School Programs

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School-based programs that are carefully designed and implemented can play an important role in promoting lifelong physical activity and healthy eating among young people (1). The rationale for school health education programs is based largely on their potential ability to reduce preventable morbidity and mortality (2).

The advantage of school-based interventions is the extensive reach to a diverse group of children 5 to 17 years of age, cutting across socioeconomic, racial, and cultural lines; schools also provide opportunities for repeated exposure to intervention activities and access to the families of the participating children, spreading the benefits to other families and creating a positive environment at home.

A literature search suggests that school health education programs seem to have a long tradition in the United States (3,4), but only a few projects from Europe (5), Australia, and Asia are documented and published.

School-based health programs include short- and long-term trials as well as sustained programs. The school health education programs cited are diverse and not all directed at obese and overweight children. Many include the entire cohort of children, in order to promote physical activity, healthy eating, and healthy lifestyles, including prevention of smoking (5).

The purpose of this chapter is to provide an overview of school-based programs that primarily target obesity and overweight, that address obesity and overweight as risk factors for the development of cardiovascular diseases, and that use weight or body fat status as a variable in physical activity interventions among schoolchildren. Published reports of school-based health education programs and several programs in progress are included. School-based intervention programs are categorized by age group of intervention (Table 1).

PRIMARY OR ELEMENTARY SCHOOL PROGRAMS

The Child and Adolescent Trial for Cardiovascular Health (CATCH)

