

**State Nutrition, Physical Activity and Obesity (NPAO) Program  
Technical Assistance Manual  
January 2008  
Centers for Disease Control and Prevention  
Division of Nutrition, Physical Activity  
And Obesity**

**Section III:  
Interventions and Strategies Addressing  
NPAO Principal Target Areas**

## Introduction

The national Nutrition and Physical Activity O program supports state efforts to work with communities to develop, implement, and evaluate interventions that address behaviors related to the following six principal target areas:

- Increase physical activity
- Increase consumption of fruits and vegetables
- Decrease the consumption of sugar-sweetened beverages
- Reduce the consumption of high-energy-dense foods
- Increase breastfeeding initiation and duration
- Decrease television viewing

This section of the manual provides the background and rationale for the target area, intervention strategies and examples of interventions. The example interventions are provided as illustrations of the strategy only; therefore, materials may not be available to replicate the intervention. The summary of intervention strategies for each target area describes systematic reviews of the effectiveness of interventions. If a systematic review is not available, the summary includes the best evidence available from the peer-reviewed literature. This manual is a living document, and it will be updated as more evidence related to the effectiveness of interventions is reported in the literature.

### ***Design and Implement Strategies and Interventions***

Public health practitioners can implement interventions at every level of the Social-Ecological Model (societal, community, organizational, interpersonal, and individual levels). The Socio-Ecological Model in the figure on the next page shows the various behavioral settings and stakeholders that commonly exist in a community.

Interventions to prevent and control obesity should include an approach that creates environments, policy and practices that support both the increase in physical activity and improvement in dietary behaviors within the target audience. Interventions that are multi-component (education with skill-building, creating access with campaigns for awareness, etc.) go beyond the audience acquiring new knowledge and toward building skills and practicing the desired behavior. Approaches and interventions selected should be determined only after formative assessment of the target audience (as provided in the social marketing and the evaluation framework process). Further assessment of the target audience and their needs, barriers and goals will direct the practitioner to the most appropriate intervention to reach the target population's nutrition and physical activity goals. See Appendix A, "Social Marketing, the Social Ecological Model, and Evidence-Based Strategies," for more information on how to use social marketing and the Social-Ecological Model when planning and implementing interventions. Evaluation planning in the early stages of developing interventions is also critical. Guidance on how to evaluate interventions is included in the section "Evaluation Guidance for State NPAO Programs" on page 24.

### **Community Framework for Addressing Overweight and Obesity**

#### ***Evidence-Based Intervention Strategies***

The paragraph titled "Effectiveness" included for each strategy describes the effectiveness of interventions reported in systematic reviews and individual studies published in peer-reviewed journals. One of the most rigorous types of evidence is the scientific reviews of published studies conducted by the Task Force on Community Preventive Services. From these reviews, the Task Force makes recommendations that are published as part of the *Guide to Community Preventive Services*, commonly referred to as the Community Guide. The Community Guide has several reviews in process; however, only a few recommendations have been published related to physical activity, nutrition, and obesity. The

Community Guide has found sufficient evidence to recommend eight community interventions that include informational; behavioral and social; and environmental and policy approaches to increase physical activity. It also found sufficient evidence to recommend that interventions in the worksite that combine nutrition and physical activity are effective in helping employees lose weight and keep it off in the short term. Additional resources on interventions and strategies are also available.

- The national NPAO Program has a Prevention Research Center cooperative agreement special interest project with the University of North Carolina Center of Excellence for Training and Research Translation to develop a Web site, [www.center-trt.org](http://www.center-trt.org) that provides practitioners with the best available evidence for interventions and strategies related to the prevention and control of obesity.
- The Community Guide recommendations are available on their Web site, [www.thecommunityguide.org](http://www.thecommunityguide.org). A link in the Community Guide's "Research Tested Intervention Programs" provides access to the next Web site:
- <http://cancercontrolplanet.cancer.gov/index.html>. This site provides general examples and access to materials sorted by the Community Guide strategies. It is important however, to tailor interventions to the needs, cultures, and barriers of the target audience. Additional tools are also provided on this Web site to assist in properly adapting evidence-base programs: [http://cancercontrol.cancer.gov/use\\_what\\_works/start.htm](http://cancercontrol.cancer.gov/use_what_works/start.htm)

### ***Terminology Used in This Section of the Manual***

*Intervention strategy:* The term strategy is not used consistently in evidence summaries and literature reviews of interventions. In this manual the term strategy is used to describe an approach, course of action, or method used to achieve an objective, which in turn is a means to achieving a goal. A strategy may be a health intervention at the individual or population level, but it can also refer to such things as a systems change initiative. Please note that the Community Guide does not use the term strategy to describe the eight community interventions that are recommended to promote physical activity. However, they are defined as strategies in this manual so a consistent term can be used throughout the document.

*Intervention:* Any kind of planned activity or group of activities (including programs, policies, and laws) designed to prevent disease or injury or promote health in a group of people. (For the definition and characteristics of an intervention that are used by NPAO for the state reporting in the PMR, see Appendix C.)

*Intervention example:* Examples of interventions are provided as illustrations of the strategy. They were obtained from the Community Guide review, other objective reviews, or peer-reviewed articles. Other interventions consistent with the strategy may also exist. Users of this manual may not always find available materials to replicate the interventions described in this manual.

Sources for the Community Framework for Addressing Overweight and Obesity:

Sobush K, Dunet D, Kettel Khan L. Common community measures for obesity prevention. Draft Methodology Report. Atlanta, GA: CDC, 2007.

Institute of Medicine. 2007. Progress in preventing childhood obesity: how do we measure up? Washington, DC: The National Academies Press, 2007.

## Target Area: Physical Activity

### **Background and Rationale**

Regular physical activity helps maintain good health across the life stages. It substantially reduces the risk of coronary heart disease—the nation's leading cause of death and decreases the risk for stroke and breast and colon cancer. It also contributes to healthy bones, muscles, and joints and promotes healthy growth and development in children and reduces the risk of falls among older adults. Physical activity reduces the risk of anxiety and depression and promotes psychological well-being, and is associated with fewer hospitalizations, physician visits, and medications. Regular physical activity is effective, recommended treatment for many chronic diseases, including arthritis, heart disease, high blood pressure, high blood cholesterol, osteoporosis, diabetes, and chronic lung disease. In addition, physical activity, combined with appropriate calorie intake, is an important component of weight control. In both adults and children, physical activity reduces the adverse effects of overweight and obesity, such as elevated blood pressure, hyperlipidemia, and glucose intolerance (1-3).

Despite these well-documented benefits, 52% of U.S. adults in 2005 did not engage in recommended amounts of physical activity; during that same time, 27.5% of adult men and 23.2% of adult women did not engage in any physical activity during their leisure time (4) [BRFSS 2005]. There is also cause for concern among adolescents: In 2003, for example, 10% of surveyed youth had not participated in any moderate or vigorous physical activity during the prior week (4) [YRBS 2005].

Barriers for individuals include lack of time, energy, motivation, skills, resources, and supportive social environments; concerns about injury; inclement weather; age-related loss of fitness and health problems (5-7). Community barriers for physical activity include lack of access to quality recreational facilities (i.e., parks, trails, and gyms) and public transit (bicycle and pedestrian infrastructure and connectivity)(8-9).

Changing physical activity behaviors requires an understanding of how factors at each level of the social ecological model affect the individual's physical activity. Therefore, understanding the determinants of physical activity becomes the cornerstone in setting policies, recommendations, and guidelines that better enable individuals and communities to engage in physical activity as part of a healthier lifestyle and helps to guide the development, implementation, and evaluation of interventions. Physical activity resources for health professionals may be found on CDC's Web site:

[http://www.cdc.gov/nccdphp/dnpa/physical/health\\_professionals/index.htm](http://www.cdc.gov/nccdphp/dnpa/physical/health_professionals/index.htm)

### **Overview of Strategies**

The Community Guide recommends the following eight community-level physical activity intervention strategies (10-12). Though they are described separately, these interventions are typically multi-component and can share the same components in practice. For example, community-wide campaigns can simultaneously use social support and point-of-decision prompts to create or enhance access to places for physical activity. For any intervention strategy to be selected, decision-makers should consider these interventions in light of factors such as community resources, needs, priorities, and constraints.

### **Community Guide Approaches and Interventions**

#### *Informational*

- Community-wide campaigns
- Point-of-decision prompts

#### *Behavioral and social*

- Individually adapted health behavior change programs
- Enhanced school-based physical education

- Social support interventions in community settings

### *Environmental and policy*

- Creation of or enhanced access to places for physical activity combined with informational outreach activities
- Community-scale urban design/land-use policies and practices
- Street-scale urban design/land-use policies and practices

### **Promising Interventions**

- Safe Routes to School

### **References**

1. Haskell WL, Lee I-M, Pate RP, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation* 2007;116:1081–93.
2. DHHS. Physical activity and health. A report of the Surgeon General 1996. [On-line Access] <http://www.cdc.gov/nccdphp/sgr/sgr.htm>
3. Strong WB, Malina RM, Limkie CJ, et al. Evidence based physical activity for school-age youth. *J Pediatr* 2005; 146:732-7.
4. DNPA. Importance of physical activity. [On-line Access] <http://www.cdc.gov/nccdphp/dnpa/physical/importance/index.htm>
5. Sallis JF, Hovell MF. Determinants of exercise behavior. *Exercise and Sport Science Reviews* 1990;18:307-330.
6. Sallis JF, Hovell MF, Hofstetter CR. Predictors of adoption and maintenance of vigorous physical activity in men and women. *Preventive Medicine* 1992;21(2):237-251.
7. DHHS. *Promoting physical activity: a guide for community action* 1999. and DNPA Overcoming Barriers to Physical Activity: <http://www.cdc.gov/nccdphp/dnpa/physical/life/overcome.htm>
8. Schmid T, Pratt M, Howze E. 1995. Policy as intervention: environmental and policy approaches to the prevention of cardiovascular disease. *Am J Public Health* 1995;85(9): 1207-11.
9. Active Community Environments Initiative: [http://www.cdc.gov/nccdphp/dnpa/physical/health\\_professionals/active\\_environments/aces.htm](http://www.cdc.gov/nccdphp/dnpa/physical/health_professionals/active_environments/aces.htm)
10. CDC. Increasing physical activity: A report on recommendations of the Task Force on Community Preventive Services. *MMWR* 2001;50(RR18):1-16.
11. CDC. Guide to preventive services: systematic reviews and evidence-based recommendations—physical activity 2005. (<http://www.thecommunityguide.org/pa/>)
12. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002; 22(4S):73-107.

## **Physical Activity Strategy 1: Community-Wide Campaigns**

### *Description (1-5)*

Community-wide campaigns can successfully integrate multiple strategies in community settings to positively affect levels of physical activity and related outcomes.

The following are general characteristics of community-wide campaigns:

- They are large-scale, intense, and highly visible, with messages directed to large audiences through various media, including television, radio, newspapers, movie theaters, billboards, and mailings.
- They include non-media components such as:
  - partnerships
  - environmental change (e.g., new walking trails)
  - policy change
  - social support (e.g., buddy system, self-help groups)
  - physical activity counseling

### *Examples*

- Wheeling Walks (6) used paid advertising to encourage walking among sedentary older adults. The program's campaign activities included paid newspaper, TV and radio advertising; weekly press conferences and news coverage; worksite programs; Web site exposure; and other public health education programs implemented by physicians, health professionals, and ministers. The results indicate that 30% of Wheeling's sedentary residents increased their walking to the recommended level compared to a 16% increase in a control community.
- BC Walks (7) promoted 30 minutes or more of moderate-intensity daily walking among insufficiently active residents of Broome County, New York, aged 40 to 65 years. Promotion activities included paid advertising, media relations, and community health activities. Impact was determined by pre-intervention and post-intervention random-digit-dial cohort telephone surveys in intervention and comparison counties. Exposure to the campaign was reported by 78% of Broome County survey respondents. Sixteen percent of Broome County participants changed from nonactive to active walkers compared to 11% in the comparison county. Forty-seven percent of Broome County respondents reported any increase in total weekly walking time compared to 36% in the comparison county.

