

## Chapter 2

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# Physical Activity

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There is no doubt that Americans are not physically active enough. Only 45% of adults get the recommended 30 minutes of physical activity on five or more days per week, and adolescents are similarly inactive.<sup>1,2</sup> Regular physical activity improves aerobic capacity, muscular strength, body agility and coordination, and metabolic functioning.<sup>3</sup> Those who are physically active have a reduced risk of cardiovascular disease,<sup>4-9</sup> ischemic stroke,<sup>10,11</sup> type 2 (non-

\*Insufficient evidence means that we were not able to determine whether or not the intervention works.

The Task Force approved the recommendations in this chapter in 2001. The research on which the findings are based was conducted between 1980 and 2000. This information has been previously published in the American Journal of Preventive Medicine [2002; 22(4S):67-72 and 73-107] and the MMWR Recommendations and Reports [2001; 50(No. RR-18):1-14].

insulin-dependent) diabetes,<sup>12-18</sup> colon cancers,<sup>19-22</sup> osteoporosis,<sup>23-25</sup> depression,<sup>26-29</sup> and fall-related injuries.<sup>30-33</sup>

Recommendations for increasing physical activity have been made for individuals and for clinical settings. In this chapter we present recommendations for increasing physical activity through interventions in community settings. Because increasing physical activity involves behavioral, social, and environmental factors (both physical and social), interventions in community settings to promote physical activity have emerged as a critical piece of an overall strategy to increase physical activity in the United States. The interventions we reviewed used several approaches to increasing physical activity: informational, behavioral and social, and environmental and policy changes.

## RECOMMENDATIONS FROM OTHER ADVISORY GROUPS

*Healthy People 2010*<sup>1</sup> ranks physical activity as 1 of 10 leading health indicators. The *Healthy People* objectives aim to (1) increase the amount of moderate or vigorous physical activity performed by all people and (2) increase opportunities for physical activity through creating and enhancing access to places and facilities where people can be physically active. The *Healthy People* objectives to improve levels of physical activity for adults, adolescents, and children, and to reduce sedentary behavior among adolescents, are shown in Table 2-1.

In 2002, the U.S. Preventive Services Task Force concluded that the evidence is insufficient to recommend for or against behavioral counseling in primary care settings to promote physical activity.<sup>34</sup> They noted that the effectiveness of physical activity in reducing morbidity or mortality related to chronic diseases has been well documented, so it was not the focus of their review. The review also did not focus on counseling in other settings.

A consensus statement developed by a panel of the American College of Sports Medicine and the Centers for Disease Control and Prevention<sup>35</sup> recommends that every adult accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week. This recommendation was modified to emphasize that even activity that is not strenuous or continuous (e.g., three 10-minute exercise sessions per day instead of one 30-minute session) can produce health results. The recommendation is supported by the Surgeon General<sup>3</sup> and the National Institutes of Health.<sup>36</sup>

## METHODS

Methods used for the reviews are summarized in Chapter 10. Specific methods used in the systematic reviews of physical activity have been described

**Table 2-1.** Selected *Healthy People 2010*<sup>1,2</sup> Objectives for Increasing Physical Activity

<i>Objective</i>	<i>Population</i>	<i>Baseline</i>	<i>2010 Objective</i>
Reduce the proportion of adults $\geq 18$ years engaged in no leisure-time physical activity (Objective 22-1)	Adults	40% (1997 <sup>a</sup> )	20%
Increase the proportion of adults $\geq 18$ years who either engage regularly, preferably daily, in moderate physical activity for $\geq 30$ minutes or engage in vigorous physical activity $\geq 3$ days per week for $\geq 20$ minutes per occasion (22-2, updated 2004)	Adults	32% (1997 <sup>a</sup> )	50%
Increase the proportion of adults $\geq 18$ years engaged in vigorous physical activity $\geq 3$ days per week for $\geq 20$ minutes per occasion (22-3)	Adults	23% (1997 <sup>a</sup> )	30%
Increase the proportion of adolescents (students in grades 9-12) who engage in moderate physical activity for $\geq 30$ minutes on $\geq 5$ of the previous 7 days (22-6)	Adolescents	27% (1999)	35%
Increase the proportion of adolescents (students in grades 9-12) engaged in vigorous physical activity $\geq 3$ days per week for $\geq 20$ minutes per occasion (22-7)	Adolescents	65% (1999)	85%
Increase the proportion of adolescents (students in grades 9-12) who participate in daily school physical education (22-9)	Adolescents	29% (1999)	50%
Increase the proportion of adolescents (students in grades 9-12) who view television $\leq 2$ hours on a school day (22-11)	Adolescents	57% (1999)	75%
Increase the proportion of trips of $\leq 1$ mile made by walking by adults $\geq 18$ years (22-14a)	Adults	17% (1995 <sup>a</sup> )	25%
Increase the proportion of trips to school of $\leq 1$ mile made by children and adolescents <sup>b</sup> walking (22-14b)	Children/ adolescents	31% (1995 <sup>a</sup> )	50%
Increase the proportion of trips of $\leq 5$ miles made by bicycle by adults $\geq 18$ years (22-15a)	Adults	0.6% (1995 <sup>a</sup> )	2.0%
Increase the proportion of trips to school of $\leq 2$ miles made by bicycle by children and adolescents <sup>b</sup> (22-14b)	Children/ adolescents	2.4% (1995 <sup>a</sup> )	5.0%

<sup>a</sup>Age adjusted to the year 2000 standard population.

<sup>b</sup>Children and adolescents defined as aged 5-15 years.

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in detail elsewhere<sup>37</sup> and are available at [www.thecommunityguide.org/pa](http://www.thecommunityguide.org/pa). The logic framework depicting the conceptual approach used in these reviews is presented in Figure 2–1.

## **ECONOMIC EFFICIENCY**

A systematic review of available economic evaluations was conducted for all recommended interventions, and a summary of each review is presented with the related intervention. The methods used to conduct these economics reviews are summarized in Chapter 11.

## **RECOMMENDATIONS AND FINDINGS**

This section presents a summary of the findings of the systematic reviews conducted to determine the effectiveness of the selected interventions in this topic area. We evaluated three kinds of approaches to increasing physical activity: informational, behavioral and social, and environmental and policy approaches.