CATCH is the largest and most ambitious randomized controlled school health education intervention conducted in the United States. The goal of this 3-year randomized intervention trial, funded by the National Heart, Lung, and Blood Institute, was
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<tr>
<td>The Child and Adolescent Trial for</td>
<td>National Heart Lung and Blood</td>
<td>Impact of health education on cardiovascular risk</td>
<td>5,000 ethnically diverse students from 96 schools</td>
<td>• Manual for food service</td>
<td>3-year randomized intervention</td>
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<tr>
<td>Cardiovascular Health (CATCH)</td>
<td>Institute, USA</td>
<td>factors and risk-related behaviors</td>
<td>in four states</td>
<td>• Guidebook for teachers to increase moderate-to-vigorous physical activity</td>
<td>trial</td>
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<tr>
<td>Sports, Play, and Active Recreation</td>
<td>National Heart Lung and Blood</td>
<td>Create, implement, and evaluate a curriculum and</td>
<td>Over 350 schools in 12 states</td>
<td>• Activity box with 350 easy-to-teach activities</td>
<td>2 years physical education and</td>
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<td>for Kids (SPARK)</td>
<td>Institute, USA</td>
<td>staff development program</td>
<td></td>
<td>• Three exercise videotapes</td>
<td>one semester for self-management</td>
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<tr>
<td>Know Your Body (KYB)</td>
<td>Los Angeles, USA</td>
<td>Improve knowledge and belief about health, increase</td>
<td>1,400 students in over 18 schools</td>
<td>• Classroom curriculum modules for third, fourth, and fifth graders</td>
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<td></td>
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<td>physical activity</td>
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<td>• Family involvement component</td>
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<td>• PE curriculum for K1 through 2 and grades 3 to 6 with a minimum of 30</td>
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<td>minutes of PE, 3 days a week throughout the entire school year</td>
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<td>• Self-management program to be active outside of schools</td>
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<td></td>
<td></td>
<td></td>
<td>• 30–50 hours of health education each year</td>
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<tr>
<td>Program</td>
<td>Country</td>
<td>Description</td>
<td>Participants/Participants</td>
<td>Duration</td>
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<tr>
<td>Go for Health (GH)</td>
<td>USA</td>
<td>Foster healthful diet and exercise</td>
<td>409 students in four schools</td>
<td>2 years</td>
<td></td>
</tr>
<tr>
<td>Nebraska School Study</td>
<td>Rural Nebraska, USA</td>
<td>Reduce obesity and improve fitness by promoting physical activity</td>
<td>Grades 3 to 5 in two schools</td>
<td>2 year study</td>
<td></td>
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<tr>
<td>Cardiovascular Health in Children Study (CHIC)</td>
<td>North Carolina, USA</td>
<td>Effects of classroom-based and risk-based interventions to reduce multiple VCD risk factors</td>
<td>2,109 schoolchildren in 18 randomly selected schools</td>
<td>8-week intervention</td>
<td></td>
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<tr>
<td>Eat Well and Keep Moving (EWKM)</td>
<td>USA</td>
<td>Impact of a school-based interdisciplinary health behavior education on diet and physical activity</td>
<td>Grades 4 and 5</td>
<td>2 years</td>
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</tr>
<tr>
<td>Take 10™</td>
<td>ILSI's Center for Health Promotion, Atlanta, USA</td>
<td>Opportunities for physical activity during the school day</td>
<td>Over 200 schools in Georgia from kindergarten through 5th grade</td>
<td>Ongoing since 1999</td>
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<tr>
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</tr>
</tbody>
</table>
| Trim and Fit (TAF) Program             | Ministries of Health and Education,  | Promote healthy lifestyle and enhance quality of life, starting with the  | All school children in primary and secondary schools and | • Physical education  
|                                        | Singapore                            | nation's youth                                                            | junior college                                            | • Extracurricular activities  
|                                        |                                      |                                                                           | Remedial program for over- and underweight children     | • Improved the school environment  
|                                        |                                      |                                                                           | All TAF club students in elementary schools             | • Healthier tuckshops  
|                                        |                                      |                                                                           |                                                          | • TAF club for overweight children  
|                                        |                                      |                                                                           |                                                          | • Obesity clinic for severely over- and underweight children              | Ongoing since 1992|
| Power Kids Eat Smart™                  | ILSI Southeast Asia                  | Resource tool for TAF club teachers to educate and empower TAF club      | All TAF club students in elementary schools             | • Nutrition education module  
| Power kids on the go™                  | Asia                                 | club teachers to educate and empower TAF club students                    |                                                          | • Physical education module  
|                                        | Ministries of Health and Education,  |                                                                           |                                                          | • Self-management module  
|                                        | School of Physical Education, Singapore |                                                                           |                                                          |                                                                             | Launched 2001    |
| Australia School Project               | New South Wales, Australia           | Increase the proportion of students who do more than 1 hour of exercise   | Over 3,200 students in one high school and two primary  | • CVD screening  
|                                        |                                      | outside school                                                             | schools                                                  | • Curricula                                                                | 2 years          |
| **Secondary/high school program**      | USA                                  | Create, implement, and test a school-based multiple-risk factor reduction | 1,447 students from four senior high schools          | • Special 20-session CVD risk reduction intervention | 2 months         |
| The Stanford Adolescent Heart Health    |                                      | program                                                                    |                                                          |                                                                             |                  |
| Program                               | USA                                  |                                                                           |                                                          |                                                                             |                  |

Abbreviations: CVD, cardiovascular disease; PE, physical education.
to demonstrate the effectiveness of health education in producing modest changes in cardiovascular risk factors and risk-related behaviors in schoolchildren. CATCH involved more than 5,000 ethnically diverse students from 96 schools (56 intervention and 40 control) in four states in the United States (6).

The curricula that were developed for CATCH provide skills training in healthier eating, physical activity, and nonsmoking behaviors. The CATCH program includes a manual for food service directors and cooks on ways to lower total fat (30% of energy), saturated fat (10% of energy), and sodium (600 to 1000 mg per serving) in the school meals. It includes methods for planning menus, purchasing products, and promoting school lunch. The CATCH physical education (PE) module consists of a guidebook for elementary school teachers to help them increase moderate to vigorous physical activity of their students by 40% (2). The CATCH PE module also includes an activity box with 350 easy-to-teach activities and three videotapes that include warm-up, aerobics, strength-building activities, and cool-down activities. In addition, CATCH consists of classroom curriculum modules for third, fourth, and fifth graders. These sessions include messages on healthy eating, physical activity, and smoking prevention. The family involvement component consists of activity packets and family “fun nights” (7).