### *Effectiveness (2-4)*

- The Community Guide rates the evidence for community-wide campaigns as strong.
- The recommendation for community-wide campaigns is based on review of 10 studies in which the median effect size suggests these campaigns result in a 5% increase in the proportion of the population that is physically active, and a 16% increase in average, individual energy expenditure.
- In addition to increasing physical activity, community-wide campaigns were often shown to improve community capacity by developing or strengthening social networks and by improving community members' sense of cohesion as well as their collective ability to bring about change.
- This strategy is effective among diverse populations (e.g., different racial/ethnic and socioeconomic groups) and in diverse settings (e.g., rural, urban).

## References

1. Brownson RC, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. *Ann Rev Public Health* 2006;27:341-70.
2. CDC. Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. *Morbidity and Mortality Weekly Report* 2001;50(RR18):1-16.
3. CDC. 2005. Guide to preventive services: systematic reviews and evidence-based recommendations—physical activity. (<http://www.thecommunityguide.org/pa/>)
4. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Prev Med* 2002;22(4S), 73-107.
5. Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? *Am J Health Promotion* 2005;19(3):167-93.
6. Reger-Nash B, Bauman A, Booth-Butterfield S, et al. Wheeling Walks: Evaluation of a media-based community intervention. *Family & Community Health* 2005;28(1):64-78.
7. Reger-Nash B, Fell P, Spicer D, Fisher BD, et al. Walks: replication of a communitywide physical activity campaign. *Prev Chronic Dis* 2006 3(3):A90.

## **Physical Activity Strategy 2: Point-of-Decision Prompts for Stairwell**

### *Description (1-5)*

Point-of-decision prompts are low-cost, easy to implement, and effective ways to increase levels of physical activity by increasing the number of individuals who use stairs instead of elevators or escalators in worksites and elsewhere in the community. Most interventions are multi-component involving physical change of stairwell, promotion of stairwell as a means of daily physical activity and sometimes include a challenge or competition. The following are general characteristics of Point-of-Decision Prompts for Stairwells:

- Visual cues (e.g., signs or banners posted near elevators, escalators, or moving walkways) designed to encourage individuals to use stairs.
- A variety of messages highlighting the benefits of physical activity, weight loss, and saving time. Examples (6) include: “Your heart needs exercise, use the stairs.” “Improve your waist line, use the stairs.”
- Signs designed to be highly visible (e.g., through placement and size).
- Reminders to people that opportunities to be more physically active are nearby.
- Making stairs a viable and appealing option by ensuring stairwells are accessible, safe, well-lighted, and clean, and by providing music or displaying art.

### *Example*

- *Stairwell to Better Health* (6) was a study conducted by CDC’s Division of Nutrition and Physical Activity to determine if making physical changes to a stairwell in the Atlanta-based, Koger Center Rhodes Building, along with adding music and motivational signs would motivate employees to use the stairs instead of the elevator.

### *Effectiveness (2-4)*

- The Community Guide rates the evidence for point-of-decision prompts as sufficient.
- The recommendation for point-of-decision prompts is based on review of six studies in which the median effect size suggests that these prompts increase stair use by 54%.

- This intervention is effective among diverse populations (e.g., men, women, the obese, older adults) and in diverse settings (e.g., malls, subways, trains, bus stations, university libraries).

### **References**

1. Brownson RC, Haire-Joshu D, Luke DA. Shaping the context of health: a review of environmental and policy approaches in the prevention of chronic diseases. *Ann Rev Public Health* 2006;27:341-70.
2. CDC. Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. *MMWR* 2001;50(RR18):1-16.
3. CDC. Guide to preventive services: systematic reviews and evidence-based recommendations –physical activity 2005: (<http://www.thecommunityguide.org/pa/>)
4. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. *Am J Preventive Medicine* 2002;22(4S):73-107.
5. Matson-Koffman DM, Brownstein JN, Neiner JA, Greaney ML. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? *Am J Health Promotion* 2005;19(3):167-193.
6. Kerr NA, Yore MM, Ham SA, Dietz WH. Increasing stair use in a worksite through environmental changes. *Am J Health Promotion* 2004;18(4):312–15.

### **Physical Activity Strategy 3: Individually Adapted Health Behavior Change Programs**

#### *Description (1-3)*

Individually adapted health behavior change programs can increase physical activity in diverse settings and among diverse populations. The following are general characteristics of individually adapted health behavior change programs:

- Targeting participants in a variety of community settings (through workshops and seminars) or larger populations (through web-based programs, mail, or telephone) which may provide opportunities to reach larger numbers of people at less expense.
- Tailoring to an individual's specific interests, preferences, and readiness for change.
- Follow-up phone calls or monitoring by a counselor or coach.
- Teaching of behavioral skills such as:
  - setting goals and monitoring progress
  - building social support for new behavioral patterns
  - reinforcing behavior through self-reward and positive self-talk
  - problem solving geared toward maintenance of behavior change
  - preventing relapse into sedentary behaviors

#### *Examples*

- *The Strong for Life Program* (4) was cited by the Community Guide as one example of an evidenced-based program to increase physical activity in sedentary older adults. The program consisted of a 35-minute videotaped program of 11 exercises performed by a trained leader. Participants used color-coded elastic bands of varying resistance. Those in the program also received two home visits by a physical therapist who also reviewed behavioral techniques to maintain program adherence and progression such as goal setting, rewards, behavioral contracts and self-monitoring. This program resulted in significant improvements in the intervention group as opposed to the control group (those on waiting list) in the areas of hip extension, hip abduction, shoulder abduction in addition to a significant reduction (18%) in overall disability.
- *Active Choices* (5): One of the Active for Life interventions developed at the Stanford Prevention Research Center, Active Choices is a telephone-assisted physical activity counseling program for

older adults that helps to incorporate more physical activity into their daily lives. The program includes an introductory face-to-face session with a health educator in order to determine realistic, individualized exercise plans. Written information on physical activity is also provided to help increase understanding of the different aspects of physical activity and to motivate behavior change. This initial session is followed by regular telephone contacts initiated by the health educator. This program was shown to be effective from pretest to posttest in increasing moderate-to-vigorous physical activity and total physical activity. In addition, participants reported improvements in satisfaction with body appearance, body function, depressive symptoms, perceived stress, and decreased BMI.

#### *Effectiveness (1-3)*

- The Community Guide rates the evidence for individually adapted health behavior change interventions as strong.
- The recommendation for individually adapted behavior change is based on review of 18 studies in which the median effect size suggests this intervention increases an individual's physical activity by 35% and energy expenditure by 64%.
- Individually adapted behavior change increases other measures of physical activity, such as the percentage of people starting exercise programs and the frequency of physical activity.
- These interventions are effective among diverse populations (e.g., different racial/ethnic minority and socioeconomic groups) and in diverse settings (e.g., communities, worksites, schools).

#### **References**

1. CDC. Increasing physical activity; a report on recommendations of the Task Force on Community Preventive Services. MMWR 2001;50(RR18):1-16.
2. CDC. Guide to preventive services: systematic reviews and evidence-based recommendations—physical activity. 2005. <http://www.thecommunityguide.org/pa/>
3. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. Am J Preventive Med 2002;22(4S):73-107.
4. Jette A et al. Exercise—it's never too late: the strong-for-life program. AJPH 1999;89(1):66-72.
5. Wilcox S, Dowda M, Griffin SF, Rheaume C, et al. Results of the first year of Active For Life: translation of 2 evidence-based physical activity programs for older adults in community settings. Am J Public Health 2006;96(7):1201-09.

#### **Physical Activity Strategy 4: Enhanced Physical Education (PE) in Schools**

##### *Description (1-3)*

School-based PE interventions have been shown to increase the amount of time youth are moderately to vigorously physically active in PE classes. Characteristics of this intervention could also be applied in a variety of youth-oriented settings, such as after-school programs and community and recreation centers. The following are general characteristics of enhanced physical education programs:

- Increase in the amount of time a child is physically active in class.
- Increase in length and frequency of classes.
- Increase in the number of children moving as part of a game/activity.  
by modifying game rules (e.g., in softball, having the entire team run the bases)  
or changing activities (e.g., replacing softball with soccer, so more students are active).
- High equipment-to-student ratio (e.g., at least every other student has a ball or jump rope).
- Active instruction and class management (e.g., students walk during roll call or engage in an activity while returning equipment).

- Use of limited and appropriate competition (e.g., no individual competition, a reduced emphasis on winning).
- Enthusiastic role models and reinforcement for active students.
- Focus on activities that are enjoyable to the children.
- Classroom instruction and/or behavior change strategies, such as goal setting, decision-making, and self management.
- Health-education activities.

### *Examples*

- CATCH (Coordinated Approach to Child Health) (4) uses a multi-component behavioral health intervention to be delivered in grades 3, 4, and 5 to students of diverse communities. CATCH consists of components that are school-based (school food service, physical education, and classroom curricula) and family-based (home curricula, family fun nights), and are aimed at decreasing consumption of fatty and salty foods and increasing physical activity. Curricula are implemented by classroom teachers over a specific time period during the school year. CATCH has been shown to increase moderate-to-vigorous physical activity in PE classes and exceeds the Healthy People 2010 goal of greater than 50% of (PE) class time should be devoted to moderate-vigorous activity.
- SPARK (Sports, Play, and Active Recreation for Kids) (5) promotes high levels of enjoyable physical activity among fourth- and fifth-grade students during physical education classes and outside of school. SPARK consists of a physical education component and a self-management component. The physical education includes health fitness activities such as aerobic dance, aerobic games, walking/jogging, and jump rope, combined with skill-fitness activities such as basketball and soccer. The self-management program teaches behavioral change skills to help children generalize regular physical activity outside of school. Students spent significantly more minutes being physically active in specialist-led and teacher-led classes than in control groups. Also, two years later, girls in specialist-led classes were superior in abdominal strength and cardiorespiratory endurance than girls in control classes.

### *Effectiveness (1-3)*

- The *Community Guide* rates the evidence for school-based PE as strong.
- The recommendation for school-based PE is based on review of 14 studies, in which the median effect size suggests that PE interventions result in an 8% increase in aerobic fitness among school-aged children.
- This strategy is effective among diverse populations (e.g., different racial/ethnic minority and socioeconomic groups, boys and girls, elementary- and high-school students) and in diverse settings (e.g., rural, urban).

### **References**

1. CDC. Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. MMWR 2001;50(RR18):1-16.
2. CDC. Guide to preventive services: systematic reviews and evidence-based recommendations—physical activity, 2005. (<http://www.thecommunityguide.org/pa/>)
3. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. Am J Preventive Med 2002;22(4S):73-107.
4. Perry C, Lytle L, Feldman H, et al. Effects of the child and adolescent trial for cardiovascular health (CATCH) on fruit and vegetable intake. J Nutr Ed 1998;30:354-60.

5. Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Faucette N, Hovell MF. The effects of a 2-year physical education program (SPARK) on physical activity and fitness in elementary school students. *Am J Public Health* 1997;87(8):1328-34.

### ***Physical Activity Strategy 5: Social Support in Community Settings***

#### *Description (1-3)*

Social support interventions can create, strengthen, and/or maintain new or preexisting social networks that provide supportive relationships for physical activity behavior change and which address barriers to exercise and negative perceptions about activity. The following are general characteristics of social support interventions in community settings:

- Buddy systems.
- Making contracts with others to complete specified levels of physical activity
- Walking or other activity groups to provide companionship, friendship, and support while being physically active.
- Monitoring of progress (e.g., through phone calls from other participants or project staff to encourage continued participation).