### ***Informational Approaches to Increasing Physical Activity***

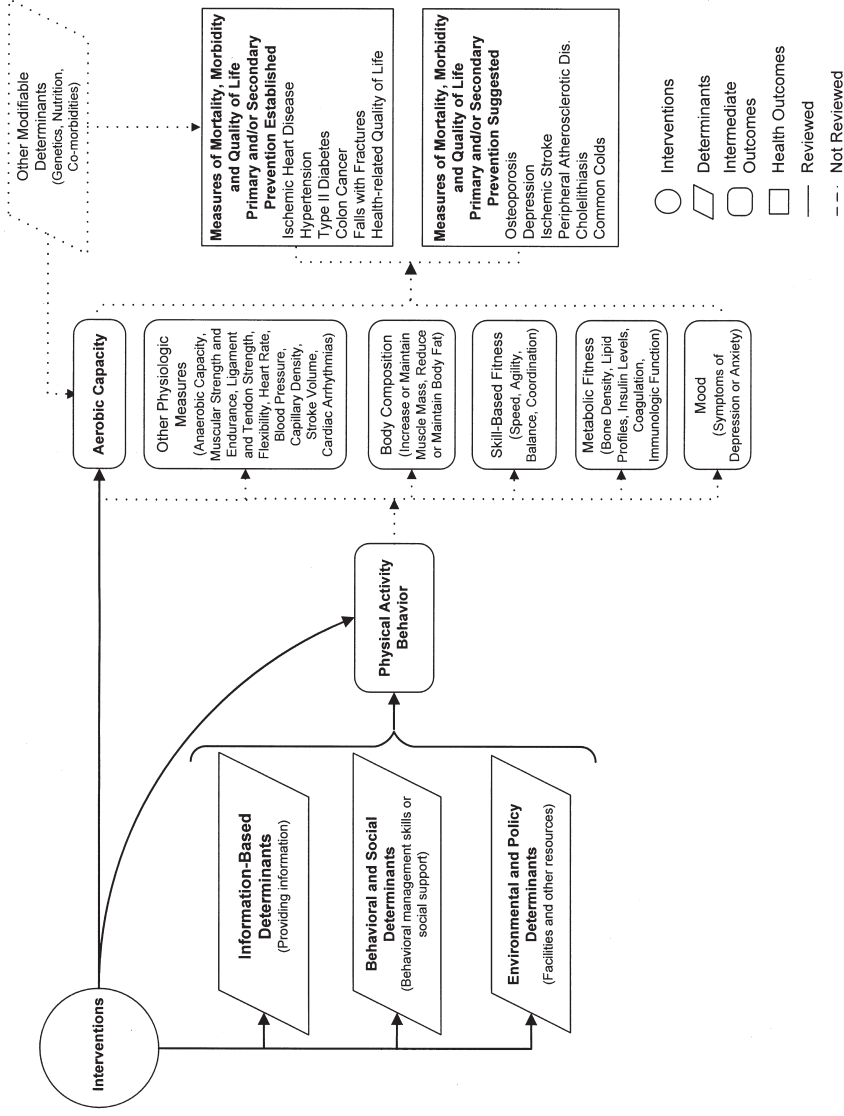
Informational approaches focus on increasing physical activity by providing information to motivate and enable people to change their behavior and to maintain that change over time. The interventions primarily use educational approaches to present both specific information about physical activity and exercise and general information (e.g., ways to reduce the risk of cardiovascular disease). The information is intended to change people’s knowledge about the benefits of physical activity, increase their awareness of opportunities for increasing physical activity, explain methods for overcoming barriers and negative attitudes about physical activity, and ultimately increase physical activity.

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### ***Community-Wide Campaigns: Recommended (Strong Evidence of Effectiveness)***

Community-wide campaigns involve many community sectors in highly visible, broad-based, multicomponent approaches to increasing physical activity. In addition to considering sedentary behavior, most of the campaigns reviewed also addressed other cardiovascular disease risk factors, particularly diet and smoking.

These campaigns are effective in increasing the level of physical activity and the fitness of both adults and children. They also increase knowledge



**Figure 2-1.** Logic framework illustrating the conceptual approach used in systematic reviews of physical activity. (Reprinted from Am J Prev Med, Vol. 22, No. 4S, Kahn EB et al., The effectiveness of interventions to increase physical activity: a systematic review, p. 76, Copyright 2002, with permission from American Journal of Preventive Medicine.)

about exercise and physical activity, as well as intentions to be more physically active.

#### *Effectiveness*

- Community-wide campaigns are effective in increasing the percentage of active people by approximately 4%.
- These campaigns are also effective in increasing energy expenditure by approximately 16%.

#### *Applicability*

- The findings of this review should be applicable to most communities in the United States if the campaign is adapted to the target population.

The findings of our systematic review are based on 10 studies of the effectiveness of large-scale, community-wide campaigns in increasing physical activity and improving physical fitness.<sup>38-47</sup> Some programs sought to decrease levels of cardiovascular disease by increasing physical activity and improving diet over a period of years; others lasted from six weeks to six months. We studied only multicomponent campaigns and evaluated them as such because we could not separate the effects of each component.

Campaign messages were directed to large audiences through a variety of channels, including television, radio, newspapers, direct mail, billboards, posters at bus stops and train stations, and trailers in movie theaters. Messages were delivered through paid advertisements, donated public service announcements, news releases, the creation of feature items in newspapers, or any combination of these approaches. The campaigns reviewed also included such components as support and self-help groups; physical activity counseling; risk factor screening and education at worksites, schools, and community health fairs; community events; and creation of walking trails.

Many of the interventions were designed to decrease levels of cardiovascular disease in a community over a period of several years by increasing levels of physical activity and improving dietary behaviors. These interventions included activities supported by media efforts but conducted independently. The remaining studies were six weeks to six months long and activities, although more limited, were still presented community-wide.

