 months post intervention, analysis using heart rate data (n=394) indicated the intervention effect was stronger for MVPA and VPA with increasing recess duration (each p<0.05). Analysis using accelerometer data (n=280) also found that the duration of recess was positively associated with increased MVPA (p<0.10). 6. At 6 months post intervention, analysis using heart rate data (n=394) showed the intervention effect was stronger for children who were less active at baseline for MVPA (p<0.05) and VPA (p<0.10). 7. At 6 weeks and 6 months post intervention, the intervention effect was stronger for younger children, as younger children were found to engage in higher levels of MVPA (6 weeks p<0.05 ; 6 months p<0.10).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Dyment, Bell (2007), Dyment, Bell (2008) Canada	School ground greening including a diversity of natural and built elements (e.g., shelters, rock amphitheaters, trees, shrubs, wildflower meadows, ponds, grassy embankments, food gardens, art, seating areas, trails) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 105 respondents (28 parents, 48 teachers, 29 administrators) from 59 schools (27 urban, 21 suburban,11 rural) in Canada (British Colombia, Manitoba, Ontario, Quebec, Nova Scotia, Newfoundland) ***PRIMARY OUTCOME:*** Vigorous and moderate intensity physical activity ***MEASURES:*** 1. Questionnaire asked respondents to describe the school physical environments before and after the greening project and to estimate changes in students' physical activity, quality of play and physical activity, interaction with the natural world, social health, and cognitive development (valid instrument). ***DATA COLLECTION:*** Three questionnaires (closed and open-ended questions) were sent to each of the schools that completed greening projects. The questionnaire's content validity was judged by a panel of experts and pilot-tested. ***LIMITATIONS:*** Recall bias due to the retrospective nature of the survey; data analyzed at the individual rather than school level	About half of the schools were Caucasian. The remaining schools were largely Aboriginal, Afro-Canadian, Indo-Canadian, Arabic, and/or Asian. ***ELIGIBILITY:*** Inclusion criteria for the schools: 1. The greened site was sufficiently developed and defined so that a comparison could be made with its prior/ ungreened state 2. Children had access to the greened site during their free time (before and after school, at recess) 3. Diversity of socio-economic status of schools 4. Diversity of grade levels (K-8th grade). 5. Diversity of urban, suburban, small town, and rural schools across Canada. ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Previous research suggests school ground greening benefits include increased sun protection, enhanced social and mental health, improved motor development, and increased physical activity. ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** The evaluation was funded by the Public Health Agency of Canada. Evergreen (charitable organization that promotes school ground greening) assisted the research team in identifying candidate schools. ***STRATEGIES:*** Not applicable	***PHYSICAL ACTIVITY:*** 1. Almost half of the respondents (49%) reported the school ground promoted more vigorous activity after greening compared to before (40% no change, 2% less activity, 9% unsure). 2. The majority of the respondents (71%) indicated that greening resulted in more moderate and/or light physical activity (17% no change, 1% less activity, 11% unsure). Respondents indicated that turf and asphalt support more vigorous and moderate levels of activity and greened areas of school grounds support more moderate and light activity. ***ENVIRONMENT CHANGE:*** 3. Respondents reported school ground greening projects dramatically changed the school landscape. Prior to greening, school grounds primarily consisted of asphalt, manicured grass, and play equipment. After greening, respondents reported that grounds included more shade trees (96% of respondents) and shrubs (87%) as well as rocks/boulders (66%), wildflower gardens (65%), floral gardens (49%), butterfly gardens (41%), sand (38%), logs (38%), berms (31%), water features (7%), food gardens (27%), woodland habitats (35%), grassland habitats (20%), wetland habitats (10%), greenhouses (6%), art (25%), seating (81%), trails (22%), and composting (42%). ***OTHER:*** 4. Respondents indicated that the redesigned grounds appeal to a wider variety of student interests (90%) and support a wider variety of play activities (85%). Respondents stated that green grounds promote more active (82%), more imaginative (83%), and more constructive (59%) play; more civil behavior (81%); better integration of physical activity into school life (77%); strengthened link between play and learning (82%); and exploration of the natural world (84%).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Willenberg, Ashbolt (2009) Australia	Playground environmental factors including surface type and amenities (part of the 'fun 'n healthy in Moreland!' project) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 3006 children from 23 schools (25 sites) in Melbourne, Australia ***PRIMARY OUTCOME:*** Moderate (MPA) and vigorous intensity physical activity (VPA) ***MEASURES:*** 1. System for Observing Play and Leisure Activity in Youth (SOPLAY) was used to directly observe physical activity behaviors, presence of supervision, and equipment availability [reliable and valid instrument] (n=23 schools, 156 observation settings across 25 sites) 2. Photo documentation of each school site to classify the surface type (hard, soft) and amenities (sport/play markings, fixed play equipment) [n=25 school sites] 3. Focus groups to explore 8- to 11-year-old children's perspectives of being fun and healthy in school environments (n=12 schools, 91 children) ***DATA COLLECTION:*** During SOPLAY scans, pre-determined settings were scanned from left to right to record the number of boys and girls engaging in sedentary, walking, or very active behaviors. The presence of supervision and equipment availability were also noted. Scans were conducted by two field researchers (1 scanner, 1 recorder) during lunch time for fourteen months as long as weather permitted. All 25 school sites were photographed and visited to clarify any ambiguity that may have resulted from indistinct photo documentation. Focus groups were held during school hours and lasted no longer than one hour. The same researchers conducted each focus group. Each focus group session included four parts: 1) concept map, 2) group discussion, 3) picture drawing, and 4) photographic ordering. For the photo ordering part, students were asked to discuss and group 17 photographs of situations and environments (e.g., families, playgrounds, sports equipment, lunchboxes, bake sales) in order of most healthy to least healthy. ***LIMITATIONS:*** Self-reported information from children; small size of some focus groups; some assumptions were made in relation to sex and activity type	5-12 year olds Urban 6182 children were enrolled at the 23 schools; culturally diverse, predominantly low socio-economic area; schools were government, independent, religious, and special development ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** Funding was provided by the Victorian Government's Community Support Fund as part of the 'Go For Your Life' campaign. ***STRATEGIES:*** Not applicable	***PHYSICAL ACTIVITY:*** 1. More students participated in vigorous physical activity (VPA) when loose equipment (33% vs. 20%; p<0.001) and teacher supervision (29% vs. 22%; p<0.001) were present, compared to when they were not. Higher levels of VPA were particularly marked for boys (p<0.001). 