#### *Examples*

- *Physical activity training for weight loss in Latinas* was a controlled trial (4) that consisted of a support group that attended 10 weekly one-hour sessions and included self-monitoring using diaries and exercise, as well as describing the assistance received from an assigned buddy. Additionally, women were taught problem-solving skills such as identifying weight-related or exercise-related problems, generating a plan for solving the problem, implementing the plan, evaluating the outcome, as well as re-evaluating and revising the plan if not successful. Women participating in this study showed significant reductions in body mass index, waist-to-hip ratio, waist circumference, and hip circumference, and increases in fitness, as well as frequency of walking for exercise.
- *Healthy Mothers On the Move (MOMs), (Madres Saludables en Movimiento)* (5) is a community-based program that consists of a 10-week curriculum designed to increase knowledge, skills, and reduce physical and social environmental barriers to stress management, health-promoting exercise, and dietary practices for pregnant and post-partum Latino women. Women's Health Advocates (WHA's) lead curriculum-focused meetings as well as make phone calls and home visits to the participants. Weekly group discussions garner social support (through mothers addressing their concerns, ideas, and successes) as well as provide skill-building activities (food demonstrations, exercise classes, stress management lessons, etc.). Participants in the program report an increase in physical activity as well as healthier eating.

#### *Effectiveness (1-3)*

- The Community Guide rates the evidence for community social support as strong.
- The recommendation is based on review of nine studies, in which the median effect size suggests this intervention results in a 44% increase in time spent being physically active and a 20% increase in energy expenditure.
- This intervention is effective with diverse populations (e.g., men, women, adults of different ages, sedentary individuals, physically active individuals) and in diverse settings (e.g., communities, worksites, universities).

## References

1. CDC. Increasing physical activity: a report on recommendations of the Task Force on Community Preventive Services. MMWR 2001;50(RR18):1-16.
2. CDC. Guide to preventive services: systematic reviews and evidence-based recommendations—physical activity 2005. (<http://www.thecommunityguide.org/pa/>)
3. Kahn ET, Ramsey LT, Brownson RC, Heath GW, et al. The effectiveness of interventions to increase physical activity: a systematic review. Am J Preventive Med 2002;22(4S):73-107.
4. Avila P, Hovell MF. Physical activity training for weight loss in Latinas: a controlled trial. Int J Obesity & Related Metabolic Disorders 1994;18(7):476-82.
5. Healthy Mothers On the Move, Madres Saludables en Movimiento, Translation Trial, Dr. Edie Kieffer, NIDDKD grant #5 R18 DK 062344, July 1, 2002 - June 30, 2007.

## **Physical Activity Strategy 6: Create or Enhance Access to Places for Physical Activity Combined with Informational Outreach Activities**

### *Description (1-5)*

This intervention provides and promotes physical activity opportunities for the target population by creating or improving access, combined with distribution of information. Efforts often involve the efforts of communities, worksites, coalitions, and agencies, and they create or improve access to places and facilities where people can be physically active.

The following are general characteristics of interventions that create or enhance access to places for physical activity, combined with informational outreach activities:

- Creating access such as building a new facility or walking trail or providing access to an existing nearby facility in a community where an opportunity for physical activity did not exist.
- Enhancing or improving access or eliminating barriers to improve physical activity opportunities such as adding new equipment or extending facility hours of operation, extending or improving walking trails.
- Involving the efforts and partnerships of various community entities (e.g., worksites, coalitions, agencies, and community members) to create an ongoing and sustainable supportive environment for physical activity.
- Multi-component interventions that promote and sustain environmental or policy changes (e.g., promotion/awareness, skill-building, health education, referrals to physicians or additional services, health and fitness programs, and support or buddy systems).

### *Examples*

- The Stanford University's Health Improvement Program (HIP) (6) was an employee health program that aimed to increase physical activity and decrease weight. The intervention was a 16-week exercise program on a nearby worksite parcourse that consisted of 19 different activity stations placed around a 1½ mile course. Also, free ninety-minute exercise classes, occurring immediately after work, were offered to employees twice a week. Participants were also provided exercise-related information about potential health benefits of regular aerobic activity and were encouraged to exercise at least one additional time per week outside of class in order to reach the program goal of exercising at least three times a week. Those attending the classes showed significant increases in fitness and decreases in weight and significantly greater confidence concerning their ability to exercise regularly and increased energy relative.
- The Physical Activity for Risk Reduction (PARR) (7) project sought to promote physical activity among low-income and low-education African American residents of public housing and rental communities in Birmingham, Alabama. PARR enhanced access to existing facilities and physical activity programming by providing childcare, transportation, enhanced safety, and peer-led programming. To

ensure enhanced access to facilities and programming, the PARR staff recruited and extensively trained individuals from each community and paid them as part-time leaders for the local activity sessions. Each participating community also received physical activity tools as well as incentives for participants that included weightlifting equipment, supplies for aerobics programs (including audiotapes and boom boxes), tools for screening participants (scales, stethoscopes and sphygmomanometers), and prizes for participation (mugs, t-shirts, certificates for free laundry, etc). As part of data collection prior to program implementation, several barriers to physical activity were addressed such as childcare, transportation, organized and facilitated walking groups, safer walking routes, and waived fees at local community recreation centers for a full year. Sixty-nine percent of community members attended at least one event.

#### *Effectiveness (2-4)*

- The Community Guide rates the evidence for creating or enhancing access combined with informational outreach to places for physical activity as strong.
- The recommendation for creating or enhancing access to places for physical activity is based on review of 10 studies in which the median effect size suggests this intervention results in a 25% increase in the proportion of the population who are physically active at least three times per week.
- Most of the studies reported weight loss or decrease in body fat among participants.
- This intervention is effective among diverse populations (e.g., different racial/ethnic minority and socioeconomic groups) and in diverse settings (e.g., low-income communities, industrial plants, universities, federal agencies).

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#### **Physical Activity Strategy 7: Street-Scale Urban Design and Land-Use Policies and Practices**

##### *Description (1,2)*

Using street-scale urban design and land-use policies and practices can help increase physical activity among target populations. The following are general characteristics of street-scale urban design and land-use policies and practices:

- They are implemented in small geographic areas, generally a few blocks.
- Urban-design elements and practices include:
  - ensuring sidewalk construction or improvements

- increasing the ease and safety of crossing streets
- introducing or enhancing traffic-calming and speed-reduction measures (e.g., speed bumps, traffic circles)
- improving street lighting
- enhancing aesthetics of the street landscape
- addressing safety issues (e.g., perception of crime)
- Land-use policies and practices include:
  - environmental changes
  - roadway design standards
  - zoning regulations
  - building codes
  - builders' practices
- A broad array of disciplines and expertise are used, such as public health professionals, urban planners, architects, engineers, and developers.

*Example*

- Sunnyside Piazza (3) was a neighborhood revitalization effort, the goal of which was to convert a neighborhood intersection that was in disrepair into an attractive community gathering place. They used artistic features intended to foster a sense of community, and they enhanced the street landscape, repaired and improved sidewalks, including the installation of a canopy. The intersection was enhanced by including a large sunflower street mural, a community kiosk with a solar-powered lamp, an art wall, seating areas adorned with glass mosaic, and overarching trellised hanging gardens in front of nearby homes. The multidisciplinary team for the project included local nonprofit organizations that addressed city repairs, resident landscape designers and architects, advocates, and other community members.

*Effectiveness (1-3)*

- The Community Guide rates the evidence for street-scale urban design and land-use policies and practices as sufficient.
- The recommendation for street-scale urban design is based on review of six studies, in which the median increase in physical activity across all effect measures (difference or change in people walking, number active, or users of path or cyclists) was 35%.
- Other potential benefits include improvements in green space, increased sense of community, decreased isolation, and reduction in crime and stress.

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## **Physical Activity Strategy 8: Community-Scale Urban Design and Land-Use Policies and Practices**

### *Description (1,2)*

Community-scale urban design and land-use regulations, policies and practices commonly strive to create more livable communities. The following are general characteristics of Community-scale urban design and land-use policies and practices:

- Typically represent large geographic areas, generally several square miles or more and involve a broad array of disciplines and expertise, such as public-health professionals, urban planners, architects, engineers, and developers.
- Design elements and practices, such as:
  - ensuring sidewalk construction or improvements
  - increasing the ease and safety of crossing streets
  - introducing or enhancing traffic-calming and speed-reduction measures (e.g., speed bumps, traffic circles)
  - improving street lighting
  - enhancing aesthetics of the street landscape
  - addressing safety issues (e.g., perception of crime)
  - considering community design, density, and diversity by planning mixed-development communities; addressing the density and diversity of residential and commercial development; and locating stores, jobs, schools, and recreation areas within walking distance of where people live
- Land-use policies and practices, such as:
  - environmental changes
  - roadway design standards
  - zoning regulations
  - building codes
  - builders' practices

### *Example*

- *The Montgomery County, Maryland Pedestrian Safety Advisory Committee* (3-5) appointed a Blue Ribbon Panel on Pedestrian and Traffic Safety in June 2000 under growing concerns about pedestrian safety and access amidst increasing pedestrian fatalities. As part of their research, the panel, consisting of 40 multidisciplinary members, analyzed trends and examined all aspects of hazardous driving from both behavioral and engineering perspectives.

The panel released a report of their work in 2002 that outlined 54 recommendations organized by a) education, b) enforcement, c) engineering, and d) legislation. The report recommended a pedestrian impact statement as a requirement for all construction projects. The statement includes assessment of connectivity with destinations within two miles; master plan items for sidewalks, bikeways, and streetscape requirements; existing conditions related to pedestrian walkability and safety; and recommended improvements and their related costs. Developers in Montgomery County were encouraged to assess pedestrian impact on both new and existing projects.

Following this report, a recommendation was made to create the Pedestrian Safety Advisory Committee to oversee the implementation of the recommendations made in the Blue Ribbon Panel report. The Pedestrian Impact Statement Policy was formally adopted in May 2004. Collaboration with developers was key, but most were already conducting similar assessments so the new county policy was adopted with little resistance.

In July 2007 legislation was approved to require all capital improvement projects to submit bicycle and pedestrian impact statements. The Pedestrian Safety Advisory Committee continues to sustain itself as a

committee within the county executive government and continues to set the agenda and report on the status of the implementation of the recommendations made by the Blue Ribbon Panel Report.

#### *Effectiveness (1-3)*

- The Community Guide rates the evidence for community-scale urban design and land use policies and practices as sufficient.
- The recommendation for this intervention is based on review of 12 studies in which the median increase across a variety of measures of physical activity related to these interventions was 161%.
- Other potential benefits include improvements in green space, increased sense of community, decreased isolation, and reductions in crime and stress.

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#### **Physical Activity Strategy 9: Safe Routes to School**

##### *Description*

Safe Routes to School interventions are designed to increase the number of youth walking or bicycling to school. These interventions are referred to in a number of ways (e.g., Active Transportation to School, KidsWalk, Walk to School, Walking School Bus) and are of particular interest to public health because of their potential to increase physical activity and improve health among a large number of youth (1-7). Central to this intervention is the creation of an action plan to identify strategies and their solutions across the four “E’s”: 1) Education programs that teach motorists, pedestrians and bicyclists about their responsibilities and about traffic rules; 2) Enforcement enlists the help of local law enforcement to focus efforts in problem areas and increase community awareness of school safety issues; 3) Engineering tools include a variety of street design techniques that can reduce traffic volumes, decrease speed, and improve safety; and 4) Encouragement which includes developing awareness and building enthusiasm for walking and biking. Therefore, these interventions include multiple components including those recommended by the Community Guide (i.e., promotional campaigns, urban design and land-use policies and practices at both the street- and community-scale levels.)