The percentage of people engaging in physical activity increased by a median of 4.2% (range, -2.9% to 9.4%; six arms of five studies). Energy expenditure also increased by a median of 16.3% (range, 7.6% to 21.4%; three arms of two studies). Four out of five other measures of physical activity also showed increases. These results show that large-scale, community-wide campaigns are effective in increasing physical activity and improving physical fitness.

These results should be applicable to diverse communities—rural, urban, and suburban—and to populations of any race, ethnicity, or socioeconomic sta-

tus, if the program is adapted to the target population. For example, bilingual campaign materials and leaders can be used, materials can be written at a reading level appropriate for the target population, or campaigns can be adapted to the physical setting (e.g., emphasizing skiing in northern states during the winter or walking on the beach in warmer coastal climates).

Community-wide campaigns produced some additional benefits, including increases in knowledge about exercise as well as intentions to increase physical activity. Studies that measured change in weight, however, had mixed results. Some showed losses, others showed no change, and still others showed slight gains.

These campaigns can also produce a decrease in risk factors for cardiovascular disease. Communities themselves can benefit, too, by developing a greater sense of cohesion and a collective motivation to exercise, developing or strengthening social networks to achieve program goals, and even becoming involved in local government or civic organizations, thereby increasing social capital.

We did not find any economic evaluations of community-wide campaigns.

Poor planning and coordination of the campaigns, inadequately trained staff, and insufficient resources to implement a campaign of sufficient scope are all barriers to the success of community-wide campaigns. To change people's knowledge, attitudes, or behaviors, especially in high-risk populations, considerable exposure to campaign messages is required. Community buy-in (the involvement and acceptance of any targeted community) is also needed, and achieving it usually requires considerable effort.

In conclusion, the Task Force recommends community-wide campaigns on the basis of strong evidence of effectiveness in increasing both the number of people who are active and the energy expended by active individuals. The findings of this review should be applicable to most communities in the United States, provided that the campaigns are adapted to the specific needs and interests of the target population.

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***Point-of-Decision Prompts: Recommended (Sufficient Evidence of Effectiveness)***

Point-of-decision prompts are signs placed by elevators and escalators to motivate people to use nearby stairs for health benefits or weight loss. These signs appear to motivate both people who want to be more active and those interested in the general health benefits of using the stairs. All interventions evaluated were single component, in which placement of signs was the only activity.

*Effectiveness*

- Point-of-decision prompts are effective in increasing the percentage of people taking the stairs (rather than escalators or elevators) by approximately 54%.
- These prompts are also effective in increasing levels of physical activity.
- Prompts are more effective among obese than non-obese people, especially when signs link use of stairs to weight loss rather than general health benefits.

*Applicability*

- These findings should be generally applicable in diverse populations and settings, provided that the intervention is adapted to the target population.

The findings of our systematic review of the effectiveness of point-of-decision prompts are based on six studies (two studies in one report) conducted between 1980 and 2000.<sup>48-52</sup> These studies were conducted in shopping malls, train and bus stations, and a university library.

Stair use was quite low at baseline: under 12% in all but one study (range, 4.8% to 39.6%). Five studies showed a median increase in stair-climbing of 53.9% (range, 5.5% to 128.6%). The remaining study showed an unspecified increase in stair-climbing and also found that the signs were effective in getting those who were less active (as measured by responses to a brief survey) to take the stairs. Both obese and non-obese people increased their stair use in response to the signs, although obese people seemed more likely to use the stairs than did non-obese people. Among obese people, a sign that linked stair use to the potential for weight loss produced a higher increase in stair use than a sign linking stair use to general health benefits.

These results show that point-of-decision prompts are effective in increasing the percentage of people who use the stairs, as well as in increasing physical activity.

These results should be applicable across diverse settings and population groups, provided that appropriate care is taken to adapt the messages to the target groups. As noted above, a study that reported results separately for obese people found that a message linking stair use to weight loss was more effective in increasing the percentage of stair users than a message emphasizing general health benefits. Another way to adapt the message can be to use culturally appropriate language on the signs.

We did not find any economic evaluations of point-of-decision prompts.

Several potential barriers to increased stair use are all related to the condition and accessibility of the stairs themselves. Stairways in many buildings and facilities are difficult to find and are poorly lit, maintained, or secured, making



them apparently or actually unsafe. Additionally, some stairwells are locked, preventing access to them.

In conclusion, the Task Force recommends point-of-decision prompts on the basis of sufficient evidence of effectiveness in increasing levels of physical activity, as measured by the number of people who choose to use the stairs instead of riding escalators or elevators. Signs linking stair climbing to weight loss may be more effective among obese people than generic signs.

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***Mass Media Campaigns: Insufficient Evidence to Determine Effectiveness***

These single-component campaigns are designed to increase knowledge about physical activity, influence attitudes and beliefs, and change behavior by transmitting messages through newspapers, radio, television, and billboards, singly or in combination. Paid advertisements, donated time and space for promotions, and news or lifestyle features are used. Unlike the community-wide campaigns discussed above, these interventions do not include other components such as support groups, risk factor screening and education, or community events.

*Effectiveness*

- We found insufficient evidence to determine the effectiveness of mass media campaigns alone in increasing physical activity or improving fitness.
- Evidence was insufficient because of the small number of available studies, limitations in their design and execution, and inconsistent findings.
- Insufficient evidence means that we were not able to determine whether or not the intervention works.

The findings of our systematic review are based on three studies<sup>40,45,53</sup> that measured the effectiveness of mass media campaigns in changing (1) the percentage of people achieving a specified level of activity (i.e., walking, moderate- or vigorous-intensity physical activity, aerobic or non-aerobic activity), (2) the percentage of people categorized as sedentary, and (3) energy expenditure. Some—but not all—measures suggested a modest trend toward increasing physical activity, especially among people who were less physically active at the start of the programs. Because of the small number of available studies and limitations in their design and execution, the evidence was insufficient to determine the effectiveness of mass media campaigns, when used alone, in increasing physical activity or improving fitness.

Because we could not establish the effectiveness of these programs, we did not examine situations in which the programs would be applicable, information about economic efficiency, or possible barriers to implementation.