2. Compared with all other settings, the proportion of children engaged in moderate physical activity (MPA) was higher in settings where fixed play equipment were located (35% vs. 20%; p<0.001). There was a corresponding lower proportion of children, particularly boys, engaged in VPA in settings with fixed play equipment (23% vs. 38%; p<0.001). 3. The proportion of children engaged in MPA in areas with marked hard surfaces was greater than for areas with unmarked hard surfaces (sport markings: 34% vs. 20%, p<0.001; play markings: 25% vs. 20%; p=0.04). 4. No differences in levels of MPA or VPA were detected between settings with different surface types (hard vs. soft). On fields, no difference was found with the addition of sport markings. 5. A greater proportion of boys engaged in VPA overall compared with girls (32% vs. 29%; p<0.02). 6. A greater proportion of girls engaged in sedentary activity than boys (49% vs. 39%, p<0.001). ***OTHER:*** 7. The focus groups indicated that children liked a mix of playground areas with different surfaces and open spaces. Children preferred soft surfaces to hard surfaces due to concerns about injury from falls, and preferred that hard surfaces be marked. Children preferred metal structures to wooden and disliked policies that limited use of fixed playground equipment to younger students. Children also believed that the provision of more sports equipment stimulated physical activity.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Haug, Torsheim (2008) Norway	Availability of outdoor physical activity resources (e.g., sport fields, equipment, green space) at schools ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 16,471 students from 130 primary, secondary, and combined schools in Norway ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Principal Questionnaire: 14-page survey of school policies, environmental, and organizational structures related to physical activity and healthy eating, such as soccer fields, areas for other ball games, areas for hopscotch/ skipping rope, playground equipment, obstacle course, sledding hill, green space/forest areas, and areas for boarding/skating (n=130 schools) 2. Student Questionnaire (physical activity during school classes, transportation to school, and recess) [valid and moderately reliable instrument] ***DATA COLLECTION:*** A principal (school-level) questionnaire and a student questionnaire, to be distributed to all students, were sent to each school administration with information letters and a standardized description of procedures for teachers. Data were collected from both the student and principal questionnaires for three months. Schools that did not return the surveys received two e-mail reminders. ***LIMITATIONS:*** Self-reported data; subjective assessment of school policies and environments; higher probability of inaccurate data among young students	6-15 year olds ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** The Norwegian Directorate for Education and Training and The Norwegian Directorate of Health and Social Affairs ***STRATEGIES:*** Not applicable	***PHYSICAL ACTIVITY:*** 1. For all ages, significantly more boys than girls were engaged in physical activity ($p<0.05$). Participation reached a peak at grade 6 for both genders. A significant reduction in physical activity from the previous grade was observed in higher grades, starting age 12 for girls and age 13 for boys ($p<0.05$). 2. Students age 13-15 with a larger number of outdoor facilities at school had nearly 3 times higher odds of being physically active compared with students in schools with fewer facilities (Boys: OR=2.69, 95% CI=1.21,5.98; Girls: OR=2.90,95%CI=1.32,6.37). 3. Significantly higher odds ($p<0.05$) for school break physical activity were observed for boys age 13-15 at schools with the following outdoor characteristics: soccer field (OR=1.68, 95%CI=1.15,2.45); areas for hopscotch/skipping rope (OR=2.53, 95%CI=1.55,4.13), and playground equipment (OR=1.66, 95%CI=1.16,2.37) 4. Boys and girls age 13-15 had significantly ($p<0.05$) higher odds of being physically activity in schools with a sledding hill (Boys: OR=1.70, 95%CI=1.23, 2.35; Girls: OR=1.58, 95%CI=1.11, 2.24). 5. No association between the school environment and physical activity were found with students at the primary school level (ages 6-12).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Physical Activity and Environment Policies-United States						
Williamson, Copeland (2007) No location specified	Wise Mind Study - Physical activity component: Teacher supplies (bean bags, balls) to promote play during class time/recess, lesson plans for academic games involving the equipment ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* School policies to modify school menus to include: 1. Five fruit and vegetable servings per day 2. <30% of dietary energy from total fat 3. <10% of dietary energy from saturated fat 4. 20 to 30 g fiber per day *Complex:* 1. Family component: Newsletters, weight gain prevention website, school assemblies for families promoting healthy eating, increased PA/decreased sedentary behavior. 2. Posters promoting physical activity centers	***DESIGN:*** Group randomized trial ***DURATION:*** 2 school years ***SAMPLE SIZE:*** 586 students in grades 2-6 (313 intervention- healthy eating & exercise [HEE], 348 control- alcohol/drug/tobacco use prevention [ADT]) from 4 private schools (2 HEE, 2 ADT) ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], percent body fat) 2. Digital photography (food selections, plate waste, food intake) 3. Self-administered physical activity checklist [SAPAC] (one day recall of physical activities and sedentary behaviors) 4. Godin-Shephard Leisure Time Physical Activity Questionnaire (intensity and frequency of physical activity during a usual week) 5. Child Depression Inventory-Short Form (mood) 6. Rosenberg Self Esteem Scale (self-esteem) 7. Children's Eating Attitudes Test (eating disorder symptoms) ***DATA COLLECTION:*** Body mass index (BMI) and BMI z-scores were calculated using height and weight. Percentage of body fat was collected using the Tanita body composition analyzer. Plate waste was photographed and analyzed by dietitians using the Pennington Biomedical Research Center nutrient database. The Godin-Shephard Leisure Time PA Questionnaire and the SAPAC are valid and reliable. ***LIMITATIONS:*** The number of schools was insufficient to allow controlled cluster randomization with adequate statistical power; small sample size; sample was predominantly white and middle class; self reported measures	6-11 year olds 94.9% White, 2.4% African American, 2.7% other racial groups (evaluation sample) ***ELIGIBILITY:*** Written consent from parents and students ***EXPOSURE/ PARTICIPATION:*** All children at the 2 HEE schools were exposed to the school lunch changes and physical activity intervention.	