The result of extensive process evaluation confirmed that the CATCH curricula were delivered with adequate fidelity, with more than 90% of the curriculum completed and more than 88% of the lessons completed without modification (8). The mean percentage of energy from fat and saturated fat in the food served at school lunches fell by 6.8% and 2.8%, respectively, but sodium goals were not achieved (9). CATCH schools showed a significant increase in moderate-to-vigorous physical activity during PE class, from 37% to 52% (10). Total cholesterol, blood pressure, and body mass index (BMI) did not show significant change (11).

Sports, Play, and Active Recreation for Kids (SPARK)

SPARK is a physical education program for elementary schoolchildren. Also funded by a research grant from the National Heart, Lung, and Blood Institute, the aim of this project was to create and evaluate a curriculum and staff development program that can be implemented in real-world settings by both classroom teachers and physical education specialists. To date, more than 350 schools in 12 states in the United States have adopted SPARK (12).

The SPARK curriculum offers packages in two levels—for K2 and grades 3 to 6. SPARK recommends a minimum of 30 minutes of PE 3 days a week throughout the entire school year. One unique feature of SPARK is the self-management program that teaches children skills and techniques necessary to be active outside of schools, on the weekends, during vacations, and ultimately for the rest of their lives (12). More than 24 papers have been published on a variety of topics about SPARK, ranging from methodology to impact. One study of 955 grade 4 and 5 students in seven schools in San Diego that took part in the SPARK curriculum showed that sessions led by physical education specialists and trained teachers provided more
moderate-to-vigorous physical activity during PE than sessions led by regular teachers. No change was noted in out-of-school physical activity or self-management in any group (13,14). Researchers found that incentives provided as self-reward in this program had no effect on physical activity outside the school but succeeded in increasing moderate-to-vigorous physical activity in PE classes (13).

Know Your Body (KYB)

The KYB program, a multiple-risk-factor school health education curriculum, involved 1,400 students in more than 18 schools in Los Angeles. This program is targeted at elementary school students and aims to improve knowledge and belief about health and to increase physical activity (15).

The KYB program delivers 30 to 50 hours of health education each year for 3 years. Three major evaluations of the program carried out at the end of 3 years showed a significant difference in total cholesterol levels in two trials, and in systolic and diastolic blood pressure in all three trials, but no difference in BMI or skinfold thickness measurements (2).

Go for Health

The Go for Health program from the United States includes classroom health education and environmental changes in school lunch and physical education to foster a healthy diet and exercise among elementary schoolchildren.

In-depth study of 409 students in four schools who took part in the program showed increased knowledge and a better attitude, with an increase in moderate-to-vigorous physical activity in PE classes from less than 10% at baseline to about 40% of class time after intervention. No change was observed in out-of-school physical activity (16). In the two intervention schools, school lunches showed reductions from baseline in total fat (by 15.5% and 10.4%), saturated fat (by 31.7% to 18.8%), and sodium (by 40.2% and 53.6%) (17).

Nebraska School Study

Cohorts from grades 3 to 5 in two schools in rural Nebraska in the United States participated in this 2-year study of enhanced physical activity, grade-specific nutrition education, and a school lunch that was lower in fat and sodium. The aim of this school-based intervention was to reduce obesity and improve fitness by promoting physical activity (6).

By year 2, the investigators found that the intervention group was consuming significantly less energy (9%), fat (25%), and sodium (21%), and more fiber (17%) during lunch. However, 24-hour recalls showed differences for sodium alone (18). The researchers also found that compensation for lower-fat meals by the intervention schoolchildren was not evident, as the percentage of energy from fat in the diet as a whole was only 1.3% greater than the percentage in the lunch that was served (19).
Physical activity was 6% greater in the intervention group in the classroom and 16% lower outside of school when compared with controls. Body weight and body fat were also not different between normal and obese children in the two groups. However, high-density lipoprotein (HDL) cholesterol was significantly greater, and the total cholesterol-to-HDL ratio was significantly lower in the intervention group (18).

