Population-Level Intervention Strategies and Examples for Obesity Prevention in Children*

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Abstract

With obesity affecting approximately 12.5 million American youth, population-level interventions are indicated to help support healthy behaviors. The purpose of this review is to provide a summary of population-level intervention strategies and specific intervention examples that illustrate ways to help prevent and control obesity in children through improving nutrition and physical activity behaviors. Information is summarized within the settings where children live, learn, and play (early care and education, school, community, health care, home). Intervention strategies are activities or changes intended to promote healthful behaviors in children. They were identified from (*a*) systematic reviews; (*b*) evidence- and expert consensus–based recommendations, guidelines, or standards from nongovernmental or federal agencies; and finally (*c*) peer-reviewed synthesis reviews. Intervention examples illustrate how at least one of the strategies was used in a particular setting. To identify interventions examples, we considered (*a*) peer-reviewed literature as well as (*b*) additional sources with research-tested and practice-based initiatives. Researchers and practitioners may use this review as they set priorities and promote integration across settings and to find research- and practice-tested intervention examples that can be replicated in their communities for childhood obesity prevention.

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INTRODUCTION

Poor nutrition and inactivity contribute to childhood obesity, which currently affects approximately 12.5 million American youth (86). Children who are obese are more likely to have adverse health conditions such as hypertension, dyslipidemia, type 2 diabetes, asthma, and nonalcoholic fatty liver disease. In addition to physical health issues, children who are obese have a greater risk of social and psychosocial problems, such as discrimination and poor self-esteem (31, 44, 109). Childhood obesity is also associated with increased school absenteeism and poorer school performance (45, 111). In addition to these immediate consequences, obese children are also more likely to become obese adults (101), which is associated with serious health conditions including heart disease, diabetes, and some cancers. Estimates of health care costs associated with adult obesity were approximately $147 billion in 2008 dollars (40).

Intervention strategies that can improve nutrition target behaviors to help prevent childhood obesity include increasing fruit and vegetable intake and decreasing calories from added sugars and solid fats (119). The National Health and Nutrition Examination Survey findings indicate that American children and youth consume too many calories from solid fats, added sugars, and refined grains (119). A healthy eating pattern limits intake of these items and emphasizes nutrient-dense foods such as vegetables and fruits, whole grains, and low-fat/non-fat dairy sources (119).

Additional obesity intervention strategies address activity behaviors and include increasing physical activity and decreasing sedentary and screen time. According to the 2008 Physical Activity Guidelines for Americans, children and adolescents ages 6–17 years old should take part in one hour or more of physical activity every day, with the majority of time spent in either moderate- or vigorous-intensity aerobic physical activity (120). As part of their daily physical activity, children and adolescents should do vigorous-intensity activity as well as muscle- and bone-strengthening activity each on at least three days per week. Evidence suggests that physical activity results in a favorable body composition in children (120).

A number of organizations and high-level officials have put forward recommendations for childhood obesity prevention, including the U.S. Surgeon General's Vision for a Fit and Healthy Nation and the President's Childhood Obesity Task Force (121, 126). In addition, the National Physical Activity Plan and the Institute of Medicine (IOM) have put forward publications for decision makers and policy makers including the Local Government Actions to Prevent Childhood Obesity and the Early Childhood Obesity Prevention Policies that move the field from research evidence to action (**http://iom.edu/Reports**).