***LEAD AGENCY:*** The research team and the schools ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** An executive committee composed of school staff and research team members served as a policy and planning board during the planning phase. ***IMPLEMENTATION:*** The research team developed the intervention; worked with schools to garner support; trained cafeteria staff for meal preparation, portion size control and presentation of healthy food selections; trained teachers in healthy eating and exercise (6 sessions); and delivered the family component. The schools changed their menus, developed the health promotion program, and developed more opportunities for safe exercise. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Personnel (trainers, school staff) 2. Posters 3. Handouts 4. Menu boards 5. Parent newsletter 6. Physical activity equipment 7. Resources for events, incentives 8. Funds/ personnel to create/ maintain internet program ***FUNDING:*** National Institutes of Health ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Analysis of change in body mass index (BMI) z-scores from baseline as a function of treatment arm (intervention or control) indicated no significant effects related to treatment arm, (p=0.5458). 2. There was a negative correlation (r= -0.18) between baseline BMI z-scores and changes in BMI z-scores at 18 months for intervention and control, indicating that at risk for overweight and overweight children tended to either lose weight, relative to changes in height and age, or gain modest amounts of weight. 3. The success rates for weight gain prevention at month 18 for the intervention group were 51% and 54.7% for control. There was a positive correlation (r= 0.17) between baseline BMI z-scores and success of weight gain prevention for intervention and control, indicating that children with higher BMI z-scores at baseline were more likely to decrease or maintain their BMI z-score in comparison with children with lower baseline BMI z-scores. 4. Baseline % body fat (BF) was significantly associated with changes in % BF at 18 months, with lower levels of %BF at baseline being associated with greater increases in %BF during intervention period (r= -0.09, p<0.02). This indicates that fatter children (in both groups) at baseline tended to lose fat during the intervention at rates that were lower than those for children who were lean at baseline (r= -0.12, p <0.05 for control, r= -0.07, p>0.05 for intervention). ***PHYSICAL ACTIVITY:*** 5. Marginally significant effects of the intervention were observed for the physical activity checklist measure of physical activity. The intervention group was associated with increased minutes of physical activity (22 ± 4.8), while control group had a non-significant decrease in physical activity. The effect size for this difference was 0.23, (p=0.06). ***NUTRITION:*** 6. After 18 months, the intervention group was consuming fewer total calories (-59 ± 13.3, d=0.55) and lower percentages of calories from total dietary fat (-41 ± 3.4, d=0.61), saturated fat (-17 ± 1.2, d=0.49) and protein (-11 ± 4.0, d=0.60). The dietary changes were determined primarily by changes in food selections. ***OTHER:*** 7. Improvement in measures of depression, self-esteem and eating disorder symptoms were observed in both intervention and control groups (p<0.05).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Durant, Harris (2009) Massachusetts, Ohio, and California	Availability of policies and resources for physical activity in schools including: 1. Physical activity equipment in school 2. Supervised physical activities after school 3. Play areas and fields available after school hours 4. Days per week of physical education ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* Not reported	***DESIGN:*** Cross-sectional study ***DURATION:*** Not applicable ***SAMPLE SIZE:*** 165 adolescents aged 12-18 years from a larger psychometric study of a new instrument for assessing the environmental influences of child and adolescent physical activity and nutrition. ***PRIMARY OUTCOME:*** Physical activity (PA) and overweight/obesity ***MEASURES:*** 1. Student survey (frequency of physical education classes, accessibility of physical activity equipment and facilities, school physical activity policies during and after school, self-reported physical activity, self-reported weight and height, time spent watching television) ***DATA COLLECTION:*** Surveys took approximately 40 minutes. Only responses from the first survey were used in the present study. Body mass index (BMI) was calculated from self-reported weight and height. BMI percentiles and z-scores were determined from the 2000 Centers for Disease Control and Prevention growth charts. ***LIMITATIONS:*** Generalizability of findings to other regions may be limited; study relied on self-reported measures of physical activity, television watching, height, and weight; the after-school supervised physical activity survey item had low test-retest values; modest sample size may have prevented the detection of meaningful associations; researchers were unable to access or evaluate school-level data on physical education classes because this was a multisite study with youth attending a number of different schools; no causal relationships can be determined	12-18 year olds 56.5% White, 29.8% Black, 10.6% Hispanic, 3.1% other ethnicities (evaluation sample) ***ELIGIBILITY:*** Children ages 11-18 who attended schools outside their home were eligible to participate. Parent consent and child assent were required. ***EXPOSURE/ PARTICIPATION:*** Not applicable	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not applicable ***ADOPTION:*** Not applicable ***IMPLEMENTATION:*** Not applicable ***FORMATIVE EVALUATION:*** Interviews with parents and youth were conducted to develop new survey items. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** Not applicable ***FUNDING:*** Not applicable ***STRATEGIES:*** Not applicable	***OVERWEIGHT/OBESITY:*** 1. In the adjusted analysis, none of the school environment or policy variables were correlated with BMI or BMI z-scores. ***PHYSICAL ACTIVITY:*** 2. Both the number of days physical education was offered and accessibility of school fields for use after school were positively associated with overall physical activity even after adjustment for race-ethnicity, site, gender, and age (β=0.286, p=0.002, semipartial correlation= 0.236 and β=0.801, p=0.016, semipartial correlation= 0.186; respectively). 3. Being physically active at a school with recreation facilities open to the public was a significant predictor of overall physical activity in adjusted analysis (β=0.876, p=0.009, semipartial correlation =0.205). 4. Perceived accessibility of after-school supervised physical activities and accessibility of school equipment were not significant correlates of physical activity in either unadjusted or adjusted analyses. 5. In multivariable linear regression modeling that tested the independent effect of each school factor on overall physical activity, while controlling for demographics, weekly physical education classes was the only school factor that remained significantly associated with overall physical activity (β=0.264, p=0.007, semipartial correlation = 0.136). Access to school play areas or fields after school was marginally significant (β=0.626, p=0.077, semipartial correlation=0.136).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
School Physical Activity and Environment Policies-International						