Specific examples of components in Safe Routes to School programs include:

- Addressing infrastructure (8-10):
  - ensuring sidewalk construction or improvements (e.g., continuity of sidewalks)
  - increasing the ease and safety of crossing streets
  - introducing or enhancing traffic-calming and speed-reduction measures (e.g., speed bumps, traffic circles)
  - improving street lighting
  - enhancing aesthetics of the street landscape
  - addressing safety concerns and issues (e.g., perception of crime, bullying)

- providing and securing bicycle facilities
- Changing policy or practices (11-13):
  - environmental changes
  - roadway design standards
  - zoning regulations
  - building codes
  - builders' practices
- Promoting and/or changing behavior (13):
  - safety campaigns
  - walking and bicycling skill building
  - active transport campaigns
  - penalties for disobeying of traffic or pedestrian laws
- Involvement of partners (8,9,11,12,13):
  - a broad array of community members, disciplines and expertise, such as students, parents, teachers, school administrators, public-health professionals, urban planners, architects, engineers, and developers.

Safe Routes to School legislation was passed in 2005 as part of SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users [Public Law 109-59]) (14). The law provides funding for state departments of transportation to create and administer programs to make walking and bicycling to school a safe and viable option for children in grades in grades K–8. Construction and capital improvement projects must be located within approximately two miles of a primary or middle school (grades K - 8). Updates on how states are using these funds are available at the National Center for Safe Routes to School Clearinghouse (15).

*Example*

- Safe Routes to School: Arlington County, Virginia, board spearheaded a county-wide initiative to increase active transportation (i.e., walking and bicycling to school) at all public schools, joining the national Safe Routes to School effort. Schools across the county have integrated four key components:
  - ⌚ Engineering—The Department of Public Works conducted an in-depth safety evaluation of existing conditions at 32 county schools. Design issues that were identified included minor changes such as improving signage and markings at crosswalks and school zones. Major design issues that were identified included new sidewalks and traffic-calming measures, such as pedestrian refuge islands and curb extensions within a quarter mile of schools.
  - ⌚ Education—Education occurred on multiple levels: Teachers provided or reviewed safe walking tips by integrating the material into their curriculum, while parents reinforced these lessons at home. Students were provided maps that identified things like stop and yield signs, marked crosswalks, crossing guards, and bus stops. Through local media and messages on utility bills, the public information office disseminated a comprehensive public awareness campaign promoting Safe Routes to School, encouraging residents' cooperation, and discouraging parents from driving to school to ease traffic congestion.

- ⌚ Enforcement—Police increased their presence during student travel time and also ticketed for violations such as speeding, illegal turns, and crosswalk obstruction. Speed trailers were prominently displayed, and crossguards were given cell phones to report dangerous situations quickly.
- ⌚ Encouragement—The campaign praised the efforts of those walking to school and continually highlighted the health and community benefits of children walking to school.

The case study (link below) on the Arlington County project reported that more than half of the students in Arlington County are now walking to school and some schools report that as many as 95% of students walk every day. See the following description of the Arlington County program, *Community Rallies Around Safe Routes to School Program*, in the Active Living by Design Web site: <http://www.activelivingbydesign.org/index.php?id=342>

### *Effectiveness*

Though the Community Guide did not include these interventions in their review, individual studies suggest that these interventions can be effective (1,4-7).

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## Target Area: Increased Consumption of Fruits and Vegetables

### *Background and Rationale*

Fruits and vegetables contain essential vitamins, minerals, fiber, and other compounds that may help prevent many chronic diseases. Compared with people who consume a diet with only small amounts of fruits and vegetables, those who eat more generous amounts as part of a healthful diet are likely to have reduced risk of chronic diseases, including stroke and perhaps other cardiovascular diseases, and certain cancers (1-3). Fruits and vegetables are also relatively low in calories per volume of food because of their high fiber and water content; thus, in their natural form they are low in energy density. Substituting fruits and vegetables for higher-energy-dense foods, such as those high in fat and added sugars, can therefore be part of a successful weight management strategy (4,5). The CDC publication, *Can eating fruits and vegetables help people to manage their weight?* (Research to Practice Series No. 1) examines the evidence from available studies to determine whether or not eating fruits and vegetables can help with weight management (5).

Despite evidence supporting the health benefits of consuming fruits and vegetables, very few Americans consume the recommended amounts. The *Healthy People 2010* objectives for the nation (6) include increasing to 75% the percentage of persons who eat at least two daily servings of fruit and increasing to 50% the proportion of persons who eat at least three daily servings of vegetables. In 2005, only 1 in 3 adults (32.6%) met the fruit objective and 1 in 4 adults (27.2%) met the vegetable intake (7). The 2005 Dietary Guidelines (8) recommend 2 cups of fruit daily and 2 ½ cups of vegetables per day for many Americans (based on their level of physical activity and caloric needs). However, an assessment of fruit and vegetable intake found that about 1 in 10 Americans consume the recommended amounts and even fewer consume adequate variety including those delivering vital micronutrients such as dark green and orange vegetables (9). In general, Americans with lower consumption include men, younger adults, and those with less education and lower incomes. Public health approaches for eating behavior change in populations have focused on increasing individual knowledge and awareness through educational approaches. The National Fruit and Vegetable Alliance (NFVA) is a national partnership dedicated to coordinating efforts across key public and private organizations to increase the amount of fruits and vegetables consumed by Americans. CDC is the lead federal agency and health authority for the NFVA. The Fruits & Veggies—More Matters® brand<sup>1</sup> that was developed by the NFVA is used to promote fruit and vegetable consumption through health education campaigns, printed materials, and consumer Web sites: <http://www.fruitsandveggiesmorematters.org/> and <http://www.fruitsandveggiesmatter.gov>.

Many barriers prevent adequate consumption of fruits and vegetables including lack of knowledge about health benefits, availability, cost, individual taste preferences, social support, preparation skills, and time available for preparing food. Studies also show disparities in access to fruits and vegetables as

measured by type of stores, geographic distance, or store concentration (10). Choosing healthy foods is difficult in environments where retail establishments are comprised mainly of convenience stores and fast food restaurants or for individuals dependent on public transportation for supermarket access.

### *Overview of Strategies*

Several multi-component interventions that include behavioral and environmental approaches to increase fruit and vegetable consumption are published. Many of these multi-component interventions to increase fruit and vegetable consumption are included in comprehensive intervention programs to prevent cardiovascular disease or obesity that may include other interventions for dietary or physical activity behaviors. However, the term multi-component is used here to describe the different components included in the interventions to increase consumption of fruits and vegetables such as a curriculum, parent newsletters, or modifications of cafeteria menus and not multiple behaviors that the intervention program may have addressed. Efforts that show evidence of success in increasing fruit and vegetable consumption, at least in short-term assessments, have been reviewed and include interventions in schools (11,12), worksites (13-16), health care settings (14) and other community settings such as faith-

<sup>1</sup> The Fruits & Veggies—More Matters brand replaced the 5 A Day for Better Health brand in 2007.

based organizations (17) and childcare settings (18). Typical environmental strategies used in these interventions include changes in food availability (physical access or environmental opportunity), price (economic access, incentives), or promotional, advertising, and point-of-purchase information whereas policy strategies include the setting of standards for training of staff or foods served in cafeterias or meetings. Recently, greater attention has been given to the role of environmental influences on food choices and to policies that might increase access and availability to fruits and vegetables. In this manual the term access includes geographic accessibility to a food retailer (e.g., the distance to stores), the type of food retailer in the vicinity (e.g., supermarkets, small stores, or farmers' markets), and public transportation systems that provide access to food retailers. The term availability includes the number and types of fruits and vegetables offered. Increasing the availability of fruits and vegetables can be achieved through a variety of ways such as training food-service staff on how to make existing menu items more healthful by adding fruits and vegetables and partnering with the food system to provide more fruit and vegetable options.

Environmental and policy strategies address local area barriers such as access, availability, and cost of fruits and vegetables. For example, without access to grocery stores that offer a wide variety of quality, nutritious foods at lower prices, poor and minority communities may not have the ability to purchase and consume a variety of healthy food (19). Policies aimed at improving fruit and vegetable consumption should consider the physical environment, economic determinants (cost, income), and promotion strategies (marketing and advertising) with consideration of the many factors influencing decisions on food choice. Decisions related to food choice include biological determinants such as hunger, appetite, and taste; education, skills (e.g., cooking) and time; social determinants such as culture, family, peers and meal patterns; and, attitudes, beliefs and knowledge about food (20). Therefore, efforts to develop policy and environmental strategies should consider use of a social-marketing approach in the same way that planners of behavioral change strategies do. This approach will help planners understand barriers to and determinants of fruits and vegetable purchases and consumption among different demographic groups; shopping and purchasing behaviors; and how the prices of fruits and vegetables and perceptions of their quality and affordability influence purchases and ultimately consumption.

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### ***Fruit and Vegetable Strategy 1: Multi-component Interventions in Schools***

#### *Description*

Studies of multi-component interventions to increase consumption of fruits and vegetables in schools have shown that these interventions affect fruit and vegetable consumption among children positively (1). The following are general characteristics of multi-component interventions in schools:

- A classroom curriculum that involves interactive learning through skill-building and problem-solving exercises that familiarize students with fruits and vegetables such as school gardens, exercises that teach them how to prepare these foods, and also how to promote them at home.
- Parental involvement, especially for primary-school-aged children.
- Information on recipes, tips on purchasing and preparing fruits and vegetables at home, and short family assignments.
- Training for food service staff on the purchase, preparation, and promotion of fruits and vegetables.
- Training for teachers on nutrition education, fruit and vegetable promotion, and/or how to integrate the intervention goals into existing curriculum.

### *Examples*

- *Active Programme Promoting Lifestyles Schools Study (APPLES)* (2) The intervention schools received the active programme promoting lifestyle education in schools (APPLES) that consisted of teacher training, modifications of school meals to increase fruits and vegetables, and the development and implementation of school action plans designed to promote healthy eating and physical activity over one academic year. The school action plans that targeted the health curriculum, physical education, tuck shops, and playground activities were developed based on their perceived needs. The intervention targeted the whole school community including parents, teachers, and catering staff. The increase in fruit and vegetable consumption was statistically significant among children in the intervention group compared to the control group (mean difference 0.3 servings/day).
- *5 a Day Power Plus Program* (3) consists of four components: behavioral curricula for the 4<sup>th</sup> and 5<sup>th</sup> grades, parental involvement/education, school food service changes, and industry support and involvement. The food service intervention encouraged consumption of fruits and vegetables through four strategies: 1) point-of-purchase promotion of fruits and vegetables, 2) enhancing the attractiveness of fruits and vegetables, 3) increasing the variety served, and 4) providing an additional fruit item on the days that a baked food was served. The industry component provided the produce, educational materials, and incentive materials. The increase in fruit and vegetable consumption was statistically significant among children in the intervention group compared to the control group (mean difference 0.4 servings/day).
- *5 a Day Power Play! Campaign* (4) included two levels of interventions: school only and a more intensive school plus community involvement. The school only included a behavioral curricula for 4<sup>th</sup> and 5<sup>th</sup> grades, parental involvement/education, school food service changes, and industry support and involvement. The intensive school plus community involvement intervention group received the school only components plus independent work in classrooms, canteens, and with families, community youth organization activities, point-of-purchase education and promotion in produce markets, public service announcements on local television, and fruit and vegetable competitions sponsored by the fruit and vegetable industry. The increase in fruit and vegetable consumption was statistically significant among children in the intervention group compared to the control group (mean difference 0.7 servings/day).
- *Planet Health* (5) aims to improve activity and dietary behaviors among 6th, 7th, and 8th grade students. Planet Health uses an interdisciplinary curriculum approach, placing intervention materials in language, arts, math, science, social studies, and physical education classes, using grade-level and subject-appropriate skills and competencies. The Planet Health approach increases the efficiency of program delivery by using classroom teachers with minimal health education training to implement the materials. The program enhances its effectiveness by involving multiple classes and

frequent use of different approaches to learning. The lessons on increased consumption of fruits and vegetables resulted in an increase in fruit and vegetable consumption that was statistically significant among children in the intervention group compared to the control group (mean difference 0.32 servings/day).

### *Effectiveness*

School-based interventions effectively improve fruit and vegetable consumption among participants. One systematic review of interventions to increase fruit and vegetable consumption found an increase in fruits and vegetables servings that ranged from 0.3 to 0.99 per day (1). The review included 14 school-based interventions.