**Cardiovascular Health in Children Study (CHIC)**

The Cardiovascular Health in Children (CHIC) study sought to determine the population effects of both classroom-based and risk-based interventions designed to reduce multiple cardiovascular disease risk factors in children. The study involved 2,109 elementary school children in 18 randomly selected schools across North Carolina. The children were randomized by school to a classroom-based intervention for all third and fourth graders, a risk-based intervention group (which included children with one or more cardiovascular risk factors), or a control group. Regular teachers conducted an 8-week intervention that included knowledge, attitudes, and physical activity components (20).

Results showed that physical activity in the risk-based group and posttest knowledge in the classroom group were higher than in the control. Cholesterol, the primary outcome measure, fell in the classroom group by 11.7 mg/dl (0.30 mmol/l), in the risk-based group by 10.1 mg/dl (0.26 mmol/l), and in the control group by 2.3 mg/dl (0.06 mmol/l). Both intervention groups had greater health knowledge and a small reduction in body fat. Skinfold thickness decreased by 2.9% in the classroom group and by 3.2% in the risk-based group compared with the control (20).

**Eat Well and Keep Moving (EWKM)**

The Eat Well and Keep Moving (EWKM) project, also from the United States, aimed to evaluate the impact of a school-based interdisciplinary health behavior education on diet and physical activity among children in grades 4 and 5. Classroom teachers taught the EWKM program over 2 years in mathematics, science, language, arts, and social studies classes. Materials provided links to school food services and families. EWKM also provided training and wellness programs for the teachers and staff members. Intervention materials focused on decreasing consumption of foods high in total fat and saturated fat and increasing fruit and vegetable intake, as well as on reducing television viewing and increasing physical activity (21).

A quasi-experimental field trial with six intervention schools and eight matched control schools was conducted. The study showed that percentages of total energy from fat and saturated fat were reduced among students in intervention compared with control schools. There was also an increase in fruit and vegetable intake (0.36 serving per 1,000 kcal) as well as vitamin C and fiber intakes. Television viewing was marginally reduced by 0.55 h/day (21).
Take 10

Take 10 is a physical activity program specifically designed by the International Life Sciences Institute’s (ILSI) Center for Health Promotion in Atlanta. It is designed to give children opportunities for physical activity during the school day. This program promotes 10-minute periods of moderate to vigorous physical activity in the classroom. Created by teachers, it includes graded packages that cover the elementary school, from kindergarten through fifth grade. The materials include 10 different grade-specific activity cards, one cool-down lesson, a teacher’s manual, and a tracking poster. The activities suggested have been validated and proven effective for use in a classroom setting, and are linked to the core curriculum objectives (22). Approximately 2,600 students and 108 teachers from four Atlanta elementary schools participated in a 10-week pilot intervention and assessment in October 1999. Currently, implemented in over 200 schools in Georgia, various aspects of the Take 10 program are being evaluated.

Nutrifit

The Nutrifit program consists of nutrition education and physical training modules. The program was tested among 514 schoolchildren 8 to 9 years of age who were enrolled in two provincial government schools and two private schools in the Bangkok metropolitan area.

Health-related fitness tests using a Fitnessgram were administered in all four schools, followed by the Nutrifit intervention program. The intervention included 10 nutrition and physical education training classes held during regular PE class. During the 7-month program period, the nutritional status of children, as assessed by weight-for-height, did not show a significant change. However, there was definite improvement in health-related fitness tests in both intervention and control schools.

The investigators found that the fitness test scores alone inspired the school authorities to create opportunities for those who failed to take up extra training, even in the control groups. Plotting their own weight and height seemed to increase interest among the children to attain ideal weight-for-height. Use of “star labels” and “recognition” as incentives seemed to generate peer pressure to improve fitness in Thai children (23).