de Barros, Nahas (2009); Nahas, de Barros (2009) Brazil	Saude na Boa project - School policy aimed at increasing the number of days/ week that students accumulated 60+ minutes of moderate-to-vigorous physical activity (MVPA) by providing: 1. Bike racks 2. Physical education kits for PE teachers 3. Equipment for physical activity (e.g. balls, jumping ropes, weights) 4. Weekend active leisure activities (supervised trails or sports activities) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Healthy snack day - fruit was distributed once a week. *Complex:* 1. Informational posters, newsletters and the Saude na Boa website (provided project information and health promotion materials). 2. Promotional materials (e.g., t-shirts, Frisbees, balls, water bottles) distributed at special occasions and events.	***DESIGN:*** Group randomized trial ***DURATION:*** 9 months ***SAMPLE SIZE:*** 989 high school students aged 15-24 attending evening classes in 2 cities (Florianopolis - 262 intervention, 268 control; and Recife - 212 intervention, 247 control); 20 high schools, 10 in each city (5 intervention, 5 control in each city) ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], waist circumference) 2. Questionnaire (physical activity [frequency per week of moderate-to-vigorous physical activity], active transportation, TV/computer daily hours, eating behavior) ***DATA COLLECTION:*** Data were collected at baseline (March 2006), post-intervention (Dec. 2006), and after a 6-month follow-up (June 2007). Anthropometric data was collected by trained staff following the standard procedures. The questionnaire was a validated measure adapted from the PACE project. ***LIMITATIONS:*** Attrition (1,166 lost to follow-up); physical activity was self-reported; potential that intervention students reported higher physical activity levels to please interviewers; teachers' strikes in both cities made it complicated to promote the intervention and to collect follow-up data; lack of buy-in/support among physical educators and canteen owners	15-24 year olds % White ranged from 24.7-61.0% (evaluation sample) ***ELIGIBILITY:*** All students aged 15-24 years attending 1st and 2nd year of high school classes during days of data collection were eligible. Passive parental consent was required for those <18 years. Verbal consent was required for participation in the intervention activities and measurement procedures and for those ≥18 years. ***EXPOSURE/ PARTICIPATION:*** All students attending evening high school classes in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** Research team ***THEORY/ FRAMEWORK:*** Transtheoretical model, World Health Organization's (WHO) "Health Promoting Schools" philosophy and the Centers for Disease Control and Prevention (CDC) "Guidelines for School and Community Programs." A logic model was developed and guided the intervention. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team provided materials and technical support and conducted the initial orientation and training workshops. The school community received an initial presentation of the proposed intervention. School staff received training about healthy foods, and guidance for buying, cleaning and distributing the fruits during class breaks. Physical education teachers received 4-hour workshops every other week (8 sessions), with suggestions for implementing small changes in the curriculum. The school personnel carried out the intervention ***FORMATIVE EVALUATION:*** Formative evaluation was conducted, but no details were reported. ***PROCESS EVALUATION:*** Process evaluation was conducted, but no details were reported.	***RESOURCES:*** 1. School personnel 2. Resources for training and engagement activities 3. Guest speakers 4. Promotional materials 5. Website 6. Bike racks 7. Fruits 8. Physical education kit ($500 per school) ***FUNDING:*** Healthy Lifestyles, Healthy People Project of the International Life Sciences Institute Research Foundation, Pan American Health Organization, and the CDC; support from Ministry of Science and Technology, Brazil, the Federal University of Santa Catarina, and the State University of Pernambuco. ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. At post-intervention the proportion of subjects meeting physical activity recommendations (≥ 5 days/week of 60+ min. MVPA) decreased in both the intervention (8%) and control (14%) groups, but the intervention was effective at minimizing this reduction in the intervention group. The difference between intervention and controls post-intervention was significant, (p=0.001). 2. Post-intervention, the control group had significantly fewer days per week accumulating 60+ minutes MVPA compared to the intervention group (2.6 days vs. 3.3 days, respectively; p<0.001). 3. There was a significant reduction in the prevalence of physically inactive observed in the intervention group (3.2% decrease for Florianopolis; 6.5% decrease for Recife), and a rise was found in the control group (0.45% increase for Florianopolis; 4.7% increase for Recife). The difference between the intervention and controls at post-intervention was significant for Recife (p=0.03) and neared significance in Florianopolis (p=0.06).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Verstraete, Cardon, (2007); Verstraete, Cardon (2007) Belgium	School policy to increase physical activity (PA) that included: 1. Two 50 minute physical education classes per week supporting increased physical activity 2. Game equipment at lunch and recess 3. Extracurricular organized PA once per week during lunch and after school hours ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Health Education: 6 lessons and 3 repetition lessons to increase knowledge and healthy living by teaching skills such as goal-setting, time-planning, problem solving and self-talk.	***DESIGN:*** Group randomized trial ***DURATION:*** Fall 2002 – Spring 2004 ***SAMPLE SIZE:*** 764 children (399 intervention, 365 control) from 16 schools (8 intervention, 8 control) ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], biceps, triceps, subscapular, suprailiac and calf skinfolds) 2. Physical activity questionnaire (physical activity levels during leisure time, psychosocial correlates of PA) 3. Accelerometers (physical activity) 4. System for Observing Fitness Instruction Time [SOFIT n=234 pre-test, n=228 post-test] (activity levels) 5. EUROFIT test battery to measure physical fitness (flamingo balance test, plate tapping, sit and reach, standing broad jump, hand grip, bent arm hang, 10x5m shuttle run, 20m endurance shuttle run) ***DATA COLLECTION:*** Pre-test measures were taken Sept.-Oct. 2002 when all the children were in 4th & 5th grade and post-test measures were taken April-June 2004 when all the children were in 5th & 6th grade. A subsample of children (n=111) were analyzed with accelerometers for five consecutive days. The children were also asked to record each activity performed without wearing the accelerometer on a record form, including the duration and the intensity. Trained graduate students observed six randomly selected children (3 boys and 3 girls) from each class using SOFIT every 20 seconds. The questionnaire, accelerometers, and SOFIT are all valid and reliable measures. The EUROFIT tests were administered by trained research staff. ***LIMITATIONS:*** Small number of schools included in the study; implementation fidelity was not assessed; limited number of observed physical education lessons	9-12 year olds ***ELIGIBILITY:*** Parental consent required ***EXPOSURE/ PARTICIPATION:*** Not reported	***LEAD AGENCY:*** Policy Research Centre, a consortium of researchers from the Catholic University of Leuven, Ghent University and Free University of Brussels and the schools ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Intervention was adapted from the physical education and self management components of the Sports, Play and Active Recreation for Kids (SPARK) program. ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The research team developed the intervention and conducted the health education lessons. Physical education teachers received manuals, guidelines, and sample physical education lessons and were asked to implement them. Classroom teachers organized distribution of the game equipment during recess and lunch. External physical education teachers conducted the extracurricular organized physical activity. Physical education teachers received one-on-one training by research staff on how to teach the physical education curriculum. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Physical education manuals, guidelines and sample lessons 2. Game equipment for recess/lunch 3. Materials for teacher trainings 4. Trained physical education instructor for extracurricular physical activities ***FUNDING:*** Regional government/ Flemish government ***STRATEGIES:*** Not reported	***OVERWEIGHT/OBESITY:*** 1. Children's sum of skinfolds were significantly higher in the control schools than the intervention schools at posttest (64.04 ± 39.67 vs. 55.56 ± 27.79 mm; F=5.24, p<0.05). ***PHYSICAL ACTIVITY:*** 2. Based on the analysis of SOFIT observations, the proportion of physical education class time spent on moderate-to-vigorous physical activity (MVPA) at post-test was significantly higher in the intervention group compared to the control group (F[1,14]= 15.78, p<0.001). The average MVPA engagement increased from 42% to 56% in the intervention group and from 37% to 41% in the control group. The proportion of MVPA engagement within the lesson contexts management, general knowledge, fitness activities and game play was significantly higher in the intervention vs. control group (data not shown). 3. Based on accelerometer data, the time spent on MVPA was significantly higher at posttest in the intervention group compared to the control groups (141.5 ± 46.84 min/day vs. 125.13 ± 33.52 min/day; F=10.62, p<0.01). This was also true for time spent on moderate-intensity PA (122.90 ± 37.86 vs. 107.45 ± 27.11; F=15.32, p<0.01). This represents a smaller decrease in moderate physical activity (PA) and MVPA engagement from baseline for the intervention schools compared with the control schools. 4. No gender differences were found on the accelerometer data, which suggests that the intervention effects were similar for boys and girls. 5. Based on results from the PA questionnaire, at post-test, children in the intervention group engaged in more moderate-intensity PA in leisure time compared to children in the control group (12.25 ± 18.44 min/day vs. 8.66 ± 15.40 min/day; F=5.23, p<0.05). 6. There were no significant effects of the intervention on the physical fitness tests at post-test. However, in girls, explosive strength (standing broad jump) at post-test was significantly higher in the intervention schools than control schools (150.91 ± 22.17 vs. 144.18 ± 22.87; F= 4.63, p<0.05).

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Reed, Warburton (2008); Naylor, Macdonald (2006); Naylor, Macdonald (2008); Naylor, Macdonald (2006); Ahamed, Macdonald (2007) Canada	Action Schools! BC – school policy to increase physical activity (PA) to 150 minutes per week by adding an additional 15 min/ day of moderate to intense PA in addition to existing physical education classes (2 x 40 min per week) ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. School Action Team – committee of school stakeholders developed and implemented a school action plan to increase physical activity through changes to the school curricula and environment 2. Support team-developed and provided resources, training and on-going consultation to school staff 3. School Facilitators – two elementary school teachers that provided support and advice to the School Action Teams and teachers on a weekly basis *(continued next page)*	***DESIGN:*** Group randomized trial ***DURATION:*** 16 months ***SAMPLE SIZE:*** 515 students from 10 elementary schools in British Columbia (7 intervention [4 Liaison and 3 Champion], 2 usual practice) ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Height and weight (body mass index [BMI]) 2. Biochemical measures (blood pressure, total cholesterol, high and low density lipoproteins, apolipoprotein B, C-reactive protein and fibrinogen) 3. Parent questionnaire (child's health history, demographics) 4. Leger's 20-m incremental shuttle run test (cardiovascular fitness) 5. 7-day Physical Activity Questionnaire for children [PAQ-C] (moderate-to-vigorous physical activity) 6. Pedometers (physical activity) 7. Canadian Achievement Test (CAT-3) – (student academic performance) 8. Tanner staging (self-assessed physical maturity) ***DATA COLLECTION:*** Baseline measurements were taken February-March 2003 and at follow-up April-June 2004. Children completed the shuttle run test with a member of the measurement team, to ensure correct pacing. The children ran 20-m laps at 8.5 kmh-1, then increased speed by 0.5 kmh-1 each minute. Children continued running until they could no longer maintain the preset and standardized pace. The PAQ-C questionnaire was administered to students 3 times, to account for seasonal variation. The 3 scores were averaged. Children wore pedometers 4 different times for 4 consecutive days. CAT-3 tests were administered by classroom teachers to grades 4 and 5 students in the intervention and control schools in June 2003 and again in June 2004 (grades 5 and 6). ***LIMITATIONS:*** Potential sampling bias due to voluntary participation by schools, teachers and children; small sample of children were obtained for blood collection; although the clustered design was controlled for with statistical analyses the study was unable to power for this a priori	9-12 year olds 46% East and South East Asian, 24% North Americans of European descent, 10% South Asian, 13% mixed and 8% other (evaluation sample). This is representative of the greater Vancouver area. ***ELIGIBILITY:*** Parental consent was required to participate. Schools were excluded if they were already undertaking a PA initiative, or experienced high student mobility (50% of the student population per year). ***EXPOSURE/ PARTICIPATION:*** All grades 4 and 5 children enrolled in the intervention schools were exposed to the intervention activities (N=1084).	***LEAD AGENCY:*** Researchers at the University of British Columbia and the schools ***THEORY/ FRAMEWORK:*** The socio-ecological model was used, along with the concept of an "active school" framework that emphasized an integrated whole-school approach rather than traditional classroom-based health education. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Three committees were formed to develop and guide the implementation of the intervention, the provincial advisory committee, AS! BC support team, and school advisory committee. ***IMPLEMENTATION:*** The research team developed the intervention and the schools implemented the activities. The school support team and school facilitators provided two 1-day trainings for all intervention classroom teachers. *(continued next page)*	***RESOURCES:*** 1. School staff support 2. School champion 3. Physical activity equipment for the classroom action bins 4. Teacher planning guide 5. Resource directory 6. Bike racks 7. Fruits 8. Material for teacher trainings ***FUNDING:*** Ministry of Health and 2010 Legacies Now, BC Ministry of Education, BC Ministry of Tourism Sports and the Arts, and the Provincial Health Services Authority ***STRATEGIES:*** The premier of British Columbia and the ministers of education, health, and finance announced a $14.5 million contribution, over 5 years, for the expansion of Action Schools! BC. An additional $500,000 was provided by the Ministry of Education for teacher training and to support school districts that enrolled in Action Schools! BC.	