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### ***Fruit and Vegetable Strategy 2: Multi-component Interventions in Childcare Settings***

#### *Description*

Of the nation's 21 million preschool-aged children, 13 million spend a substantial part of their day in childcare facilities (1). Given that food and physical activity preferences are formed early in life, childcare settings offer opportunities to develop and evaluate effective strategies to increase the consumption of fruits and vegetables among young children (2). However, few studies have been published. Efforts that may affect fruit and vegetable consumption in childcare settings include:

- Curricula that a) incorporate color, music, and the senses to teach children that healthy food and physical activity are fun and b) hand puppets used to initiate nutrition activities reflecting messages from the food pyramid.
- Parent component including newsletters and homework assignments for parents.
- Parent education with a focus on interactive cooking lessons and recipes that fit the topic of the lesson such as fruits and vegetables and dietary fiber.
- Staff training on the importance of healthy eating and physical activity for young children as well as for staff.
- Self-assessment of the childcare setting's nutrition and physical activity environments.

Because there are few interventions, there are not general characteristics across interventions for this strategy.

#### *Examples*

- *Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC)* (3,4) is an environment and policy intervention that uses self-assessment by childcare centers and technical support provided by local health consultants to effect changes in the policies, practices, and environment for healthy eating and regular physical activity of children in childcare. The nutrition areas of focus included fruits and vegetables; fried food and high-fat meats; beverages; menus and variety; meals and snacks; food items outside of regular meals and snacks; supporting healthful eating; nutrition education for children, parents and staff; and nutrition policy. The center director completes a self-assessment

instrument with help from key staff, such as the cook, teacher, or program planner. Based on the assessment the director chooses a key area to improve, such as availability of fruits and vegetables. Local health consultants then provide technical assistance on the key area. Results of this pilot study suggest that the intervention centers improved their scores on the self-assessment instrument and made tangible nutrition and physical activity environmental improvements, whereas comparison centers demonstrated minimal change. However, given the small sample size for the comparison group, it could not be concluded that the increase in total score on the self-assessment instrument was or was not statistically significant. A larger study is presently underway to test effectiveness of this intervention and look more closely at changes in fruit and vegetable consumption.

- *Color Me Healthy* (5) is a curriculum designed to promote physical activity and healthful eating among children ages 4-5 through a variety of fun, interactive learning opportunities. Designed to be used in family daycare homes, Head Start classrooms, and childcare centers, the *Color Me Healthy* kit contains materials needed to implement the program. In North Carolina where the curriculum was developed by the state cooperative extension program, implementation among the state's childcare agencies included training of childcare providers by cooperative extension personnel who partnered with county personnel. Childcare providers indicated that using *Color Me Healthy* increased the children's knowledge about healthy eating. Of participating providers, 79.0% indicated that the children were more willing to try new foods, and 82.0% reported that the curriculum had improved fruit and vegetable recognition.

#### *Effectiveness*

Although childcare education can be a major force in shaping children's diet only a few published studies are available on behavioral and environmental approaches to increase consumption of fruits and vegetables in childcare settings. Additional studies are needed to confirm these positive findings from environmental self assessment tools and curricula.

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#### ***Fruit and Vegetable Strategy 3: Multi-component Interventions in Worksites***

##### *Description*

Worksites offer access to a large portion of the adult population and serve as a vehicle for delivering interventions across multiple levels of influence (intrapersonal, interpersonal, and environmental) within one setting. Studies show that multi-component worksite interventions increase fruit and vegetable consumption among adults (1). The following are general characteristics of multi-component interventions in worksites:

- Nutrition-education strategies focusing on individuals include nutrition lectures and workshops as well as educational materials such as self-help manuals, personalized feedback, Web-based learning, and newsletters.
- Interpersonal approaches include combining education with social activities such as peer support and family-related activities.

- Environmental supports include nutrition displays, cafeteria point-of-purchase information, healthful food preparation or choices, and exposure to 5 a Day events.
- Environmental strategies to increase access to fruits and vegetables may include increasing healthful offerings in cafeterias, vending machines, and at meetings. Other environmental changes may include providing breakroom facilities for food preparation and storage (refrigerators).
- Policies include setting standards for food at meetings and in cafeterias.
- Creation of worker-staffed advisory boards to plan and implement interventions.

### *Examples*

- *Treatwell 5 a Day* (2) used an advisory board, a core education program (18 sessions), cafeteria point-of-purchase labeling, behavior change strategies, health fairs, taste tests, and food and cooking demonstrations. The *Treatwell 5 a Day* program has a family-support component, including the use of a family learn-at-home program, family newsletter, and annual family picnic. Outcome measures showed that workers receiving family support fared better than those who did not. The increase in fruit and vegetable consumption was statistically significant among in the intervention group compared to the control group (mean difference 0.48 servings/day).
- *Health Works for Women (HWW)* (3) was a 5-year worksite promotion intervention that focused on rural, blue-collar women working in small- to medium-size manufacturing industries. The two-pronged intervention included individualized computer-tailored “women’s magazines” that provided 1) personalized feedback, strategies for change and community resource information, and 2) a natural helpers intervention that trained women in the workplace to diffuse information and provide support for healthy behavior changes. The increase in fruit and vegetable consumption was statistically significant among the intervention group compared to the control group (mean difference 0.7 servings/day).

### *Effectiveness*

Worksite interventions have been shown to effectively increase fruit and vegetable consumption among diverse ethnic groups as well as the general population. These efforts can improve dietary practices with positive effects on dietary fat and fiber as well as fruit and vegetable consumption. One systematic review of interventions to increase fruit and vegetable consumption found an increase in fruits and vegetables servings that ranged from 0.13 to 0.70 per day (1). The review included 11 worksite interventions.

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### ***Fruit and Vegetable Strategy 4: Multi-component Interventions in Faith-Based Organizations***

#### *Description*

Studies show that multi-component interventions in faith-based organizations increase fruit and vegetable consumption among adults (1). Faith-based organizations offer access to a large portion of the adult population and serve as a vehicle for delivering interventions across multiple levels of influence. However, few studies have been published. Efforts that may affect fruit and vegetable consumption in faith-based settings include:

- Use of peer education, lay advisors, lectures, workshops, and speakers
- Motivational interview phone calls that provide personal counseling and education
- Printed materials such as cookbooks and videos on fruits and vegetables that use spiritual messages
- Nutrition displays and promotions in the cafeteria as well as healthy choices in the cafeteria
- Pastor support and community involvement

Because there are few interventions, there are not general characteristics across interventions for this strategy.

#### *Examples*

- *Black Churches United for Better Health (BCUBH)* (2) was an intervention trial that aimed at increasing availability of fruits and vegetables at church functions and grocery store promotions; produced computer-tailored newsletters; and provided lay health advisors who conducted education sessions and cooking classes and distributed printed education materials. The pastor also gave support to the project. The increase in fruit and vegetable consumption was statistically significant among the intervention group compared to the control group (increase of 0.85 servings/day).
- *Eat for Life* (3) was a intervention trial to increase fruit and vegetable consumption that included Eat for Life self-help (SH group) materials and motivational interview (MI group) phone calls. The self-help materials consisted of an *Eat for Life* cookbook that contained recipes from church members and the video “Forgotten Miracles.” The cookbook also included information about the health benefits of fruits and vegetables, tips for shopping and storing fruits and vegetables, and cooking techniques. The video “Forgotten Miracles” promoted fruit and vegetable consumption using both spiritual and secular motivational messages. Dieticians conducted three motivational interview phone calls with each participant. The increase in fruit and vegetable consumption was statistically significant among the intervention group compared to the comparison group. The net difference between the MI group and the comparison group was around 1.2 servings/day and the net difference between the MI and SH groups was around 1.0 servings/day.
- *Body and Soul* (4) is a intervention that was developed using key components of the Black Churches United for Better Health and the Eat for Life interventions. The Body and Soul intervention includes churchwide nutrition interventions, self-help materials, and motivational interviewing. The churchwide activities include a kick-off event, development of a project coordination committee, at least three churchwide nutrition events plus one additional event involving the pastor, and at least one policy change. The self-help materials include the Eat for Life cookbook and the video “Forgotten Miracles.” Lay counselors conduct two motivational interview phone calls with each participant. The increase in fruit and vegetable consumption was statistically significant among the intervention group compared to the control group. Post-test differences were 0.7 and 1.4 servings for the 2-item and the 17-item fruit and vegetable frequency measures, respectively.

#### *Effectiveness*

These three interventions in African American churches produced an increase in fruit and vegetable consumption from 0.7 to 1.4 servings per day (1).

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### ***Fruit and Vegetable Strategy 5: Multi-component Interventions in Health Care Settings***

#### *Description*

Multi-component interventions in the health care setting can improve fruit and vegetable consumption. This strategy aims to influence dietary behavior primarily on the individual and interpersonal level (1). Nutrition information is often prepared on the basis of theoretical constructs such as stages of change, transtheoretical model, or the health belief model (1). The following are general characteristics of multi-component interventions in healthcare:

- Individual approaches that may consist of dietary assessment followed by tailored counseling, computer-tailored messages, personalized letters, role-playing, teaching self-monitoring, training to overcome barriers to selecting healthful foods, goal-setting, and guidance in food shopping and preparation (1).
- Interpersonal approaches that often include social support via cooking workshops, food demonstrations, lectures, discussion groups, and field trips to grocery stores or farmers' markets (2).

#### *Examples*

- *Puget Sound Eating Patterns Study (PEP)* (3) was a tailored, multi-component self-help intervention designed to promote lower fat consumption and increase fruit and vegetable consumption among enrollees of a large health maintenance organization. The tailored self-help intervention included a manual that provided information about short- and long-term benefits of increasing fruit and vegetable consumption, information about grocery shopping, dining out, and modifying meals to increase fruit and vegetable consumption. The specialized dietary-change materials included tip sheets, refrigerator magnets, recipe cards, shopping lists, and self-evaluations. Each participant received a dietary analysis and a computer-tailored letter with motivational and behavioral feedback based on the diet analysis as well as one motivational interview phone call. In addition, semi-monthly newsletters were sent to participants.
- *Computer-Tailored Print Materials*: A study (4) was conducted among healthy adults enrolled in a North Carolina health maintenance organization to determine the effectiveness of different computer-tailored nutrition newsletters to improve the number and variety of fruits and vegetables consumed. The intervention groups received non-tailored nutrition newsletters, tailored nutrition newsletters without a goal-setting component, or tailored nutrition newsletters with a tailored goal-setting component. All newsletters contained strategies for improving fruit and vegetable consumption. Tailored newsletters used computer algorithms to match a person's baseline survey information with the most relevant newsletter messages for promoting dietary change. All three newsletter groups had significantly higher daily intake and variety scores compared with the control group. Although there was a trend of improved intake and variety with each added newsletter element, there were no significant differences at follow-up among the newsletter groups.

#### *Effectiveness*

Multi-component Interventions based in health care settings have been shown to modestly increase fruit and vegetable intake among adults eligible for primary care. Increases in fruit and vegetable consumption vary with the type of intervention. One systematic review of interventions to increase fruit and vegetable consumption found an increase in fruits and vegetables servings that ranged from 0.1 to 1.4 servings per day (1). The review included nine healthcare interventions. More impact was found with adults at risk for diet-related chronic disease and adults motivated to make dietary changes (2).