Even in the absence of sufficient evidence to determine effectiveness, some positive effects of mass media campaigns are apparent. Significant and substantial improvements in knowledge and beliefs were seen in two of the studies. Mass media campaigns might also play important roles in changing awareness of opportunities for and benefits of physical activity, helping to build support for environmental and policy changes that improve physical activity behavior, fitness, or both. We did not, however, assess the effect of mass media campaigns on these outcomes.

In conclusion, the Task Force found insufficient evidence to determine the effectiveness of mass media campaigns, when used alone, in increasing physical activity or improving fitness. (When combined with other activities, such as support groups, risk factor screening and education, and community events, these are regarded as community-wide campaigns, which are recommended and discussed in this chapter.) At the time of our systematic review, only three studies were available, which had limitations in their design and execution and showed inconsistent evidence of effectiveness in increasing physical activity.

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***Classroom-Based Health Education Focused on Providing Information:  
Insufficient Evidence to Determine Effectiveness***

These programs consist of health education classes in elementary, middle, or high schools whose goal is to help students develop the skills they need to make rational decisions about adopting healthier behaviors. Class content is usually multicomponent, with teachers educating students about aspects of physical inactivity, nutrition, smoking, and alcohol and drug misuse. Behavioral skills components (e.g., role-play, goal-setting, contingency planning) can also be part of the classes. Spending additional time in physical activity is not usually part of the curriculum.

***Effectiveness***

- We found insufficient evidence to determine the effectiveness of classroom-based health education focused on providing information in increasing physical activity levels and physical fitness.
- Evidence was insufficient because of inconsistent results in the available studies.
- Insufficient evidence means that we were not able to determine whether or not the intervention works.

The findings of our systematic review are based on 10 studies, most of which sought to reduce students' risk of developing chronic disease.<sup>54-63</sup> An additional three studies were identified but did not meet our quality criteria and

were excluded from the review.<sup>64–66</sup> Four programs were based on the Know Your Body curriculum,<sup>67</sup> designed to provide children with the skills needed to adopt behaviors that reduce the risk of developing cardiovascular disease. These classes focused on nutrition, physical fitness, and preventing cigarette smoking. One program focused on preventing type 2 diabetes by encouraging students to eat low-fat foods and exercise regularly. Programs lasted from three months to five years.

There was no clear trend in the effects of these classes. Some of the studies showed increases in time spent in physical activity outside the school setting, while others showed decreases. Changes in self-reported physical activity behavior also varied: some programs produced positive changes in self-reported behavior, while others showed no effect or reported negative changes. Aerobic capacity was not measured in any of these studies. These findings provided insufficient evidence to determine if classroom-based health education focused on providing information is effective in increasing levels of physical activity or physical fitness.

Because we could not establish the effectiveness of these programs, we did not examine situations in which the programs would be applicable, information about economic efficiency, or possible barriers to implementation.

Although these studies did not show clear changes in activity, many showed other benefits, including increases in general health knowledge, exercise-related knowledge, and personal motivation to exercise. The programs may also provide additional benefits, such as more supportive attitudes for physical activity initiatives or changes in other health-related behaviors.

In conclusion, the Task Force found insufficient evidence to determine the effectiveness of classroom-based health education focused on providing information in increasing physical activity levels and physical fitness because of inconsistent results in the available studies.

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### ***Behavioral and Social Approaches to Increasing Physical Activity***

Behavioral and social approaches focus on increasing physical activity by teaching behavior management skills that can be used in many settings and by structuring the social environment to provide support for people trying to change their health and activity habits. These interventions often involve group behavioral counseling and may also involve an individual's friends or family members. Skills focus on recognizing cues and opportunities for physical activity, ways to manage high-risk situations, and ways to maintain de-

sired behaviors and prevent relapse. These interventions also involve making changes in the home, family, school, and work environments.

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***School-Based Physical Education: Recommended (Strong Evidence of Effectiveness)***

These programs modify school-based physical education (PE) classes by increasing the amount of time students spend in PE class, the amount of time they are active during PE classes, or the amount of moderate or vigorous physical activity (MVPA) they engage in during PE classes. Most studies reviewed increased the amount of physical activity during already-scheduled PE classes by changing the activities taught (e.g., substituting soccer for softball) or modifying the rules of the game so that students are more active (e.g., the entire team runs the bases together if the batter makes a base hit). Health education was often part of the program as well.

*Effectiveness*

- School-based PE is effective in increasing levels of physical activity and improving physical fitness.
- Time spent in PE classes increased by approximately 10%, and time spent in MVPA in PE classes increased by approximately 50%.
- Aerobic capacity increased by approximately 8%.

*Applicability*

- These programs should be generally applicable to elementary and high school students if the program is adapted to the students receiving it.

*Other Effects*

- School-based PE produced small improvements in flexibility and muscular endurance as well as increases in knowledge about exercise, fitness, nutrition, general health, and personal motivation to exercise.
- We found no evidence to support the perception that time spent in PE classes harms academic performance.

The findings of our systematic review are based on 14 studies in 13 reports.<sup>68-80</sup> An additional four studies were identified but did not meet our quality criteria and were excluded from the review.<sup>81-84</sup> Studies evaluated the effectiveness of modifying school-based PE curricula and policies by increasing the amount of time students spend in PE class, the amount of time they are active during PE class, or the amount of MVPA they engage in during PE classes (the last can be accomplished by adding new PE classes or increasing the number of existing classes, lengthening existing PE class sessions, or increasing the MVPA of students during PE classes without necessarily length-

ening class time). Studies looked at a variety of measures of improved fitness and increased activity, including energy expenditure, percent of class time spent in MVPA, minutes spent in MVPA, observed activity score, physical activities outside of school, aerobic capacity results from timed runs, and endurance testing. The amount and percent of time spent in MVPA at school showed consistent increases in five arms from four studies: the median increase in the amount of PE class time spent in MVPA was 50.3% (range, 6.0% to 125.3%), and the increase in percent of time spent in MVPA in PE classes was 10% (range, 3.3% to 15.7%). Studies also showed an increase in energy expenditure, and 14 arms from 11 studies showed a median increase in aerobic capacity of 8.4% (interquartile range, 3.1% to 18.9%). These results show that school-based PE is effective in increasing levels of physical activity and in improving physical fitness.