***OVERWEIGHT/OBESITY:*** 1. There were no significant differences between groups for change in BMI or in any of the blood variables. ***PHYSICAL ACTIVITY:*** 2. (n=378) Boys in the liaison intervention schools took 1175 more steps per day, on average, than boys in the usual practice group (95% CI: 97 to 2253, p<0.03). 3. (n=378) Boys in the champion intervention schools tended to have a higher step count than boys in the usual practice group (+804 steps/day; 95% CI: -341, 1949), not significant. 4. There was no significant difference in girls' step counts across groups. 5. The intervention schools had a 20.4% greater increase in fitness (20-m shuttle run) compared with the usual practice schools (p<0.05). 6. Overall, intervention children had a higher average PA score (questionnaire) than usual practice children (2.61±0.42 versus 2.55±0.37), not significant. ***ENVIRONMENT CHANGE:*** 7. Teachers in the intervention schools delivered approximately 60 more minutes of physical activity per week than teachers in the usual practice schools (+58.9 min/week, 95% CI: 25.4, 92.4) ***OTHER:*** 8. Systolic blood pressure in the intervention group decreased significantly (from 105 to 102) compared with an increase in the usual practice group (from 104 to 108), p<0.05. There was no difference for change in diastolic blood pressure. 9. (n=288) There was no difference in academic performance scores between children attending intervention schools and usual practice schools at follow-up (-15.3; 95% CI: -41.8, 11.2).

(Continued from previous study)						
	4. Classroom Action Bin – storage bin provided to classroom teachers filled with physical activity equipment			The Liaison schools were provided external facilitation 2-4 hrs per week. Champion schools had less access to external facilitation (1 hr per week); however a facilitator (school champion) was designated from within the school. Each intervention school differed only in the amount of external facilitation provided. Teachers were given a planning guide, a resource directory of available physical activity resources in the school and community and a classroom action bin filled with physical activity equipment. Classroom teachers were responsible for delivering 15 min of moderate to intense PA daily by providing opportunities for students to 'snack on physical activities' such as skipping, dancing, and resistance exercises throughout the school day. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** 1. Weekly activity logs (type, frequency and duration of PA implemented in the classroom). The researchers compared the weekly activity logs to the Action Plans submitted by the schools to assess implementation fidelity. 2. Semi-structured telephone interviews with administrators (facilitators and barriers to implementation) 3. Six-item teacher questionnaire distributed after each training (satisfaction with training content, usefulness of the training, confidence to implement what they learned) 4. Monthly semi-structured interviews with school facilitators (lessons learned)		

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Van Beurden, Barnett (2003) Australia	School policy to increase student physical activity (PA) and fundamental movement skills (FMS) during school hours ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Project teams established by the schools to select and customize policy and environmental strategies for their school 2. "Buddy program" - preservice teachers (3rd year education students) matched with generalist teachers to provide strategies, resources, and knowledge in increasing PA and FMS during physical education lessons 3. Professional development workshops for teachers 4. Project web site 5. Funding for PA equipment	***DESIGN:*** Group randomized trial ***DURATION:*** 1 year ***SAMPLE SIZE:*** 1045 students grades 3-4 from 18 schools (9 intervention, 9 control) ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Fundamental Movement Skills (FMS) tests (static balance, sprint run, vertical jump, kick, hop, catch, overhand throw, and side gallop) 2. System for Observing Fitness Instruction Time [SOFIT] (physical activity) ***DATA COLLECTION:*** FMS data were collected for the entire sample. Groups of children were taken to each testing station; a trained tester demonstrated an FMS and each child had to repeat the skill five times. The child's performance on each FMS was rated on at least four of the five trials and a score of present or absent was given. Physical activity was examined using SOFIT, by randomly selecting four children prior to the start of each physical education lesson. Each child was observed separately for 12 periods of 20 seconds each and the physical activity level (1-5) and lesson context (management/ instruction, skill practice, game, fitness or other) were recorded at the moment the time period ended. ***LIMITATIONS:*** Schools required prior notice before lesson observation, allowing the school to change the typical lesson structure; research team could not assess which activities (e.g., soccer, dance) were associated with higher levels of physical activity, as the research team only observed broad physical activity categories (e.g., fitness, skill, game)	7-10 year olds ***ELIGIBILITY:*** Not reported ***EXPOSURE/ PARTICIPATION:*** Not reported	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Not reported ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Upon recruitment, schools established a project team to coordinate the project locally and to provide a "whole school approach." ***IMPLEMENTATION:*** The research team designed the intervention and developed the project web site. The research team also provided a 5-day training to pre-service and generalist teachers. The schools established project teams and selected policy and environmental change strategies for their school. The school teachers were responsible for increasing physical activity during physical education lessons. ***FORMATIVE EVALUATION:*** Not reported ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Money provided to schools to buy equipment ($AU 375) 2. Funds and personnel for trainings provided to teachers and "buddies" 3. Funds to create web site ***FUNDING:*** The New South Wales Health Department ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. At follow up, improvements in every Fundamental Movement Skill (FMS) were observed for both boys and girls in the intervention group compared to controls. Overall, there was a 16.8% improvement for all skills combined ($z= 9.64$, $p<0.0001$). The smallest change was a 7% improvement in throwing among girls and the largest was a 26% improvement in sprint run for boys. 2. Follow up results of PA in physical education lessons revealed a 4.5% non- significant increase in % moderate-to-vigorous physical activity (MVPA) in intervention schools, compared to control schools ($z= 1.33$, $p=0.08$), however a specific analysis of vigorous physical activity showed a significant 3.3% increase in vigorous physical activity compared to controls ($z= 2.43$, $p=0.008$) 3. In intervention schools during "fitness" lesson time there was a significant increase in % MVPA ($\beta= 0.608$, $z= 3.07$, $p<0.001$), during "skill" there was no change in % MVPA and during "game" there was a decrease in %MVPA ($\beta= -0.290$, $z= 1.66$, $p=0.045$). ***ENVIRONMENT CHANGE:*** 4. Logistic regression found that intervention schools spent more time on skill training ($\beta=0.4143$, $z= 6.55$, $p<0.001$), less time on fitness ($\beta= -0.404$, $z=5.32$, $p<0.001$), and games ($\beta= -0.120$, $z= 2.14$, $p=0.016$) and no change in time spent on management/ instruction ($\beta= -0.002$, $z= 0.038$, p=ns), compared to control schools.