Efforts to address child obesity can span levels and settings. As reviewed by Swinburn et al. (110), the physiology of energy balance is determined proximally by behaviors and distally by environments. Population-wide reductions in childhood obesity will require a comprehensive response where individual changes in diet and activity behaviors supported by healthful environments in multiple settings have the potential to collectively promote energy balance (61). Building upon the socioecological model (107) and the 2007 prevention framework for childhood obesity (61), the ecological framework in **Figure 1** shows that behavioral choices are influenced not only by settings where children spend time (physical

IOM: Institute of Medicine

environments such as early care and education, school, health care, community, home) but also by macrolevel sectors (e.g., agriculture policies, food systems, transportation), social networks (family, friends, peers), and individual factors (e.g., skills, attitudes, preferences, demographic characteristics.) As synthesized by Brennan et al. (13), policies can be levers to alter multiple environments, including the physical, economic, communication, and social environment. These systems, or environmental changes, can alter social norms, attitudes, and motivations as well as seek to improve equitable access, resources, and supports for healthy eating and active living. Environments can also be altered without the use of regulation or policy, such as through organizational-level change. Both policy and environmental changes may also help to reduce disparities by improving access to and the availability of healthy food and physical activity outlets (13, 107). Behavioral and social support interventions include those that improve knowledge, attitudes, and skills, through curricula or media venues, as well as processes that use social relationships or social resources to promote health and well-being (25).

Selecting which interventions to use for childhood obesity prevention is a complex process informed by many considerations. Various approaches have been developed to look at various intervention elements and quality of evidence. Systematic reviews, such as those published in Cochrane Reviews and The Guide to Community Preventive Services (Community Guide) (27), have looked at the body of evidence for select obesity prevention topics to identify all relevant studies, assess their quality, and summarize the evidence. In addition to evidence of intervention effectiveness, other aspects to consider in order to address the problem of obesity include reach and cost. A number of groups have worked toward defining elements of successful interventions, such as RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) (47), and an expansion of this model, Assessing the Cost-Effectiveness of Obesity in children (ACE) (17).

While the evidence of what works to improve nutrition and physical activity and to ultimately reduce childhood obesity is building, a number of groups are evaluating the quality of evidence that appears promising. The IOM acknowledges the need to consider other forms of evidence in its report Bridging the Evidence Gap in Obesity Prevention: A Framework to Inform Decision Making and its LEAD framework (short for Locate evidence, Evaluate evidence, Assemble evidence, and inform Decisions) for obesity prevention (66). The framework helps to assemble the evidence for childhood obesity prevention through steps that identify and evaluate the best evidence available and summarize it for use. Brennan et al. (13) have created tiers of evidence to summarize findings for individual interventions and across policy and environmental interventions.

An approach to expanding the base of available evidence is to draw on interventions developed not only in research settings but also in practice (i.e., practice-based interventions) as described by Leeman et al. (71). The latter may have the advantage of being more feasible to implement and more compatible with existing community efforts than researcher-developed interventions. These interventions add a source of "best available evidence" to guide community-level practice (71). For this purpose, the Center of Excellence for Training and Research Translation (22) developed a process to identify, review, translate, and disseminate the evidence and guidance public health practitioners need to implement effective interventions. Interventions are reviewed according to whether they meet baseline criteria in three areas: (*a*) potential public health impact [guided by the RE-AIM framework (47)]; (*b*) dissemination readiness (by assessing the extent to which the intervention is described sufficiently to allow replication and materials/supporting documents are available for download and of useable quality); and (*c*) effectiveness [using criteria adapted from the process used by the Community Guide (27) to assess the strength of evidence of research-tested interventions (127)]. After reviewing a

CDC: Centers for Disease Control and Prevention

ECE: early care and education

practice-based intervention, an intervention may be classified as "practice-tested," which meets all practice-based criteria, or "emerging," which meets the first two criteria, and although the later intervention may lack evaluation findings reporting effects on targeted outcomes, the approach must be innovative and its effectiveness considered highly plausible.

The purpose of this review is to provide a summary of population-level intervention strategies and specific examples that illustrate ways to improve nutrition and physical activity behaviors to prevent childhood obesity, including educational, social support, policy, system, and environmental approaches.