These findings should be applicable to elementary, middle, and high school students, provided that the program is adapted to the students receiving it.

Other benefits of these programs included small improvements in flexibility and muscular endurance; decreases in skinfold measurements; and increases in knowledge about exercise, fitness, nutrition, general health, and personal motivation to exercise. We searched for, but did not find, any evidence that time spent in PE classes harms academic performance.

We did not find any economic evaluations of modifying school-based PE classes.

School systems present the primary barriers to implementing these programs. Although PE is mandated in almost every state, requirements for the amount of PE instruction are generally low. Few middle and high schools require daily PE, and schools face increasing pressure to eliminate PE to make more time available for academic subjects.

In conclusion, the Task Force recommends modifying school-based PE classes on the basis of strong evidence of effectiveness in increasing students' activity levels and aerobic capacity. Adapting the program to the students who receive it should make this intervention applicable to all elementary, middle, and high school students. No evidence was found to support the belief that time spent in physical education harms academic performance.

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***Individually-Adapted Health Behavior Change Programs:  
Recommended (Strong Evidence of Effectiveness)***

Individually-adapted health behavior change programs are tailored to participants' specific interests, preferences, and readiness to change, teaching spe-

cific behavioral skills that enable participants to make moderate-intensity physical activity part of their daily routines. The behavioral skills taught include setting goals for physical activity and monitoring one's progress toward those goals, building social support for new behavioral patterns, reinforcing new behaviors through self-reward and positive self-talk, structured problem solving to help maintain behavior change, and preventing relapse into sedentary behaviors. Participants can engage in activities that are planned (e.g., a daily scheduled walk) or unplanned (e.g., taking the stairs when the opportunity arises). Established health behavior change models (e.g., Social Cognitive Theory,<sup>85</sup> the Health Belief Model,<sup>86</sup> or the Transtheoretical Model of Change<sup>87</sup>) are the basis for many individually adapted programs.

#### *Effectiveness*

- These programs are effective in increasing levels of physical activity.
- Energy expenditure increased by approximately 64%, and time spent in physical activity increased by approximately 35%.
- Increases were also seen in attendance at exercise sessions, number of sessions completed, percentage of people starting exercise programs, and frequency of physical activity.
- The programs decreased body weight and body fat and increased strength and flexibility.

#### *Applicability*

- These programs should be generally applicable in diverse populations and settings, if the programs are adapted to the people receiving them.

The findings of our systematic review are based on 18 studies that evaluated the effectiveness of individually-adapted health behavior change programs in changing physical activity patterns.<sup>46,88-104</sup> An additional two studies were identified but did not meet our quality criteria and were excluded from the review.<sup>105,106</sup> All of the interventions were delivered either in person to groups or by mail, telephone, or directed media. Programs typically involved recruiting volunteers who selected physical activity goals and worked in groups to achieve those goals. Group members provided companionship and support for one another. Study staff also provided encouragement in the form of phone calls to check on participants' progress and to encourage them to continue, and by leading formal group discussions about negative views of exercise and other barriers to change.

Studies used various measures of progress, including how often and how long people exercised in terms of blocks walked daily; flights of stairs climbed daily; number of minutes spent in activity; and how often they attended exercise sessions, ran, or participated in exercise and organized sports.

Participants increased time spent in physical activity (median 35.4%; interquartile range, 16.7% to 83.3%; 20 arms of 10 studies), energy expenditure

(median 64.3%; interquartile range, 31.2% to 85.5%; 15 arms of 4 studies), and maximal oxygen uptake ( $\text{VO}_2$  max) (median 6.3%; interquartile range, 5.1% to 9.8%; 13 arms of 4 studies). Increases were also seen in frequency of attendance at exercise sessions, the number of prescribed exercise sessions completed, the percentage of people starting exercise programs, and the frequency of physical activity. These findings show that individually-adapted health behavior change programs are effective in increasing levels of physical activity, time spent in physical activity, and energy expenditure.

These results should be applicable to diverse settings and populations, provided that the program is adapted to the people participating in it.

Other benefits of these programs included decreases in body weight and percentage of body fat and increases in strength and flexibility.

The findings of our systematic review of economic evaluations of individually-adapted health behavior change programs are based on one report.<sup>107</sup> This two-year study, conducted at a fitness facility in Dallas, Texas, evaluated the cost-effectiveness of two physical activity interventions—lifestyle and structured—for adults 35–60 years of age. The lifestyle intervention provided behavioral skills training to integrate moderate to intense physical activity into the lives of participants. The structured intervention consisted of supervised center-based exercise sessions. The adjusted cost-effectiveness ratio range was \$0.05–\$3.94 per person for the lifestyle intervention and \$0.07–\$5.39 for the structured intervention.

Inadequate resources, lack of planning and coordination, and lack of professionally trained staff may present barriers to thorough implementation and evaluation of these programs.

In conclusion, the Task Force recommends individually-adapted health behavior change programs on the basis of strong evidence that they increase levels of physical activity, time spent in physical activity, and energy expenditure and decrease body weight and fat. These programs, when tailored to their intended recipients, should be applicable to diverse populations and settings. The need for adequate resources and trained staff presents a potential barrier to implementation of these programs.

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***Social Support Interventions in Community Settings:  
Recommended (Strong Evidence of Effectiveness)***

These interventions build, strengthen, and maintain social networks that support increases in physical activity. New social networks can be created or

existing networks in social settings outside the family, such as the workplace, can be used. Typically, participants set up a *buddy* system and make *contracts* to guarantee that both buddies will be active, or they form walking groups or other groups to provide companionship and support while being physically active.

#### *Effectiveness*

- Social support increased time spent in activity by approximately 44%.
- Frequency of exercise increased by approximately 20%.
- Aerobic capacity increased by approximately 5%.
- Participation in these programs improved fitness levels, lowered percentage of body fat, increased knowledge about exercise, and improved confidence in the ability to exercise.

#### *Applicability*

- These findings should be generally applicable for people of all ages and levels of activity, and in diverse settings, if the programs are adapted to the people participating in them.