PRIMARY OR ELEMENTARY AND SECONDARY OR HIGH SCHOOL PROGRAMS

Trim and Fit (TAF) Program

The Trim and Fit (TAF) program in schools is part of the national integrated strategy to combat childhood obesity in Singapore. The TAF program was launched in 1992 as a motivational strategy to promote healthy lifestyle and enhance quality of life, starting with the nation’s youth. The TAF program involves all schools—primary,
secondary, and preuniversity. It encourages schools to develop strategies to reduce obesity and improve physical fitness of the entire student population.

Although national guidelines provide a framework for the school, each school is given the flexibility to develop strategies and plans for physical education and extracurricular activities and for improving the school environment. The program also creates a healthier tuckshop, with guidelines and workshop for vendors, green food labeling, water coolers, guidelines for food service, and monitoring of food sold.

In the TAF remediation program, children who are overweight, underweight, or unfit are managed at school level through a fitness group called the TAF Club, whereas severely overweight and underweight children are managed at a specialized clinic at the School Health Services by a team of health professionals. TAF Club includes a 30-week annual structured program of activities with proper record maintenance. The activities are designed to be fun and challenging and include brisk walks, aerobics, modified games, and even hiking. Children are also guided to make healthier food choices. Monthly monitoring of weight and height supports the TAF Club. Managed through a collaborative effort of several government departments such as the ministries for health and education in Singapore, the TAF program educates and trains implementers systematically.

National tracking of the program has shown that the overweight percentage has fallen from 14.0% in 1992 to 9.9% in 1998. Fitness of children, as assessed by the National Physical Fitness Awards test, showed improvement from 60% in 1992 to more than 70% in 1998. The program aims to improve the management of individuals whose weight is more than 160% of national standards, to introduce the elements of the TAF program to preschool and kindergarten levels, and to devise innovative ways to improve weight management that would appeal to children (24).

Power Kids Eat Smart and Power Kids on the Go

Responding to the government’s call for innovative ways to educate and empower TAF Club students, ILSI Southeast Asia—along with the Ministries of Health and Education and the School of Physical Education in Singapore—developed a resource tool for TAF Club teachers in primary schools.

The aim was to conduct fun activity classes for children to promote overall health and fitness and create lifelong habits that will form the basis of healthy adult behaviors. The Power Kids resource tool consists of a nutrition education module called Power Kids Eat Smart and a physical education package called Power Kids on the Go. Power Kids Eat Smart consists of nutrition messages delivered through stories and reinforced through activity sheets and goal-setting exercises. Power Kids on the Go allows the teachers to develop varied, safe, and effective physical activity sessions that promote moderate to vigorous physical activity. Parental involvement and self-management feature strongly in the program.

Piloted in three schools in the year 2000, the program is now available to all 210 primary schools in Singapore. Process and impact evaluations are in progress (25).
Australia School Project

The Australia School Project covered more than 3,200 students in one high school and two primary schools in New South Wales. The sample included both girls and boys from the lower socioeconomic class. The experimental program aimed to increase the proportion of students who do more than 1 hour of exercise outside school. At the end of the project, it was reported that this proportion increased by 17.5% in the intervention group and by 6.5% in the control group (6,26).

Other Programs

Other school-based intervention programs in progress (all in the United States) include Pathways, Stanford Obesity Prevention for Preadolescents, Planet Health, Middle School Physical Activity and Nutrition, Lifestyle Education for Activity Project, and Adolescent Computer-Based CVD Curriculum and Advocacy (6).