Intervention strategies and specific examples were selected through methods that allowed the authors to compile available evidence on research- and practice-based interventions. Intervention strategies were activities or changes intended to promote healthful behaviors in children. They were identified from (*a*) systematic reviews (e.g., Cochrane Reviews, The Community Guide); (*b*) evidence- and expert consensus–based recommendations, guidelines, or standards from nongovernmental groups [e.g., the IOM's Early Childhood Obesity Prevention Policies: Goals, Recommendations, and Potential Actions (56)] or federal agencies [e.g., the Centers for Disease Control and Prevention (CDC) School Health Guidelines to Promote Healthy Eating and Physical Activity (20)]; and (*c*) peer-reviewed synthesis reviews. Intervention examples illustrate how at least one of the strategies was used in a particular setting. To identify interventions examples, we considered (*a*) peer-reviewed literature as well as (*b*) sources with research-tested and practice-based initiatives that have been examined and found to have underlying logic and an evidence-base and are ready for dissemination [e.g., Center of Excellence for Training and Research Translation (22), the Substance Abuse and Mental Health Services Administration, and the National Cancer Institute's Research-Tested Intervention Programs (108)]. In addition to these publicly available sources, we also (*c*) spoke with experts about key emerging and promising examples. Content experts for each setting summarized available intervention strategies and selected intervention examples for inclusion in the review.

INTERVENTIONS BY SETTINGS

The following sections provide an overview of setting-specific interventions across five settings (early care and education, school, health care, home, community). A summary of the intervention examples provided in the review is presented in **Table 1**.

Early Care and Education

A key setting for childhood obesity prevention efforts is early care (i.e., child care) and education (ECE). Over 11 million children under the age of five spend an average of 36 hours in any given week in ECE (76), and 61% of all preschool children receive some form of nonparental child care on a regular basis (38). In addition to the time spent in ECE during which a large amount of activity and healthy eating can occur, ECE also provides an opportunity to shape healthy behaviors through education and role modeling. Children aged 2 to 5 years in child care are more likely to eat a food when an adult role model eats that food or one similar (1). Not only does this influence consumption, but habits developed in early childhood may potentially track into later life behaviors as well, thus affecting a lifetime of healthy eating and activity (102, 114). Although ECE settings are important for obesity prevention, they are often an untapped opportunity for supportive nutrition and physical activity changes (64).

Strategies for the ECE setting can be drawn from a variety of sources. A 2011 Cochrane review of interventions for preventing child obesity found that environments and cultural practices supported children eating healthier foods and being active throughout each day (125). This finding is relevant to the ECE setting along with other settings a child is in throughout the day. Practices supporting

Table 1 Childhood obesity prevention intervention examples and settings for improved nutrition and physical activity

Intervention example	Setting					Target	
	ECE	School	Community	Health care	Home	Nutrition	Physical activity
5-2-1-0 (74)			X	X		X	X
Baltimore Healthy Stores (22)[a]			X			X	
Bienestar (108)[d]		X	X		X	X	X
Brocodile the Crocodile (68)	X					X	X
Campaign for a Commercial-Free Childhood (16)			X		X		X
Child and Adolescent Trial for Cardiovascular Health (108)[d]		X			X	X	X
Color Me Healthy (22)[b]	X					X	X
Eat Better, Eat Together (124)					X	X	X
Eat Well Play Hard (22)[c]	X					X	X
Eat Well, Keep Moving (108)[d]		X	X		X	X	X
Fresh Food Financing Initiative (22)[b]			X			X	
Health Bucks (22)[c]			X			X	
Healthy Food Environments Pricing Incentives (22)[b]			X	X		X	
High 5 for Kids (51)					X	X	
Hip-Hop to Health Jr. (41)	X					X	X
Lifestyle Education for Activity Program (88)		X	X		X		X
Mind, Exercise, Nutrition . . . Do It! (96)					X	X	X
Nutrition and Physical Activity Self-Assessment for Child Care (22)[a]	X					X	X
New York City child-care regulations (22)[c]	X					X	X
Obesity Prevention Plus Parenting Support (52)					X	X	X
PACE+ (89)				X		X	X
Riverside Unified School District Farmers' Market Salad Bar Program (22)[b]		X				X	
Safe Routes to School (104)		X	X				X
School Nutrition Policy Initiative (43)		X	X		X	X	
Shape Up Somerville (35)		X	X	X	X	X	X
Sports Play Active Recreation for Kids (108)[d]		X					X
Take 10! (106)		X					X
Team Up at Home (116)					X	X	X