The findings of our systematic review are based on nine reports that evaluated the effectiveness of social support interventions in community settings (e.g., walking programs in the neighborhood, exercising at home).<sup>45,108–115</sup> Programs typically involved recruiting volunteers who selected physical activity goals and worked in groups to achieve those goals. Group members provided companionship and support for one another. Study staff also provided encouragement in the form of phone calls to check on participants' progress and to encourage them to continue, and by leading formal group discussions about negative views of exercise and other barriers to change.

Studies used various measures of progress, including how often and how long people exercised in terms of blocks walked daily; flights of stairs climbed daily; number of minutes spent in activity; and how often they attended exercise sessions, ran, or participated in exercise and organized sports.

Participants spent more time in physical activity (44.2% median increase; interquartile range, 19.9% to 45.6%; five arms from four studies); exercised more often (19.6% median increase; interquartile range, 14.6% to 57.6%; six arms from three studies); and improved their aerobic capacity (4.7% median increase; interquartile range, 3.3% to 6.1%; five arms from three studies). One study showed that more frequent support, whether structured or informal, effectively encouraged people to be more active.

These results show that social support interventions in community settings are effective in increasing physical activity.

These results should be applicable to men and women; young and old; initially sedentary or at any level of activity; and in settings including commu-



nities, worksites, and universities, provided that the program is adapted to the people participating in it.

The studies also showed other benefits: participants reduced body fat (−7.3% median; interquartile range, −6.8% to −8.1%) and increased their knowledge of, confidence about, and social support for exercise.

We did not find any economic evaluations of social support interventions in community settings.

We found no barriers to implementing social support in community settings to promote physical activity.

In conclusion, the Task Force recommends social support to increase physical activity on the basis of strong evidence that such support increases time spent in and frequency of physical activity, increases physical fitness and aerobic capacity, and improves participants' confidence in their ability to exercise. Programs fostering this support should be applicable to people of all ages and levels of activity, and in diverse settings, if the programs are adapted to the people participating in them.

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***College-Based Health Education and Physical Education:  
Insufficient Evidence to Determine Effectiveness***

These interventions use didactic and behavioral education to increase and retain physical activity levels among college students and to help students develop lifelong exercise habits. The physical education (PE) classes may or may not be offered by PE or wellness departments at colleges and universities but must include supervised activity in the class. Classes include both lectures and laboratory-type activities. Students engage in supervised physical activity, develop goals and activity plans, and write term papers based on their experiences. Social support is also built into these programs.

***Effectiveness***

- We found insufficient evidence to determine the effectiveness of college-based health education and PE in increasing physical activity levels.
- Evidence was insufficient because of the small number of studies and limitations in their design and execution.
- Insufficient evidence means that we were not able to determine whether or not the intervention works.

The findings of our systematic review are based on two studies in three reports.<sup>116–118</sup> An additional three studies were identified but did not meet our quality criteria and were excluded from the review.<sup>119–121</sup> In both reviewed studies, participants showed short-term improvements in physical activity

levels and aerobic capacity, but in one study, which followed up over two years, these gains were generally lost. Because of the small number of available studies and limitations in design and execution, the evidence was insufficient to determine the effectiveness of college-based health education and PE programs to help participants become more physically active and stay active after the end of the program.

Because we could not establish the effectiveness of these programs, we did not examine situations in which the programs would be applicable, information about economic efficiency, or possible barriers to implementation.

Although we found insufficient evidence to determine whether or not these programs are effective, the studies did indicate some benefits, especially in behaviors that can support increased physical activity. Men, in particular, showed some increase in giving social support to others and in resisting falling back into inactivity. Participants' perception of potential barriers to exercising may also be reduced. Women showed an increased enjoyment of physical activity as well as changes in their perception of benefits and barriers, their social support for fellow exercisers, and their ability to begin or maintain an exercise program.

In conclusion, the Task Force found insufficient evidence to determine the effectiveness of college-based health education and PE interventions in increasing physical activity because of the small number of studies and limitations in their design and execution.

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***Classroom-Based Health Education Focused on Reducing Television Viewing and Video Game Playing: Insufficient Evidence to Determine Effectiveness***

These health education classes, based in elementary school classrooms, encourage students to spend less time watching television and playing video games. Students are taught techniques or strategies to help achieve these goals, such as limiting access to TV and video games and self-monitoring and budgeting of the time spent watching TV and playing video games. All classes include a "TV turnoff challenge" encouraging students not to watch TV for a specified number of days. Classes do not specifically encourage physical activity as an alternative to watching TV and playing video games. Parental involvement is prominent, and all households are given automatic TV use monitors.

***Effectiveness***

- We found insufficient evidence to determine the effectiveness of health education classes focused on reducing television viewing and video game playing in increasing physical activity.

- Evidence was insufficient because of inconsistent results in the available studies.
- Insufficient evidence means that we were not able to determine whether or not the intervention works.

The findings of our systematic review are based on three studies, one<sup>122</sup> lasting six months, the other two<sup>123,124</sup> lasting two years. Each study measured the amount of time students spent playing video games and watching TV; one study also measured time spent in other sedentary behaviors. All studies used the amount of sedentary time in some form, usually time spent watching TV or playing video games, as the primary measure of effectiveness.

The programs produced consistent reductions in the time spent watching TV, playing video games, and other sedentary behaviors, according to both the children and their parents. Studies reported inconsistent results, however, for corresponding increases in physical activity among participants, with two measures showing increases and four showing decreases. These inconsistent results provide insufficient evidence to determine the effectiveness of these interventions in increasing physical activity.

Because we could not establish the effectiveness of these programs, we did not examine situations in which the programs would be applicable, information about economic efficiency, or possible barriers to implementation.

The studies suggest some benefits even though the evidence was insufficient to determine effectiveness. Body fat (measured by body mass index scores and skinfold tests) and rates of obesity decreased among participants according to some measures, despite inconsistent measures of increased physical activity. This may be because reduced TV viewing time also meant reduced time for snacking or because participants engaged in physical activity not recorded by the studies.