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## **Fruit and Vegetable Strategy 6: Increasing Access to Fruits and Vegetables**

### *Description*

Increasing access makes it easier for people to obtain fruits and vegetables. To date, research has focused on defining the relationship between where people live and their access to fruits and vegetables. Little research has evaluated the impact of policy and environmental changes designed to increase access to fruits and vegetables. Factors related to access of fruits and vegetables include geographic accessibility (e.g., the distance to stores), the type of food retailer in the vicinity (e.g., supermarkets, small stores, or farmers' markets), as well as access to homegrown or local produce. In some communities, food access is a transportation problem. Increasing access in these communities includes making sure people can get to food-service outlets that offer fruits and vegetables, either by ensuring that public transportation is available or by bringing food retailers to their neighborhood (1,2). Communities are seeking innovative ways to improve food access through solutions that focus on improving transportation options, supporting urban agriculture and farmers' markets, and expanding food options at the corner grocery store. However, few studies have been published. Practical strategies that may increase the access to fruits and vegetables include:

- Local Food Policy Committees that represent a wide range of organizations with a stake in the local food system that develop policies to improve access to fruits and vegetables and support local agriculture.
- Economic and urban planning land-use policies that include establishing new grocery stores, improving convenience stores, and promoting community gardens and farmers' markets.
- Federal and local transportation policies that support walking, bicycling, and public transit to grocery stores and to farmer's markets.
- Direct marketing of farm-to-plate policies and programs, such as community-supported agriculture, farm-to-work and farm-to-school programs, and farmers' markets.

Because there are few interventions, there are not general characteristics across interventions for this strategy.

### *Examples*

- *Penrith Food Project* (1) is a case study of a 10-year evolution of a local intersectoral project designed to improve components of a community's food system as an approach to improving nutrition. The project established a standing Food Policy Committee, which plans and oversees project implementation and promotes local food system reform consistent with community nutrition objectives. Members of the Food Policy Committee are directors or supervisors representing a wide range of organizations with a stake in the local food system. The five key areas identified by the Food Policy Committee were 1) improving access to food retail outlets and related transportation services, 2) expanding the availability of healthy choices in food outlets and food services, 3) increasing community facilities and support for breastfeeding, 4) promoting local agriculture, and 5) increasing

the safety of food sold. Policies that the Food Policy Committee developed cover food access in planning new housing developments; home-delivery fruit and vegetable services; establishment of fruit stands in business districts; home-delivery of groceries for homebound seniors; and bus route changes to improve access to grocery stores.

- *Philadelphia Food Marketing Task Force* (3) is a group convened by the city council to research the lack of supermarkets in Philadelphia. The Task Force released a report, "Stimulating Supermarket Development: A New Day for Philadelphia," containing ten recommendations to increase the number of supermarkets in Philadelphia's underserved communities. The Philadelphia Food Marketing Task Force has also inspired two new state-level financing tools for supermarket development and support of local agriculture, the Fresh Food Financing Initiative and First Industries. The Fresh Food Financing Initiative is using a \$20-million infusion of public funds to leverage an \$80-million financing pool for supermarket development. So far the fund has contributed to the establishment of eight new grocery stores. First Industries is an economic stimulus program that provides grants, loans, and loan guarantees to agriculture-related business.
- *Farmers' Market Salad Bar Program* (4) was launched in 1997 by the Santa Monica-Malibu Unified School District (SMMUSD) at McKinley Elementary School. The program was designed to incorporate fresh locally grown fruits and vegetables into the district's school lunch program. The pilot program had the dual purpose of increasing students' consumption of fresh fruit and vegetables and supporting local farmers by purchasing produce directly from them at local farmers' markets. On the basis of the 1997 pilot project, the program was expanded in the SMMUSD district by the year 2000 from one to 11 schools—nine elementary schools and two middle schools. As the Santa Monica-Malibu salad bar program progressed, project evaluation showed that the model was economically viable from the district's point of view and provided a consistent income to local farmers.
- The Seniors Farmers' Market Nutrition Program (SFMNP) (5) provides vouchers to low-income seniors for use at local farmers' markets. The purposes of the vouchers are to 1) provide resources in the form of fresh, nutritious, unprepared, locally grown fruits, vegetables, and herbs; 2) increase the domestic consumption of agricultural commodities by expanding or aiding in the expansion of domestic farmers' markets, roadside stands, and community support agriculture programs; and 3) develop or aid in the development of new and additional farmers' markets, roadside stands, and community support agriculture programs. Farmers reported benefits from the program, have a positive attitude about it, and are willing to make certain accommodations to participate in it again.

### *Effectiveness*

Although there is agreement that policy and environmental changes to increase fruit and vegetable consumption are important, few published studies are available to document their effectiveness in changing fruit and vegetable consumption. Policy and environmental interventions to increase fruit and vegetable consumption need to be created and evaluated.

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### ***Fruit and Vegetable Strategy 7: Increasing Availability of Fruits and Vegetables***

### *Description*

Increasing the availability, variety, and convenience of fruits and vegetables are important policy and environmental strategies to increase consumption. Availability focuses on the number and types of fruits and vegetables offered. Increasing the availability of fruits and vegetables can be achieved through a variety of ways such as training food-service staff on how to make existing menu items more healthful by adding fruits and vegetables, and partnering with the food system to provide more fruit and vegetable options such as in retail outlets including restaurants, food courts, cafeterias, lunch wagons, deli counters, take-out food sources, bars and coffee shops that serve food and food service businesses and catering services (1-4). However, few studies have been published. Practical strategies that may increase the availability to fruits and vegetables include:

- Marketing of food products such as bagged, prewashed spinach and salad or “snack-pack” baby carrots and celery sticks, which provide consumers with convenient preparation and take-out options.
- Modifications of school food service menu options to improve the variety and quality of fruits and vegetables including salad bars and a la carte options.
- Modifications of worksite cafeteria menu options and vending machine policies to increase the availability of fruits and vegetables.
- Modification of menu options by restaurants and other food establishments to include more fruits and vegetables in mixed dishes, salad bars, and broth-based soups; and adding more green salads as appetizers and a variety of fruit as dessert options to provide people with healthier choices.
- Promoting more variety of fruits and vegetables in grocery stores including increased placement and shelf space with or without labeling and signage strategies.
- Increasing fruit and vegetable offerings in other retail food markets such as farmers markets.

Because there are few interventions, there are not general characteristics across interventions for this strategy.

### *Examples*

- *5 a Day Power Plus Program* (5) consisted of four components: behavioral curricula for the 4<sup>th</sup> and 5<sup>th</sup> grades, parental involvement and education, school food service changes, and industry support and involvement. The food service intervention encouraged consumption of fruits and vegetables via four strategies: 1) point-of-purchase promotion of fruits and vegetables, 2) enhancing the attractiveness of fruits and vegetables, 3) increasing the variety served, and 4) providing an additional fruit item on the days that a baked food was served. The industry component provided the produce, educational materials, and incentive materials. The increase in fruit and vegetable consumption was statistically significant among children in the intervention group compared to the control group (mean difference 0.4 servings/day).
- *The North Karelia Project* (6) was launched in Finland in 1972-1977 in response to the local petition to get urgent and effective help to reduce the great burden of exceptionally high coronary heart disease mortality rates in the area. The intervention used multiple strategies: from innovative media and communication activities and systematic involvement of primary health care to environmental and policy changes in collaboration with food industry and agriculture. An innovative intervention example was the berry project. Over the years, many people voiced concerns about the dietary aims of the project in the area, which was initially strongly devoted to dairy farming. With people sharply reducing their consumption of butter and fatty dairy products, economic problems emerged for dairy

farmers and the dairy industry. People were also unsatisfied with the message promoting the consumption of products that were mostly imported, such as fruit and vegetables. During these discussions, the community and project representatives considered the feasibility of growing berries in the northern climate. This led to a major collaborative project between berry farmers, industry, various commercial sectors and the health authorities, which was financed by the Ministry of Agriculture and the Ministry of Commerce. Sales campaigns, new product development and various supportive activities were also involved, in addition to education. Local berry consumption rose gradually, and many farmers switched from dairy to berry production.

- A *supermarket study* (7) examined the retail price, newspaper advertising, display space, and display location quality for selected fruits and vegetables using a fractional factorial research design in four large supermarkets. The resulting impact on rates of sale was analyzed for four classes of items; hard fruit, cooking vegetables, salad vegetables, and soft fruit. The “bonus space” for products in stores increased sales, and improving the quality of the foods' locations significantly increased sales of hard fruit and cooking vegetables.

### *Effectiveness*

Evidence suggests that increasing the availability of healthful food can improve eating habits in a variety of settings and among diverse populations (5-8). In many cases, this strategy has been combined with other healthful-eating strategies, such as point-of-purchase labeling or economic incentives. Additional studies are needed to confirm these positive findings.

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### **Fruit and Vegetable Strategy 8: Economic Incentives**

#### *Description*

The cost or affordability of fruits and vegetables is a commonly cited reason why consumers do not eat more of these healthy foods (1). Economic incentives that consist of pricing policies are strategies that are geared toward increasing the sales and/or consumption of healthful foods such as fruits and vegetables. Economic incentives usually take the form of reduced prices, discount coupons, vouchers redeemable for fruit and vegetable purchases, or bonuses tied to the purchase of fruits and vegetables. Bonuses and voucher approaches used by Food Stamps and WIC are expected to influence food choice through the price effect (effectively lowering the price of fruits and vegetables) and the income effect (giving the participant additional income to spend on food). Often economic incentives are combined with

other healthful-eating strategies, such as point-of-purchase labeling or nutrition education. However, few studies have been published. Practical economic incentive strategies that may affect fruit and vegetable consumption include:

- Price reductions of fruits and vegetables in a worksite cafeteria.
- Price reductions of fresh fruits and vegetables in a school cafeteria.
- Food Stamp pilot bonus program providing participants with additional financial bonuses for every \$1 of food stamps spent on fresh produce.
- WIC and supplemental food program vouchers redeemable for fruit and vegetable purchases at grocery stores and farmers' markets.

Because there are few interventions, there are not general characteristics across interventions for this strategy.

### *Examples*

- *Fruit and Salad Purchases in a Worksite Cafeteria (2)*: This intervention involved two changes from usual cafeteria service. First, the selection of fruits and salad bar choices was increased. Six fruit choices were made available daily throughout the intervention period rather than three, and three additional fresh vegetables were added to the salad bar. Second, the price of salad and fruit was reduced by 50%, from 50 to 25 cents for a piece of fruit and from four to two dollars per pound for salad. The intervention was advertised by posting signs in the cafeteria daily and by a flyer placed in each employee's mailbox. Fruit and salad purchases increased threefold in the intervention period compared to those in the nonintervention period.
- *Fruit and Salad Purchases in a School Cafeteria (3)*: The intervention component of the study of this intervention involved two changes from the usual high school cafeteria service. First, baby carrots were a new item that was offered to students. Second, the prices for fresh fruit, baby carrots, and salad purchases were reduced by 50%. During the low-price period, attractive signs promoting the target items were placed near the area where fruit, carrots, and salad were sold. In addition, public address announcements were made during the first week of the low-price period. Fruit sales increased about fourfold, carrot sales increased about twofold, and there was no significant intervention effect on sales of salad during the low-price period. These intervention results suggest that lower pricing for fruits and vegetables with minimal promotion increases the sales of these items among high schools students.
- *Healthy Purchase Program (4)* is a pilot bonus program passed by the California legislation. Under this program, for every \$1 of food stamps spent on fresh produce, participants receive a specified portion back as a bonus. These bonus or voucher approaches could be expected to influence food choices through a price effect (they lower the price of the target food) and through an income effect (they give the participant additional income to spend). If price is the barrier to fruit and vegetable consumption, lower prices should result in food stamp households purchasing more fruits and vegetables. This bonus program includes nutrition education related to fruits and vegetables that may increase the likelihood that food stamp participants will use the additional income to purchase more fruits and vegetables.
- *WIC in Los Angeles County (5)*: The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in Los Angeles conducted a study of the impact of vouchers for purchasing fresh fruits and vegetables among low-income mothers. WIC mothers were issued \$10 worth of vouchers per week to buy produce of the participant's choice at either a supermarket or a year-round farmers'

market. Participants' consumption of fruits and vegetables and the redemption rates of the vouchers were tracked over the 14-month period of the study. The redemption rates for the farmers' market and the supermarket were similar, 90.7% and 87.5%, respectively. Overall, participants reported purchasing 27 and 26 different fruits and 34 and 33 different vegetables in the farmers' market and supermarket, respectively. These high redemption rates and the larger numbers of different produce consumed confirmed that low-income families highly value the ability to purchase and consume a wide variety of fresh produce.