(*Continued*)

Table 1 (*Continued*)

Intervention example	Setting					Target	
	ECE	School	Community	Health care	Home	Nutrition	Physical activity
The National Gardening Association, Kids Gardening Program (115)			X			X	
Turnoff Week (23)			X		X		X
VERB Campaign (54)			X				X
Ways to Enhance Children's Activity and Nutrition (78)					X	X	X

[a]Strength of evidence-level research-tested intervention per Center of Excellence for Training and Research Translation (TRT), **http://www.center-trt.org/index.cfm.**

[b]Strength of evidence-level practice-tested intervention per Center TRT, **http://www.center-trt.org/index.cfm.**

[c]Strength of evidence-level emerging intervention per Center TRT, **http://www.center-trt.org/index.cfm.**

[d]Strength of evidence-level research-tested intervention per the Substance Abuse and Mental Health Services Administration and the National Cancer Institute, **http://rtips.cancer.gov/rtips/programSearch.do.**

Abbreviation: ECE, early care and education.

healthier foods and being active are recommended by the IOM (56). Strategies for preventing childhood obesity specific to the ECE setting have also been developed in partnership with the American Academy of Pediatrics, the American Public Health Association, the National Resource Center for Health and Safety in Child Care and Early Education, and the U.S. Department of Health and Human Services (4). These evidenced-based and expert consensus–developed standards include recommendations to make water available throughout the day, limit 100% fruit juice to 4–6 ounces for 1- to 6-year-old children, avoid serving sweets, offer nutrition education to children and parents, promote active daily play, limit screen time, and encourage caregivers to be role models of healthy eating habits and physical activity (3). Additionally, in a recent review of evidence for obesity prevention in ECE center–based care, strategies that were employed in interventions that successfully improved nutrition or physical activity outcomes included modifying food-service practices, providing classroom-based nutrition education, integrating additional opportunities for physical activity into classroom curriculum, and engaging parents through educational newsletters or activities (68).

Only two ECE center–based interventions examples have successfully demonstrated a positive effect on child weight status (68). These interventions were Hip-Hop to Health Jr. (41), with nutrition and exercise lessons and parental assignments, and a preschool dietary/physical activity intervention in Israel with classroom nutrition education, exercise training, and encouragement to increase activity after school (37). Both of these examples included multiple components to address nutrition, physical activity, and sedentary behaviors. Although a number of center-based care (e.g., child-care centers, preschools, Head Start programs) interventions are under way, no published interventions have been designed for implementation in family child-care homes (68).

An example intervention that has a focus on behavioral change but also includes an environmental component is Color Me Healthy (22). Color Me Healthy is a practice-tested intervention that has been shown to improve fruit and vegetable intake and increase physical activity among 4- and 5-year-old children in ECE settings by addressing the individual and interpersonal levels of the socioecological model. It provides a highly visual and interactive curriculum that increases

exposure to nutrition education and physical access opportunities for physical activity and includes training of ECE providers, curriculum and teaching materials for teachers, developmentally appropriate lessons, the Color Me Healthy music, and a reinforcing classroom environment. This program used ECE providers and parents as teachers and role models to provide social support as well as increased opportunities for physical activity through various curriculum activities. As a result, children increased fruit and vegetable consumption, and ECE providers reported increased physical activity of children while in their care, increased willingness to try new foods, and increased nutrition and physical activity knowledge (22). Another example, Eat Well Play Hard, is an emerging intervention that seeks to increase self-efficacy and behavioral capabilities of preschool-aged children and their parents through skill-building activities related to nutrition and physical activity behaviors and to improve social support by creating a supportive environment to foster behavior change. The program is designed for centers serving low-income families. This multicomponent intervention could produce desired outcomes in the ECE setting since similar interventions have been effective at increasing fruit and vegetable consumption and physical activity in schools (22). Additionally, programs such as Brocodile the Crocodile, which included classroom education and home activities focused on reducing TV viewing, have been useful in decreasing screen time (68).