In conclusion, the Task Force found insufficient evidence to determine the effectiveness of health education classes focused on reducing television viewing and video game playing in increasing physical activity because of inconsistent results in the reviewed studies.

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#### ***Family-Based Social Support: Insufficient Evidence to Determine Effectiveness***

These interventions help families of those trying to increase physical activity (parents, siblings, or partners) to encourage this effort by modeling healthy behavior and by being supportive of exercise. Intervention components—which may include goal setting, problem solving, contracts to exercise among family members, and other techniques for promoting physical activity—are often delivered in conjunction with other school-based activities, such as

physical education (PE) or health education. Family involvement may be promoted through take-home packets, reward systems, and family record keeping. Some programs, such as CATCH (Child and Adolescent Trial for Cardiovascular Health), also included family-oriented special events (e.g., a “mini” health fair).

#### *Effectiveness*

- We found insufficient evidence to determine the effectiveness of family-based social support in increasing physical activity.
- Evidence was insufficient because of inconsistent results in the available studies.
- Insufficient evidence means that we were not able to determine whether or not the intervention works.

The findings of our systematic review are based on 11 studies (in 12 reports).<sup>56,73–78,125–129</sup> One additional study was identified but did not meet our quality criteria and was excluded from the review.<sup>130</sup> Studies showed inconsistent results: most showed no change, and others showed increases in activity, and others showed decreases. These disparities occurred both between and within studies. These inconsistent results provided insufficient evidence to determine whether or not family-based social support is an effective approach to increasing physical activity.

Because we could not establish the effectiveness of these programs, we did not examine situations in which the programs would be applicable, information about economic efficiency, or possible barriers to implementation.

The studies indicate some benefits even though the evidence was insufficient to determine effectiveness. Among both children and adults, several studies showed increases in knowledge of disease risk factors, fitness, exercise, or health. Participants in one study were more self-motivated to exercise, and in another study they reported being more satisfied with the amount of family activity.

In conclusion, the Task Force found insufficient evidence to determine the effectiveness of family-based social support in increasing physical activity because of inconsistent results.

### ***Environmental and Policy Approaches to Increasing Physical Activity***

The goal of these interventions is to help people adopt healthier behaviors by changing the physical environment, social networks, organizational norms and policies, and laws through environmental and policy approaches. Physical activity levels are affected by a wide variety of factors beyond individual

motivation and knowledge; these include being physically active close to home as well as environmental and neighborhood factors such as weather, air pollution, and lighting. Public policy that supports healthy lifestyles, creating environments to support these lifestyles, and strengthening the involvement of communities will result in healthier physical and organizational environments for all.

Interventions in this category affect entire populations by targeting physical and organizational structures. They are implemented and evaluated over a longer period of time than interventions directed to individuals. Although these interventions are conducted by traditional health professionals, they may also include others not previously involved with public health directly, such as community agencies and organizations; legislators; departments of parks, recreation, transportation, and planning; and the media.

In addition to the intervention reviewed here, we are investigating two additional approaches: urban form (design) and land-use planning strategies that lead to increased physical activity, and changes to transportation and travel policy and infrastructure that reduce dependence on motorized transport and increase physical activity. When published, the results of these reviews will be available at [www.thecommunityguide.org/pa](http://www.thecommunityguide.org/pa).

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***Creation of or Enhanced Access to Places for Physical Activity Combined with Informational Outreach Activities: Recommended (Strong Evidence of Effectiveness)***

These multicomponent interventions involve the efforts of businesses, coalitions, agencies, and communities to create or provide access to places where people can be physically active. Creating walking trails or providing access to fitness equipment in nearby fitness or community centers can increase the opportunities for people to be more active.

In addition to promoting access, many of the studies in our review included training people to use weight and aerobic fitness equipment; teaching about healthy behaviors; creating health and fitness programs and support or buddy systems; and providing seminars, counseling, risk screening, health forums and workshops, and referrals to physicians or additional services.

***Effectiveness***

- These programs are effective in getting people to exercise more.
- Participants usually report loss of weight or body fat.
- Frequency of physical activity increased by approximately 48% among participants.
- Aerobic capacity increased by approximately 5% and energy expenditure by approximately 8%.

### *Applicability*

- These programs should be applicable to both men and women in various settings if appropriately adapted to participants.

The findings of our systematic review are based on 10 studies.<sup>131-140</sup> An additional two studies were identified but did not meet our quality criteria and were excluded from the review.<sup>141,142</sup> Reviewed studies showed improvements in many measures of physical fitness. For example, the median increase in aerobic capacity was 5.1% (interquartile range, 2.8% to 9.6%; 8 arms from 5 studies). Changes were also noted in energy expenditure, people reporting some leisure time physical activity, and exercise score. In five studies that measured how often people exercised and how many people exercised three or more times per week, the median increase was an impressive 48.4% (interquartile range, 21.0% to 83.8%). Although measured in a variety of ways, the results indicate that these interventions are effective in increasing physical activity.

All studies were conducted in the United States, including eight at worksites (industrial locations such as automotive, brewing, and printing plants, plus universities and federal agencies). Two studies were conducted in low-income communities. One study included only men and one included only African Americans. Two studies stratified their results for men and women, and one study reported effects specific to African Americans. The reviewed interventions should therefore be applicable to diverse populations and settings.

Other benefits of these programs included weight reduction or loss of body fat, increases in perceived energy and confidence in the ability to exercise regularly, improved flexibility, and improved strength and better composite scores on the Physical Readiness Test. Information addressing cardiovascular disease risk factors, particularly diet and smoking, may have provided other health benefits for participants.

The findings of our systematic review of economic evaluations of interventions to create or enhance access to places for physical activity are based on two studies, both conducted in worksites.<sup>143,144</sup> In a four-year study at an employee fitness facility in a Houston, Texas, insurance company, a cost-benefit analysis of a structured physical fitness program was conducted. The program included regularly scheduled exercise classes and health seminars. Adjusted benefits were estimated at \$1106 per participant and adjusted costs at \$451 per participant.