SECONDARY OR HIGH SCHOOL PROGRAMS

The Stanford Adolescent Heart Health Program

The Stanford Adolescent Heart Health program was designed to create, implement, and test a school-based multiple-risk factor reduction program for high school students. All tenth graders from four senior high schools (1,447 students) from two school districts in the United States participated in the study. Within each district, one school was assigned at random to receive a special 20-session cardiovascular disease risk reduction intervention and one school served as the control. At a 2-month follow-up, knowledge gains were significantly greater for students in the treatment group on each of the risk factor domains tested—nutrition, physical activity, and cigarette smoking. A higher proportion of those in the treatment group started to exercise regularly and also reported that they were more likely to choose a heart-healthy snack item. Resting heart rate ($p < 0.0001$), BMI ($p = 0.05$), triceps skinfold thickness ($p = 0.003$), and subscapular skinfold thickness ($p = 0.01$) also showed improvement (27).

SYNTHESIS

The school-based programs in this paper include programs and intervention trials. Although most have been conducted in the United States, examples from Asia and Australia are included. The sample size of these programs ranged from as few as two schools to more than 400 schools. The duration ranged from short trials of 8 weeks to programs sustained for more than 8 years.

Only two programs included reduction in obesity or overweight as the major goal. Other studies addressed changes in weight status and/or body fatness as risk factors for cardiovascular diseases or as a result of physical activity interventions. Study design varied greatly in length and scope. Sampling ranged from random to
nonrandomized assignment of schools to programs. Few programs included follow-up studies beyond the period of intervention.

The largest and the longest school program that addressed fitness of students and obesity was the Trim and Fit program in Singapore. CATCH and SPARK are the two school-based intervention trials with the most papers published in peer-reviewed journals. Each school-based health education program used a different approach to effect change in the food and activity behaviors of children. The design and components of the program were tailored to the environment in which the program was implemented. Newer programs are taking a more holistic approach to addressing health-related behavior change in the individual and address environmental change and involvement of parents to support newly learned behaviors.

The results of school-based interventions are mixed, with some showing no significant change as a result of intervention (Table 2). Success seems to be associated with direction and organizational support from the government related institutes, environmental change, provision of trained physical education teachers, a strong physical education program, and the inclusion of family-based components. Almost all studies that looked at knowledge and attitudes of the intervention group showed improvement. The results on overall increase in physical activity and improved nutrition were mixed: There were more consistent data on improvement in physical activity intensity during PE classes, no improvement in physical activity outside school, and a reduction in the fat and saturated fat content of school meals.

**CHALLENGES**

In the past, the creation, implementation, and evaluation of effective school programs has presented a challenge to public health officials, school authorities, and health educators. Study of successful school health programs has highlighted key strategies essential for success. The Center for Disease Control (CDC) reports (*Guidelines for School Health Programs to Promote Lifelong Healthy Eating* and *Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People*) incorporate several of these effective and promising strategies for schools.

The CDC guidelines address the school policy on nutrition, a sequential and coordinated curriculum, appropriate instruction for students, integration of school food service and nutrition education, staff training, family and community involvement, and program evaluation (28). School-based interventions that have been highlighted include intramural sports, facilities that promote physical activity, psychosocial support for physical activity, food and beverages available in school outside the school meals program, and healthy eating (29).

As weight management in children does not focus on weight loss as much as it does on the prevention of weight gain, school programs need to be sustained for a sufficient length of time. Many health educators involved in school health education programs are now concerned about identifying strategies that ensure that school-based programs are sustainable beyond the intervention period. Renewing programs,
TABLE 2. Selected outcomes of school health education programs