Child-care policy interventions can include standards, regulations, or legislation at the provider level (i.e., in child-care centers or homes), agencywide, across a county and/or state to promote healthier foods and physical activity. These policies affect the nutrition and physical activity environment and can also provide opportunities for health education, behavior development, healthy food consumption, and physical activity time. Currently, most states lack strong regulations for ECE settings related to healthy eating and physical activity; child-care centers are the most regulated, followed by large family and group child-care homes, and then small child-care homes (68). How each state meets select Caring for Our Children childhood obesity prevention standards was assessed for child-care centers, large family child-care homes, and small family child-care homes (83). Only 12% of U.S. state regulations fully meet standards across all child-care types and all components, 32% only partially mention the standard, 52% do not refer to the standard, and 1% contradict it. The nutrition components were slightly more often met (13%) than the physical activity standards (9%). These results identify strengths and areas for improvement, and the associated National Resource Center's Licensing Toolkit (83) can be useful for caregivers, legislators, and licensing agents to strengthen regulations. At the city and state levels, examples of changed ECE policy to improve child health include New York City and Delaware. Amendments in the New York City Health Code include policies to institute stricter nutritional standards, establish minimum requirements on indoor and outdoor play, provide structured and guided physical activity, and establish limits on sedentary TV viewing (22).

One policy and environmental example at the provider level is the Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC), a research-tested intervention that is designed to assess policies and best practices and highlight areas where modifications would be beneficial. It uses self-assessment of 14 areas of nutrition and physical activity policy, practice, and environment to identify strengths and weakness of the ECE facility; a health consultant to set goals for change and develop plans for practice improvement; and staff training and technical assistance to promote organization change. NAP SACC can be used to guide adaptation of strategies for the ECE setting, including social support for nutrition and physical activity using ECE providers as role models, increasing availability of healthy foods through menu changes, increasing active play while in ECE, and increasing access to places for activity through changes in play space.

PE: physical education

Intervention ECE centers have increased their total ECE nutrition environment scores by 16% ($p < 0.01$ compared with control centers); physical activity scores, though not statistically significant from controls, showed positive improvement (22). The Let's Move! child-care initiative encourages ECE providers and parents to improve the quality of nutrition, physical activity, screen time, and infant feeding in child-care settings and is based upon the NAP SACC model.

School

Schools are another key setting for obesity prevention because 95% of youth ages 5 to 17 years are enrolled in schools for approximately six hours each school day (103). School health programs and policies can promote a school environment that supports healthy eating and physical activity and provides opportunities for students to learn about and practice these behaviors (20). Specifically, physical education (PE) and health education have historically been considered part of the K–12 curriculum in the United States (75). In addition, the federal school meal program, which was established more than 60 years ago, each school day feeds approximately 30 million students who participate in the U.S. Department of Agriculture (USDA) National School Lunch Program and approximately 10 million students who participate in the School Breakfast Program (117, 118). Many evidence-based strategies exist to prevent obesity through quality physical and health education and school nutrition environments (20).