### *Effectiveness*

There is evidence that economic incentives in the form of reduced prices can increase sales and/or consumption of fruits and vegetables (2-5). Additional studies are needed to confirm these positive findings.

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## Target Area: Reduce the Consumption of High-Energy-Dense Foods

### ***Background and Rationale***

Research shows that people eat a fairly consistent amount of food on a day-to-day basis. This finding holds true whether the amount of food contains many or few calories. Therefore, the number of calories in a particular amount or weight of food (i.e., the food's energy density) affects the total number of calories a person consumes (1). Foods with a lower energy density provide fewer calories per gram than foods with higher energy density. In general, foods with a lower energy density (e.g., fruits, vegetables, and broth-based soups) tend to be foods with either a high water content, a high fiber content, or little fat. High-energy-dense foods are often high in refined grains, added sugar and fats, and tend to be palatable, inexpensive, and convenient (2).

While the influence of dietary energy density on body weight has not been extensively investigated, several observational studies suggest that a relationship exists between consuming an energy-dense diet and obesity. For example, one cross-sectional study with a nationally representative group of adults found that normal weight individuals consumed diets that were lower in energy density than obese individuals (3). In another cross-sectional study, diets with higher energy density were predictive of higher body mass index (BMI) values and had more added fat and sugar (2). A prospective study found that consumption of high-energy-dense diets was a risk factor for higher BMI in both men and women across five different ethnic groups (4). Analyses of cross-sectional data found that dietary energy density has been identified as a correlate of obesity, elevated fasting insulin levels, and metabolic syndrome in U.S. adults (5).

The current food supply contains a significant amount of high-energy-dense foods. Many of these are processed foods that are high in fat and/or sugar and low in nutrients. Portion sizes in this country have also increased over the past two decades in restaurants, grocery stores, and vending machines. Portion sizes for manufactured and restaurant foods in the United States appear to have increased concurrently with obesity prevalence; they began to rise in the 1970s, increased dramatically in the 1980s, and have continued to grow gradually (6). Current portion sizes of French fries, hamburgers and sodas are 2-5 times larger than when they were originally offered in fast food restaurants (7). In addition, the number of eating establishments in the United States increased by 75% between 1977 and 1991. A recent review paper concluded high-energy-dense foods are lower in cost, have high palatability, and are associated with higher energy intakes (8).

### ***Overview of Strategies***

The evidence about what works to decrease consumption of high-energy-dense foods is not definitive, but promising strategies include substituting low-energy-dense foods for high-energy-dense foods,

decreasing the portion size of high-energy-dense foods, and limiting the availability of high-energy-dense foods.

Encouraging people to eat more foods low in energy density and to substitute these foods for those higher in energy density helps them decrease their caloric intake while eating satisfying portions of food and controlling hunger (9-11). Short-term studies (12- 14) show that controlling portion sizes and decreased consumption of high-energy dense foods helps limit calorie intake. A recent study showed that manipulations that decreased portion size and energy density (i.e., substituting fruits and vegetables or incorporating these low-energy-dense foods into mixed dishes) independently influence energy intake, and that these effects were additive and sustained from meal to meal (15). Although both manipulations influenced energy intake, energy density manipulations were stronger than those of portion size. Understanding how energy density and portion size work together can lead to more effective nutrition education messages than simply encouraging people to eat less. People should be encouraged to meet their caloric needs by eating satisfying portions of foods with a low energy density.

School and worksite environments are important influences on food behavior. Increasing attention has focused on the need to establish school nutrition standards that restrict or limit the availability of low-nutrition, high-calorie competitive foods and beverages that are sold outside of the federal school lunch and breakfast programs such as food in vending machines, a la carte offerings in the cafeteria, snack bars, school stores and fundraisers. Several studies have related the availability of snacks and drinks sold in schools to higher intakes of total energy, total fat and saturated fat, and lower intakes of key nutrients, fruits, vegetables, and milk (16). The Institute of Medicine (IOM) recently published Nutrition Standards for Foods in Schools, which promotes healthful food choices by limiting high-energy-dense foods (17).

Worksite environments provide opportunities and exposures that also influence individual food choices. Potential worksite policy and environmental change interventions include limiting the availability of high-energy-dense foods and improving the availability of healthful food choices in vending machines as well as changes in menu options and portion sizes of food in the cafeteria (18).

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### ***Reduce Consumption of High-Energy-Dense Foods Strategy 1: Substitute Low-Energy-Dense Foods for High-Energy-Dense Foods***

#### ***Description***

Randomized control trials and a quasi-experimental study (1-3) on lowering energy density for weight control have been reported in the literature. In the quasi-experimental study, participants (1) consumed a reduced-energy diet emphasizing foods that were low in energy density, such as fruits, vegetables, whole grains, and beans. The participants lost an average of 7.3 kg. A randomized control trial (2) examined the effectiveness of incorporating either a low-energy-dense food (broth-based soup) or a high-energy-dense food (dry snack food) into a reduced-energy diet. Participants were provided with one of the following items to incorporate into their daily diet: one serving of soup, two servings of soup, two servings of a dry snack food, or no special food. Participants who consumed two servings per day of low-energy-dense soup experienced 50% greater weight loss than participants who consumed two servings per day of high-energy-dense dry snacks (7.2 kg vs. 4.8 kg). The other randomized control (3) trial examined two strategies to reduce the energy density of the diet *without* providing the subjects with specific calorie limits. One group of women was advised to decrease the energy density of their diets by increasing their consumption of water-rich foods, such as fruits and vegetables and choosing reduced-fat foods. The other group was counseled only on reducing fat intakes. Both groups lowered the energy density of their diets, and both groups lost weight. The group counseled to eat more fruits and vegetables while also reducing fat intake experienced a greater reduction in the energy density of their diets and lost significantly more weight (7.9 kg vs. 6.4 kg) than the group told just to eat less fat. Even though they lost more weight, those participants eating the lower-energy-dense diet reported consuming more food by weight and experiencing less hunger. In summary, these research studies indicate that consuming a low-energy-dense diet—one that is rich in fruits, vegetables, whole grains, lean meats, and low-fat dairy products—helps people lose weight. At the same time, eating low-energy-dense foods helps people control their hunger and maintain feelings of satiety, or the feeling of fullness and satisfaction experienced at the end of a meal. Satiety and hunger control are important for long-term satisfaction and compliance with an eating plan (4). Findings from these research studies provide important information for developing population-based interventions. The CDC's 2007 publication, *Low Energy-Density Foods and Weight Management: Cutting Calories While Controlling Hunger* (4) includes a comprehensive discussion and summary of the literature related to the impact of eating low-energy-dense foods on calories consumed, satiety, and body weight. Another research-to-practice document included in the CDC Research to Practice Series, *Can Eating Fruits and Vegetables Help People to Manage Their Weight?* (5) provides information on substituting fruits and vegetables for higher energy dense foods. Effective population-based interventions to substitute low-energy dense foods for high-energy dense foods are not well established; therefore, public health practitioners and researchers should be encouraged to develop and evaluate these interventions. Practical strategies that may facilitate the

substitution of low-energy-dense foods for high-energy dense foods at the individual, environment and policy levels include:

- Environment and policy levels strategies such as:
  - o Food establishments can implement food preparation strategies that lower the energy density of foods so people can choose lower energy versions of their favorite foods, for example:

Prepare fruits, vegetables, and other foods without excess fat and sugar.

Lower the energy density of frequently consumed foods by reducing the amount of fat or increasing the amount of water-rich foods; however, the most substantial reductions in energy density are achieved when both of these modifications are used simultaneously.
  - o Food establishments can offer foods low in energy density such as a broth-based soup or a green salad at the start of the meal or in combination with meals.
  - o School and worksite cafeterias or vending machines can offer a variety of low-energy-dense foods such as fruits and vegetables so people can choose to substitute these foods for high-energy-dense foods.
- Individual-level behavioral counseling that helps people control their environment (4) such as:
  - o Providing information on how to avoid large portions of foods that are high in energy density, but encouraging foods low in energy density to be consumed in portions that are appropriate for calorie needs.

Incorporate a large portion of fruits and vegetables into meals.

Include broth-based soups and green salads.

Round out meals by adding starchy fruits and vegetables, whole grains, legumes, lean meats, and low-fat dairy food.

Limit portion sizes of fried foods including vegetables, refined grains, full-fat dairy foods, and fatty cuts of meats.

Consume infrequently, with particular attention to portion size, foods with little moisture, such as crackers, cookies, and chips as well as high-fat foods like croissants, margarine, and bacon.

### Effectiveness

Research studies (1-3) suggest that an eating pattern that emphasizes foods that are low in energy density is an effective strategy to reduce the energy density of the diet. A benefit of this type of eating plan is that it allows people to eat satisfying amounts of food while restricting their energy intake. Furthermore, this type of eating plan uses positive messages (i.e., eat satisfying portions of low-energy-dense foods), which has been shown to result in greater dietary changes than restrictive messages (i.e., eat small portions of all foods) (6).

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## ***Reduce Consumption of High-Energy-Dense Foods Strategy 2: Decrease the Portion Size of High-Energy-Dense Foods***

### *Description*

Short-term studies show that controlling portion sizes helps limit calorie intake, particularly when eating high-calorie foods (1-3). The Dietary Guidelines urge Americans to pay special attention to portion sizes, which have increased significantly over the past two decades (4). Portion size is the amount of a single food item served in a single eating occasion, such as a meal or a snack. Many people confuse portion size with serving size, which is a standardized unit of measuring foods. Portion size is the amount offered to a person in a restaurant or in the packaging of prepared foods, or the amount a person chooses to put on his or her plate. For example, a bagel sold in grocery stores or restaurants usually constitutes at least two servings, but is considered only one portion. People eat more when they are confronted with larger portion sizes, and they do not compensate for eating larger portions by eating fewer calories at the following meal or during the rest of the day (5). As the portion size served increases, both the weight of food consumed and energy intake also increase.

Only one randomized control trial (6) has been conducted to determine how the effects of portion size and energy density combined influence energy intake and satiety over several days. Two daily menus were developed consisting of commonly used foods that could be manipulated in energy density. The energy density of the reduced versions of the foods was decreased by 25%, either replacing full-fat ingredients with low-fat alternatives, thereby reducing the amount of fat, or increasing the proportion of fruits or vegetables. The standard portion size of food was selected so that a 25% reduction in portion size would still provide an adequate weight of food. Results of the study indicated that reducing the portion size and energy density of commonly consumed foods led to significant and independent decreases of energy intake when served over multiple days. The effects on energy intake were additive and were sustained from meal to meal, demonstrating that reductions in both portion size and energy density can help to moderate energy intake without increased hunger.

The CDC's publication, *Do Increased Portion Sizes Affect How Much We Eat?* (7) includes a comprehensive discussion and summary of the literature related to how large portion sizes may have contributed to weight gain among Americans.

Effective population-based interventions to decrease the portion size of high-energy-dense foods are not well established; therefore, public health practitioners and researchers should be encouraged to develop and evaluate these interventions. The CDC research-to-practice document and the randomized control trial that examined the impact of decreased portion size of high-energy-dense foods on energy intake provide information to develop practical strategies that may facilitate decreasing the portion size of high-energy-dense foods at the individual, environment and policy levels. These strategies include.

- Environment and policy levels strategies such as:
  - o Food establishments can provide menu options of foods that are reduced in portion size.
  - o School and worksite vending machines and grocery stores can offer smaller package sizes of high-energy-dense foods so people can choose a more appropriate portion size.
- Individual-level behavioral counseling that helps people control their environment (7) such as:

- o Raising awareness of portion distortion by promoting understanding of the differences in portion size and serving size.
- o Helping people control calorie intake when faced with large portions by splitting an entrée with a friend at a restaurant or not putting serving dishes on the table at home for second helpings.
- o Helping people assess the right amount to eat by promoting food logs, measured portions, and food models.
- o Helping people control their environment by purchasing smaller package sizes.