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| The Child and Adolescent Trial for Cardiovascular Health (CATCH) | - Mean percentage of energy from fat and saturated fat of school lunches dropped  
- Sodium goals were not achieved  
- Significant increase in MVPA during PE class  
- Total cholesterol, blood pressure, and BMI did not show significant changes |
| Sports, Play, and Active Recreation for Kids (SPARK) | - Sessions by trained teachers provided more MVPA during PE than those by regular teachers  
- No change was noted in out-of-school physical activity |
| Know Your Body (KYB) | - Increase in knowledge  
- Significant difference in total cholesterol levels  
- Systolic and diastolic blood pressure lowered  
- No difference in body mass index or skinfold measures |
| Go for Health (GH) | - Increased knowledge and a better attitude  
- Increased MVPA in PE classes  
- No change observed in out-of-school physical activity  
- School lunches lower in total fat, saturated fat, and sodium |
| Nebraska School Study | - Less energy, fat, and sodium and more fiber during lunch  
- Physical activity greater in the classroom and lower outside of school  
- Body weight and body fat not different  
- HDL cholesterol significantly greater  
- Total cholesterol to HDL ratio significantly lower |
| Cardiovascular Health in Children Study (CHIC) | - Physical activity and posttest knowledge higher  
- Reduced cholesterol  
- Small reduction in body fat  
- Skinfold decreased |
| Eat Well and Keep Moving (EWKM) | - Percentages of total energy from fat and saturated fat reduced  
- Increase in fruit and vegetable intake  
- Television viewing marginally reduced |
| **Primary/elementary and secondary/high school programs** | |
| Trim and Fit (TAF) Program | - Overweight percent has dropped from 14.0% in 1992 to 9.9% in 1998  
- Fitness improvement from 60% in 1992 to over 70% in 1998 |
| Australia School Project | - Students with more than 1 hour of exercise outside school increased |
| **Secondary/high school programs** | |
| The Stanford Adolescent Heart Health Program | - Knowledge gains significantly greater  
- Regular exercise increased  
- More likely to choose a heart healthy snack item  
- Resting heart rate, BMI, triceps skinfold, and subscapular skinfold thickness improved |

Abbreviations: BMI, body mass index; HDL, high-density lipoprotein; MVPA, moderate to vigorous physical activity; PE, physical education.
sustaining interest of implementers and children, involving the community, and ensuring cost-efficacy are new challenges being discussed.

CONCLUSIONS

The recent epidemic of obesity among children presents formidable challenges for those seeking to develop, implement, and evaluate effective prevention and treatment programs. Major impediments to creating effective and sustainable intervention programs have been the lack of knowledge about the determinants of physical activity and dietary patterns in young people, and in particular, the understanding of the causes of obesity.

Three recent CDC guidelines for school health programs aimed at promoting lifelong physical activity among young people conclude that school programs are among the most effective strategies for reducing the public health burden of chronic disease associated with sedentary lifestyles and unhealthy eating patterns (28).

Although few published studies of long-term school programs address obesity or overweight in children, enough is known to merit continued implementation and ongoing refinement. More research is needed to study the impact of these programs on student physical activity, healthy eating, and weight management in children, as well as on the development and maintenance of healthy behaviors in adulthood.

Although school-based health promotion programs help children develop skills that encourage lifetime health and fitness, healthcare professionals, school authorities, and community partners play invaluable roles in reinforcing these behaviors.

REFERENCES

7. CATCH (1995).National Heart Lung and Blood Institute Information Center, PO Box 30105, Bethesda, MD 20824-0105, USA.
12. SPARK Physical Education (1993). San Diego State University, 6363 Alvarado Court, Suite 250, San Diego, California 92120, USA.
22. Take 10! ILSI Center for Health Promotion, 2295 Parklake Drive, Suite 450, Atlanta, GA 30345, USA.
25. Power Kids Eat Smart and Power Kids on the Go. ILSI Southeast Asia, 03-45 Goldhill Plaza Podium Block, 1 Newton Road, Singapore 308899.

**DISCUSSION**

*Dr. Uauy:* What is the cost of this program per child per year?

*Mrs. Jacob:* Nobody has ever done that evaluation. For the Trim and Fit program, there is intensive input from the Ministry of Education and the school health services. The government in Singapore is willing to carry the cost for now. They have never said it costs too much. Children are considered very important.

*Dr. Endres:* In relation to those parents who did not change their diet at home, was this because they could they not afford to, or did they resist change for cultural reasons?