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Taylor, McAuley (2006); Taylor, McAuley (2007); Taylor, McAuley (2008); Williden, Taylor (2006) New Zealand	APPLE project - School policy providing sport/ play equipment during school breaks (year 2) and community activity coordinators (0.5 FTE/ school) to encourage children's daily physical activity by increasing the variety/ opportunities for physical activity during the school day. ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* 1. Provision of cooled water filters at school *Complex:* 1. Classroom resources for teachers to facilitate short bursts of activity in class called 'snacktivity.' 2. "Science lessons to promote fruit and vegetable consumption and highlight adverse effects of sugary drinks (year 2) 3. Healthy eating resources available to the intervention community (year 2) 4. Development of 'GoTri' card game	***DESIGN:*** Non-randomized trial ***DURATION:*** 2 years ***SAMPLE SIZE:*** 730 children (384 exposed, 346 unexposed) from 7 schools (4 intervention, 3 control) in 2 communities ***PRIMARY OUTCOME:*** Overweight/obesity ***MEASURES:*** 1. Anthropometric measures (height and weight [body mass index], waist circumference) 2. Pulse rate and blood pressure 3. 3-day validated short food questionnaire (beverages, fruit and vegetable intake) 4. 7-day recall questionnaire (physical activity, television viewing) 5. Accelerometers (physical activity) ***DATA COLLECTION:*** All anthropometric measurements were made in duplicate during school hours at baseline, 1 yr, and 2 yr. Body mass index (BMI) and BMI-z scores were calculated. The 3 day food questionnaire was completed at 1 yr and 2 yr. Accelerometers were worn by each child for 1-2 days at baseline and 2-5 days after one year. Students also completed a 7-day recall questionnaire to assess physical activity and television viewing. ***LIMITATIONS:*** Limited accelerometry data due to funding constraints may have been insufficient to represent habitual activity; insufficient power to identify whether individual components were likely to explain the changes in the primary outcome measures; poor response rates for food questionnaire (62-66%)	7-10 year olds 81.8% Caucasian, 17.3% Maori, 0.9% Pacific Islander Students were predominately white from middle-class backgrounds (evaluation sample). ***ELIGIBILITY:*** Authors chose 2 semi-rural geographically separate areas to reduce contamination. All students in the schools were invited to participate. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** The research team ***THEORY/ FRAMEWORK:*** Analysis Grid for Environments Linked to Obesity (ANGELO) framework was used to determine the barriers and promoters of healthy eating and physical activity in children aged 5-12 years. ***EVIDENCE-BASED:*** Not reported ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Not reported ***IMPLEMENTATION:*** The intervention was designed by the research team and implementation was carried out by Community Activity Coordinators and teachers. ***FORMATIVE EVALUATION:*** Used ANGELO framework to identify/prioritize factors in the environment to target, by conducting (1) informal interviews with community stakeholders; (2) telephone interviews with parents of intervention children; and (3) evaluation of the nutrition and physical environment of each intervention school. ***PROCESS EVALUATION:*** Not reported	***RESOURCES:*** 1. Community activity coordinators 2. $500-$1000 for school equipment 3. GoTri card game 4. Resources for "snacktivities" 5. Healthy eating resources 6. Water filters ***FUNDING:*** Health Research Council of New Zealand, Nat'l Heart Foundation, Community Trust of Otago, Univ. of Otago, Otago Diabetes Research Trust ***STRATEGIES:*** One school found funding to retain their coordinator (at reduced level of 0.3 FTE). Several activities introduced or enhanced by the coordinators continued, including triathlons, cross-country training, line dancing, and active transport to school. One school reintroduced tackle rugby for boys and supervised swimming during lunch breaks to increase activity. A few schools enacted new school policies targeting healthy eating (reductions in access or types of foods available for purchase were the most common changes).	***OVERWEIGHT/OBESITY:*** 1. Adjusting for baseline, mean BMI z-score was significantly lower in intervention children than in control children by 0.09 (95% CI: 0.01, 0.18, p<0.05) after 1 yr and 0.26 (95% CI: 0.21, 0.32, p<0.05) at 2 yr. 2. Waist circumference was significantly lower at 2 yr in intervention children (-1.0 cm, 95% CI: -2.0, 0.0, p<0.05) 3. Mean BMI z-score (adjusted for baseline z score, clustering, age, sex, activity rating significantly lower at both 1 yr (-0.08; 95% CI:-0.12,-0.04) and 2 yr (-0.29; 95% CI:-0.38,-0.21) in intervention than in control normal-weight children (p-value not reported). No intervention effect was observed in overweight children at either time point. ***PHYSICAL ACTIVITY:*** *(no p-values provided)* 4. Year 1 accelerometer counts per minute (adjusted for baseline activity, age, sex) were 28% (95% CI: 0.11-0.47) higher in intervention compared with control children. 5. Year 1 average accelerometer counts were higher in intervention children both during school hours (ratio of geometric means of intervention to control= 1.38, 95% CI: 1.18, 1.62) and home time activity (ratio= 1.20, 95%CI: 1.04, 1.37). Differences were no longer significant after 2 years. 6. After year 1, moderate/ vigorous activity was 10% (95% CI: 0.02, 0.18) or 26 minutes more in intervention compared with control children, while sedentary activity decreased in intervention children compared to controls (ratio 0.91, 95% CI: 0.85, 0.97). ***NUTRITION:*** 7. Intervention children consumed significantly fewer carbonated beverages (difference= 0.67 servings, 95% CI: 0.46, 0.98; p=0.04) and fruit juice or drinks (0.70 servings, 95% CI: 0.51, 0.97; p=0.03) compared to controls. 8. Intervention children consumed 0.8 more servings of fruit during 3 days compared to controls (p=0.01); no effect was observed for vegetable intake. ***MAINTENANCE OF OUTCOMES:*** *(n=554) (no-p-values shown)* 9. Mean adjusted BMI z-score was significantly lower in intervention than in control children by 0.30 units (95% CI: 0.24, 0.36) at the end of the intervention and by 0.21 units (95% CI: 0.14, 0.29) at 2 year follow-up. 10. The adjusted likelihood of being overweight was significantly less in intervention children at the end of the 2 year intervention (RR: 0.81; 95% CI: 0.69, 0.94), but was no longer significant at 2 year follow-up.