A 5-year study with projections for an additional 10 years was conducted in a workplace setting among 36,000 employees and retirees of an insurance company. The researchers conducted a cost-benefit analysis of a company-

sponsored health and fitness program that used health promotion centers, newsletters, medical reference texts, videotapes, and quarterly media blitzes. Adjusted benefits were estimated at \$139 million and adjusted costs at \$43 million over the 15-year life of the program.

In both studies, the adjusted benefits substantially exceeded the adjusted costs of creating or enhancing access to places for physical activity.

The amount of time and money required to build or enhance facilities promoting physical activity may present barriers to implementation. Getting the community to support such projects, and finding the expertise to plan and coordinate them, may also be difficult.

In conclusion, the Task Force recommends interventions to create or enhance access to places for physical activity combined with informational outreach activities on the basis of strong evidence of effectiveness in increasing frequency of physical activity, aerobic capacity, energy expenditure, and other indicators of fitness. When adapted to recipients, these interventions should be applicable to both men and women in a variety of settings.

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*Point-of-Decision Prompts: Recommended (Sufficient Evidence of Effectiveness)*

See the discussion of point-of-decision prompts under Informational Approaches to Increasing Physical Activity in this chapter.

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## **INCREASING PHYSICAL ACTIVITY THROUGH USE OF THESE RECOMMENDATIONS**

In the United States, physical inactivity is a leading contributor to disability and premature death, accounting for 22% of coronary heart disease, 22% of colon cancer, 18% of osteoporosis-related fractures, 12% of diabetes and hypertension, and 5% of breast cancer.<sup>145</sup> Physical inactivity accounts for about 2.4% of the cost of U.S. health care or approximately \$24 billion a year.<sup>145</sup> The recommendations in this chapter provide a variety of ways to meet the need to increase physical activity, be it at work, at school, at home, or in the community.

Those interested in increasing physical activity (e.g., employers and employees; school administrators, teachers, and students; families; and community groups) can begin by assessing several factors: current levels of activity; the presence of particularly inactive groups (who will benefit more from becoming active than will active people who increase their levels of activity); and local barriers to implementation (e.g., access barriers; deficits in individual knowledge, attitudes, or skills; or lack of resources including funding and physical locations for physical activity) and current activities to improve them. The results should be compared with the recommendations in

this chapter to determine whether existing efforts are recommended, appropriately implemented, and adequately funded. The choice of new interventions should rely in part on the interventions described by the *Community Guide*, including those that are recommended, but should also take into account local goals, characteristics, and resources.

Next, setting measurable goals, both for existing and for new interventions, can help you assess whether or not the desired results are being achieved. These goals can be as simple or as complex as your time and resources allow. *Healthy People 2010* provides national objectives (Table 2-1), which can also be measured at the local level. You may find additional goals that are relevant to the particular interventions you choose to implement or to your ability to measure them. For example, some programs might measure access to and use of services. Keeping in mind the goal of increasing physical activity can help you determine what kinds of measurements are appropriate for your program(s).

Information about applicability, which describes the settings and populations involved in the recommended interventions, can help you assess the extent to which the intervention might be useful in a particular setting or population. Economic information, provided wherever available for recommended interventions, can be useful both in identifying what resources are needed and in choosing interventions that are more economically efficient in meeting public health goals than other available options.

In choosing recommended interventions, remember that the reviewed interventions were conducted among populations, not individuals. Although only small improvements were noted in some interventions, these small changes in populations can add up to significant public health improvements. Furthermore, the largest public health benefit of interventions to increase physical activity comes from getting sedentary people to be active rather than getting already active people to be more active.<sup>146</sup> Therefore, implementation of the recommendations in a variety of settings, involving many kinds of people, can produce significant public health benefits.

We examined a variety of settings for improving physical activity, which should be relevant to most communities. Schools can choose to increase the length or number of physical education classes or simply to increase students' activity levels during existing classes. In workplaces, many possibilities exist, depending on available space and resources. Point-of-decision prompts can be posted to encourage people to use the stairs as an alternate to elevators or escalators. Social support interventions can form the basis for exercise teams or groups, and individually-adapted health behavior change programs can augment these groups or involve individuals who prefer to work toward their activity goals alone. Access to places to exercise can be increased (e.g., extending gym hours beyond working hours) and creating



walking trails or other areas for physical activity (e.g., a health center or gym) may be possible.

Community centers and faith-based groups may also choose to implement social support interventions and individually-adapted health behavior change programs. Depending on the structure of their facilities, the opportunity may exist to use point-of-decision prompts. These groups may also help members get to nearby exercise facilities (e.g., by providing transportation or child care).

Community-wide campaigns involve many community sectors. Increasingly, practitioners who conduct interventions in community settings to increase physical activity are recognizing that involvement of sectors outside of traditional public health is essential. These partnerships often involve urban and transportation planners, officials in parks and recreation, economists, and elected officials concerned about urban sprawl. Each community can decide for itself which groups to involve in the planning and implementing of these programs and the specific approaches to be used (e.g., where and how often to advertise). Even communities with limited resources may find that simple campaigns (e.g., supported by donated time and services from local media outlets, charitable groups, print shops, or delivery services) can help raise awareness of the need to increase physical activity and provide suggestions for doing so.

## **CONCLUSION**

This chapter summarizes conclusions and recommendations to date from the Task Force on interventions to increase physical activity using three types of approaches: informational, behavioral and social, and environmental and policy. To increase physical activity using informational approaches, the Task Force recommends community-wide campaigns and point-of-decision prompts. Evidence was insufficient to determine the effectiveness in increasing physical activity of mass media campaigns or classroom-based health education focused on providing information.

To increase physical activity using behavioral or social approaches, the Task Force recommends school-based physical education, individually-adapted health behavior change programs, and social support interventions in community settings. Evidence was insufficient to determine the effectiveness in increasing physical activity of college-based health education and physical education; classroom-based health education focusing on reducing television viewing and video game playing; or family-based social support.

To increase physical activity using environmental or policy approaches, the Task Force recommends creation of or enhanced access to places for physical activity combined with informational outreach activities, and point-of-decision prompts.

Details of these reviews have been published<sup>37,147,148</sup> and these articles, along with additional information about the reviews, are available at [www.thecommunityguide.org/pa](http://www.thecommunityguide.org/pa).

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