### *Effectiveness (2)*

Only one clinical trial that used both decreased portion size of high-energy-dense foods and substitution of low-energy-dense foods for high-energy-dense foods has been published that found that these effects were additive in reducing energy intake and were sustained meal to meal (2). Additional studies are needed to confirm these positive findings.

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### ***Reduce Consumption of High-Energy-Dense Foods Strategy 3: Limit Availability of High-Energy-Dense Foods***

#### *Description*

To date, most school and worksite interventions that limit high-energy-dense foods have done so by modifying cafeteria menus to decrease the availability of foods high in fat and added sugar (1,2). Although some studies have incorporated these environmental change elements in multi-component interventions, few have focused on environmental interventions as a primary intervention approach. The recent focus on environmental approaches in interventions has highlighted the lack of available measures and criteria that can be used to assess the food environment. Researchers are now beginning to develop criteria and standards that can be used to assess the food environment and develop policy to make environmental changes. The recently published IOM report, *Nutrition Standards for Foods in Schools: Leading the Way Toward Healthier Youth* includes school nutrition standards that limit the availability of low-nutrition, high-calorie competitive foods and beverages (3). The term “competitive foods” refers to all foods and beverages sold outside of the federal school lunch and breakfast programs in venues such as vending machines, a la carte offerings in the cafeteria, snack bars, school stores and fundraisers. The food items that are allowed to be sold in these venues must meet criteria for total calories, as well as calories from fat and sugar that would in effect limit the sale of high-energy-dense foods.

National nutrition standards do not exist for worksites. In worksites, standards and criteria used for policy and environmental changes are often established collaboratively by management and employee advisory

committees. One worksite intervention study has developed criteria for low-calorie, low-sugar, and low-fat food products sold in vending machines (4). This study is one of seven worksite environmental interventions for weight control and obesity prevention funded by the National Heart, Lung, and Blood Institute (NHLBI). The strategy to limit availability of high-energy-dense foods in the NHLBI studies was changes in vending options (5).

Because there are few interventions to limit availability of high-energy-dense foods, there are not general characteristics across these interventions.

#### *Examples*

- TACOS (Trying Alternative Cafeteria Options in Schools) was a 2-year, group-randomized, school-based environmental nutrition intervention trial (6). The TACOS intervention consisted of two main components that addressed the school food environment: availability of lower-fat a la carte food in the cafeteria and peer influence via peer promotions of lower-fat foods. TACOS staff and food service staff worked closely to increase the availability of lower-fat a la carte food by 30% from baseline. Lower-fat was defined as 5 grams or less fat per serving. The peer promotion intervention addressed peer influences on adolescent food choices and included taste tests, student food choice self-assessments, and media campaigns (posters, newspaper articles, and videos). Student groups were offered financial incentives for completing each promotion. The results of this study showed that changes made in the school environment to increase availability and promotion of lower-fat food choices had a significant positive impact on sales of lower-fat foods to students.
- Route H Study is a worksite environmental intervention designed to prevent weight gain among metropolitan bus drivers in four garages within the major metropolitan Minneapolis-St. Paul area over a two-year period (4). This multi-component intervention provides opportunities for healthful food choices, physical activity, and weight management. The worksite environment measure (WEM instrument) was developed to assess the food, physical activity, and weight-management environment of the bus garages. The WEM instrument includes 18 items to assess the food environment, including the number and type of vending machines, vending machine contents, microwaves, refrigerators, and water coolers. The food intervention includes increasing the availability of healthful vending machine foods and beverages and providing snack packs for drivers to take along on their bus route. Criteria were developed to identify healthful foods that could be sold in vending machines. Items were coded as healthy if they met the following criteria for calories, fat, and sugar. Low-calorie was defined as < 400 calories for entrée, < 150 calories for snacks and sweets, and < 50 calories for beverages; low-sugar was defined as 35% by weight for entrees, snacks, sweets, and beverages; and low-fat was defined as < 30% total calories for entrees, snacks, sweets, and beverage. This multi-component intervention is currently being implemented so evaluation results are not available.

#### *Effectiveness (1,2,4,6)*

Few studies have focused on environmental interventions that limit the availability of high-energy-dense foods. School and worksite interventions that limit high-energy-dense foods have done so by modifying cafeteria menus to decrease the availability of foods high in fat and added sugar or developed criteria to limit high-energy-dense foods sold in vending machines (1,2,4,6). The evaluation results of the NHLBI worksite intervention studies could have important implications for the design and implementation of policy and environmental interventions that limit the availability of high-energy-dense foods.

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## Target Area: Decrease Television Viewing

### **Background and Rationale**

Although the American Academy of Pediatrics (1) recommends no screen time for children under two years of age and no more than 1-2 hours per day for children two and over, watching television (TV) is a common sedentary activity among American children. A recent survey found that 61% of children under age two use screen media and 43% watch TV every day, and 41% of 2- to 3-year-olds and 43% of 4- to 6-year-olds use screen media for 2 hours or more on an average day (2). Children 8-18 years of age watch an average of 3 hours of television every day (3). Fifty-nine percent of U.S. adults report watching more than 2 hours a day of television (4). More time is spent watching television by African American and Hispanic children than white children, and, among children 6 years old and under, by those in households with lower socio-economic status (2-3).

Studies have found a positive association between the number of hours children and adults watch television and the prevalence of overweight and obesity (3-5), and a school-based intervention has shown that children who reported a decrease in time watching television also had a decrease in body mass index (BMI) (7). Research also shows a link between TV viewing in childhood and obesity in adulthood (8-9). Proposed mechanisms for the relationship between TV viewing and obesity include a reduction of resting metabolic rate while watching TV, displacement of physical activity, excess energy intake while watching TV, and exposure to marketing of high-energy-dense foods (8-9).

The Division of Nutrition, Physical Activity and Obesity has conducted focus groups on TV viewing among children and parents and found that there are numerous barriers to reducing television watching (10). Watching TV is common in most U.S. households, and many children and adults enjoy watching television, not perceiving the amount of time they watch as a problem. There also is substantial confusion as to what television limits would entail and what “counts.” Reducing TV time would require parents to find alternative activities to keep their children safely and quietly engaged, and it could also prevent parents from accomplishing other tasks, could increase conflict between parents and children or between siblings, and would require parents to change their own TV-viewing behavior.

### **Decreasing Television Viewing: Intervention Strategies**

#### *Description*

The few published reports on interventions to reduce television viewing have focused primarily on children and youth. Those efforts that do show evidence of success include curricula for childcare settings (11), elementary schools (7, 12), middle schools (13), clinic-based interventions (14-15), and an after-school dance program and home-delivered lessons (16). The childcare intervention was part of a health-promotion curriculum and included classroom activities as well as take-home materials for parents and parent-child activities (11). School-based interventions integrated TV-reduction efforts into existing curricula including math, science, language arts, and social studies (7,12,13). Parental components that involve newsletters for or homework assignments with parents as well as program activities that include campaigns focusing on limiting TV-viewing time such as “My TV Unplugged” or “Power Down” were included in childcare, school-based, and after school interventions (7,11,12,13,16). Self evaluation/assessment of the organization or individual and goal-setting that includes selective TV viewing and time management or budgeting of media time were included in almost all intervention settings.

Because there are few interventions, there are not general characteristics across interventions for this strategy.

#### *Examples*

- *Brocodile the Crocodile* (11) is a health-promotion childcare curriculum intervention to reduce television viewing. Each of the intervention’s seven sessions consists of a 30-minute musical activity, a 10-minute snack, and a 20-minute interactive education component. Take-home materials for parents and parent-child activities are also included. Children in the intervention group, compared to children in the control group, had a relative mean reduction by parental report of 4.7 hours/week in their television/video viewing, which is statistically significant.

- A 4-week primary-care intervention for low-income African American families (15) addressed television and video watching and video game-playing. The families were randomized to receive counseling alone or counseling plus a behavioral intervention that included an electronic television time manager. The counseling alone intervention included brief counseling of the family and three brochures from the American Academy of Pediatrics. The counseling plus behavioral intervention received the same brief counseling and brochures plus information on monitoring and setting media budgets, and an electronic media manager. Both intervention groups reported decreases in the amount of time that children spent watching television and videotapes and playing video games (mean changes of -13.7 and -14.1 hours per week), but they were not statistically significant.
- *Eat Well and Keep Moving* (13) and *Planet Health* (13) are school-based interventions to improve activity and dietary behaviors among 4<sup>th</sup> and 5<sup>th</sup> grade students and 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grade students, respectively. The programs are similar in that they focus on four behavioral changes: reducing television viewing to less than 2 hours per day; increasing moderate and vigorous physical activity; decreasing consumption of high-fat foods; and increasing consumption of fruits and vegetables to 5 a day or more. These interventions were designed to provide students with cognitive and behavioral skills to enable change in these behaviors. They differ in their outcome measures. The primary end points for the *Eat Well and Keep Moving* intervention is changes in television viewing, physical activity and dietary intake. The lesson plans are age-appropriate so they also differ in content. Classroom materials are based on social cognitive theory and include 50-minute lessons and classroom-based campaigns that also include activities at home for family members. The intervention is taught by classroom teachers and intervention materials provide links to school food service staff and families. The primary end point for the *Planet Health* intervention is obesity prevention although measures of television viewing, physical activity, and dietary intake were collected. Television viewing was marginally reduced by -0.55 hours/day, however it was not statistically significant ( $P=.06$ ) in the *Eat Well and Keep Moving* intervention. In the *Planet Health* intervention the reduction of television viewing was statistically significant, girls reduced their television viewing by -0.58 hours per day and boys reduced their television viewing by -0.40 hours per day. The prevalence of obesity among girls participating in the Planet Health intervention was reduced compared to controls and statistically significant; however, there was no differences found among boys.
- The *SMART classroom* curriculum (7) was developed for 3<sup>rd</sup> and 4<sup>th</sup> graders and addressed the children's screen time (television and video watching, and video game use). The curriculum incorporated eighteen 30-50 minute lessons into an existing curriculum for 6 months. Lessons included self-monitoring and self-reporting of television, videotape, and video game use to motivate children to want to reduce the time they spent in these activities. These lessons were followed by a television turn off during which children were challenged to watch no television or videotapes, and plan no video games for 10 days. After the turnoff, children were encouraged to follow a 7-hour per week budget of television, videotape, and video games. In addition, each participating household was given an electronic television time manager. This device locks onto the power plug of the television set and monitors and budgets viewing time for each member of the household through use of personal identification codes. Parents received newsletters that were designed to motivate them to help their children stay within their time limits. Relative to controls, the intervention group of children had statistically significant decreases in child- and parent-reported television viewing hours per week. Also compared to controls, children in the intervention group had statistically significant relative decreases in body mass index.
- *Stanford GEMS* (16) was designed to reduce television, videotape, and video-game use among African-American girls aged 8-10 years. The intervention consists of after-school dance classes (GEM) at three community centers and a five-lesson intervention called

START (Sisters Taking Action to Reduce Television) delivered in participants' homes. The GEMs dance classes were offered 5 days a week, and girls were encouraged to attend the dance classes as often as possible over the 3-month study period. Each daily class lasted up to 2.5 hours, starting with a healthful snack, an hour homework period, and 45-60 minutes of moderate-to-vigorous dance. The sessions ended with 30 minutes of GEMS talks exploring the meaning of dance. The START intervention consisted of 5 lessons delivered during home visits. Specific behavioral goals were based on self-monitoring, a 2-week TV turn-off, and budgeting TV viewing. The intervention resulted in reductions of more than 20% in television, videotape, and video game use among the intervention group of girls, and statistically significant reductions in reported household television viewing.

### *Effectiveness*

Intervention studies to reduce television viewing have shown reductions in the hours of TV viewing that range from 3.1 to 5.5 hours per week.

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