Source	Intervention Components	Study Design and Execution	Reach	Adoption, Implementation and Process Evaluation	Enforcement/ Sustainability	Impacts and Outcomes
Cass, Price (2003) Australia	School policy to support environment changes following the Health Promoting Schools Framework including: 1. Informal physical activity (PA) breaks 2. Facility improvement 3. New physical activity equipment 4. Free after-school activities for students ***OTHER INTERVENTION COMPONENTS:*** *Multi-component:* Not reported *Complex:* 1. Organizational component (e.g., student committees, health promotion officers) 2. Curriculum component (e.g., professional workshops, physical activity curriculum resources) 3. Social environment component (e.g., peer physical activity leaders training, sports/ activity classes, whole school physical activity focus days) 4. School/Home-Community links (e.g., parent newsletters, health education classes for parents, formal funding agreement between school and area health service)	***DESIGN:*** Non-randomized trial ***DURATION:*** 3 years ***SAMPLE SIZE:*** 238 students (111 intervention, 127 control) from one girls' government high school in Sydney, Australia ***PRIMARY OUTCOME:*** Physical activity (PA) ***MEASURES:*** 1. Surveys based on the 1997 New South Wales Schools Fitness and Physical Activity Survey (students' participation and attitudes toward physical activity, perceptions of barriers and enablers) 2. School employee questionnaire (perceived changes to school environment) 3. School staff telephone interviews (perceptions of the project's success) 4. Student focus groups (perceived changes at school) ***DATA COLLECTION:*** At baseline in Oct. 1998, the student survey was administered to 111 Year 7 students (intervention group) and 127 Year 10 students (historical control group). Administration of the survey was repeated in Oct. 2001 with 94 Year 10 students (i.e., intervention group, formerly Year 7). The school employee questionnaire was administered to 10 staff members at baseline and 11 at follow-up. Telephone interviews were conducted by an independent interviewer with 7 key staff members. At the end of the project, health promotion staff conducted two focus groups including Year 10 students (10 in each) to investigate perceived changes at school. ***LIMITATIONS:*** Use of a historical rather than concurrent control (due to available resources) made it impossible to determine whether both groups had similar levels of activity when they started high school. It also did not allow the monitoring of external secular influences that could have influenced the girls' behavior	14-18 year olds 86% of girls in the school are from non-English speaking, mainly Middle Eastern and Asian backgrounds ***ELIGIBILITY:*** All girls in the school were eligible to participate. ***EXPOSURE/ PARTICIPATION:*** All children in the intervention schools were exposed to the intervention.	***LEAD AGENCY:*** Health Promotion Service staff ***THEORY/ FRAMEWORK:*** The Health Promoting Schools framework ***EVIDENCE-BASED:*** The intervention is based on previous studies that suggest comprehensive and integrated school-based interventions are more likely to improve student health. ***REPLICATION/ ADAPTATION:*** Not reported ***ADOPTION:*** Advisory, planning, and student committees developed and implemented strategies from the Health Promoting Schools framework." ***IMPLEMENTATION:*** The school committees developed and implemented strategies reflecting the Health Promoting Schools framework. ***FORMATIVE EVALUATION:*** Strategy development was informed by consultations with more than 40 parents to gain insight into parent/ school communication, and seven focus groups with students to investigate attitudes to and perceptions of barriers and enablers to physical activity at their school. ***PROCESS EVALUATION:*** The project officer monitored intervention implementation by collecting meeting minutes, and recording processes and staff comments in a diary.	***RESOURCES:*** 1. Schools and co-operating faculty to conduct the intervention 2. Trained health promotion staff 3. Materials and contractors for facility 4. New physical activity equipment 5. Materials for trainings and professional workshops 6. Physical activity curriculum resources 7. Parent newsletters 8. Materials for parent health education classes ***FUNDING:*** The Health Promotion Service ***STRATEGIES:*** Not reported	***PHYSICAL ACTIVITY:*** 1. The proportion of students participating in vigorous activity was the same in the intervention and control group (p=ns). 2. Girls in the intervention group participated in more activities than girls in the control group (63% more in summer and 43% more in winter, p-value not shown). 3. Students from the intervention group reported spending less time on sedentary recreation than students from the control group (3.2 hours/day compared to 3.9 hours/day; t=2.48, p<0.05). 4. At post-intervention, intervention students spent more time in moderate and vigorous activities and less time in sedentary activities than the control students (summer activities χ^2= 14.8, 2df, p<0.01; winter activities χ^2= 6.24, 2df, p<0.05). ***ENVIRONMENT CHANGE:*** 5. Teachers reported an increase in availability of organized lunchtime physical activities for students (2-3 times a week) from baseline to follow-up (67% compared to 20%, χ^2= 4.79, p<0.05). 6. Teachers reported increased utilization of the gymnasium, fitness lab, playing fields and indoor and outdoor playing spaces.

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