*Mrs. Jacob:* Some parents will always be resistant to change. In other cases, though the teachers were doing many things with the children in school, they did not reach out to the
parents. Through the Power Kids resource we made an effort to keep the parents up to speed with what was going on in the schools. I would not say there was a cultural problem or that they couldn’t afford it in Singapore; it’s mainly lack of interest.

**Dr. Endres:** I have heard from Dr. Roulet that parents were against his school programs in Lausanne, Switzerland. Perhaps he could comment?

**Dr. Roulet:** We have tried to establish a weight control program in schools in Lausanne, but many parents refused to allow their children to take part. They say it’s not the role of a school to check on children’s weight or what they are eating at home. It can be quite a problem to involve the family, and this might be the same in Singapore.

**Mrs. Jacob:** We have had experience of parents who argue with you about whether their child is overweight or not, but the majority of parents appreciate that the school is interested and the teachers are willing to give up their busy time to care about the children in this way.

**Dr. Baerlocher:** You said that only a few programs had been described from Europe. It is true that not many have been reported in international journals, but there are in fact many programs in Europe. They have been published in one or other of the European languages in the form of booklets or reports that are available for teachers and institutions but have not appeared in medical journals. In Germany for example, the state of Baden-Württemberg has been running nutrition education programs for children from 3 to 12 years for the last 25 years, supervised by nutritionists and dietitians. In Switzerland we have recently carried out a survey of nutritional programs throughout the country which has shown that nutrition education is a part of the regular curriculum in all schools for 10 to 16-year-old children; they even have cooking lessons. There are also specific programs that have evolved in the context of a European network for health promotion in schools. In this network, schools can send in their own programs for evaluation and use in other European countries. One of these programs is called “Pausenkiosk,” which is a snack food service run by the children themselves. They buy foods at local farms and prepare the snacks that they sell to the other children. While doing this they learn about nutrition from their teachers. In another state there is a program called “energy management,” which lasts for 4 years and has the goal of improving physical activity and nutrition. In Switzerland, there is also a nutrition museum established by Nestlé in Vevey, called “Alimentarium.” This museum includes nutritional education programs for children that are very interactive. Children really enjoy going there and learning about nutrition.

**Mrs. Jacob:** Thank you. One of the things about school programs is that not all of them do get published, so if we limit our search for successful programs to those that have been published in scientific journals we will probably miss some effective and culturally specific programs.

**Dr. Ma:** Was the nutrition education program integrated with classroom teaching and is there any special school policy for the program? As you know, in China all schools are focused on academic achievement, so if there are no specific school policies it may be hard for health educators work in the schools.

**Mrs. Jacob:** In Singapore, we have a standard health education curriculum. It is not easy to change that unless you are part of the education system and can exert an influence on educators. It is simpler to set up extracurricular activities, which give you greater flexibility. On the other hand, there are many opportunities outside the curriculum area, and we can make use of these in Singapore.

**Dr. Robinson:** One of the problems that has led to school programs being less effective than they could be is that we put a lot of our energy into developing interventions for children or families and forget that we need to develop interventions for schools. We need to pay the same attention to identifying the factors that affect teacher behavior in school, administrators’
behavior, and Department of Education behavior as we do to looking at the individual behavior of children. The things that motivate teachers or parents are just as important as the things that motivate children. For example, schools may not be impressed by being told that reducing TV watching may prevent obesity, because from their point of view that is not particularly important. However, if you could tell them that reducing TV would improve school performance and test scores, they would take notice. You need to think about what the needs of the schools are, and then address those needs as part of the program.

Dr. Dulloo: Dr. Birch mentioned the importance of portion size in nutrition education. In your Singapore program, how was that taken into account?

Mrs. Jacob: Our school portions are much smaller than the portions served in outlets outside the school environment. For example, a bowl of noodles in school would be around a cupful only, but if you were to order noodles outside of school, you would get a double or two and a half times that amount. In our curriculum, we have a healthy diet pyramid, with prescribed serving sizes. We use these consistently so that the children do not get mixed messages. We incorporated Ministry of Health serving size guidelines in this program.