A number of promising school-based strategies for preventing childhood obesity were identified in a Cochrane systematic review: Establish an environment that promotes healthy eating and physical activity; incorporate healthy eating, physical activity, and body image topics into the school curriculum; add more sessions for physical activity throughout the school week; improve the nutrition quality of the school food supply; and provide training for teachers on implementing health-promotion strategies (125) Additionally, certain school-based strategies were found to be cost saving in a recent cost-effectiveness review, including education to reduce television viewing, education to reduce sugar-sweetened drink consumption, and multifaceted programs that include nutrition and physical activity (50). The CDC's School Health Guidelines to Promote Healthy Eating and Physical Activity synthesizes the results of a systematic literature review into guidelines for schools to help address and prevent obesity through a coordinated approach. The report includes evidence-based recommendations for teaching students about how to engage in healthy eating and physical activity as well as creating an environment that allows students to witness and practice healthy behaviors (20). For healthy eating strategies, the IOM recommends that schools offer foods and beverages that comply with and promote the Dietary Guidelines for Americans to address the nutritional quality of the school food supply (57, 58). The IOM provides dietary guidance for school meals to increase the requirements for fruits, vegetables, and whole grains; require only fat-free and low-fat milk; and decrease the amount of sodium and trans fat (57). In addition, the IOM provides dietary guidance for foods sold outside the federal school meal programs (i.e., competitive foods) through venues such as the school cafeteria á la carte lines, vending machines, school stores, snack bars, concession stands, classroom parties, and fundraisers on school grounds, which offer and sell foods and beverages to students across the school day (58). Most competitive foods offered in these venues are high in sugar, fat, and calories, including high-fat salty snacks, high-fat baked goods, and high-calorie sugar-sweetened beverages, such as soft drinks, sport drinks, and fruit drinks (20). The USDA released the new Nutrition Standards in the National School Lunch and School Breakfast Programs to increase requirements for fruits, vegetables, and whole grains; require only nonfat and low-fat milk; and update the age-appropriate calorie ranges (85). The Healthy, Hunger-Free Kids Act of 2010 required schools to provide free drinking

water during lunch meal times and required the USDA to develop federal nutrition standards for competitive foods consistent with the Dietary Guidelines for Americans.

In 2006, less than 8% of schools provided daily PE for the entire school year for students in all grades, and 21% of elementary schools did not provide regularly scheduled recess (70). A Cochrane systematic review concluded that school-based physical activity interventions can have a positive impact on physical activity, fitness, sedentary behavior, and blood cholesterol levels (33). The Community Guide recommends adding more time for PE and implementing practices that increase the amount of time students are engaged in moderate to vigorous physical activity during PE (14, 63). The National Physical Activity Plan (82) strategies for schools include implementing state and district policies requiring school accountability for physical activity, linking youth with community opportunities, providing before- and after-school opportunities, providing access to physical activity opportunities, incorporating population-focused physical activity promotion training in degree and certificate programs, and providing comprehensive school-based physical activity programs. For example, schools can contribute to a substantial portion of child and adolescent physical activity by providing students with a comprehensive school-based physical activity program. A comprehensive school-based physical activity program includes daily PE, recess, and other physical activity breaks; intramurals and physical activity clubs; interscholastic sports; and walk- and bicycle-to-school initiatives (20).

School-based examples that focus on behavior change incorporate healthy eating, physical activity, sedentary activity, and weight management topics into health education (108). Health education that incorporates these topics can improve student dietary behaviors and physical activity participation levels; reduce sedentary behaviors; and improve serum cholesterol levels, blood pressure, and body mass index (BMI) (20). For example, Planet Health, a research-tested intervention, integrated classroom health topics (e.g., physical activity, nutrition, and sedentary behaviors) into major subject areas (e.g., language arts, math) and physical education. The prevalence of obesity among girls participating in the intervention was reduced. Both boys and girls participating in Planet Health watched fewer hours of television, and girls consumed more fruits and vegetables (49). Other examples of research-tested interventions with a health education component include Bienestar, the Eat Well and Keep Moving Program, and the Child and Adolescent Trial for Cardiovascular Health (CATCH) (108).

Nutrition environment interventions have impacted the school nutrition environment by changing the dietary quality of the foods and beverages offered and restricting less healthy options. One approach is to train nutrition services staff to use healthy food preparation techniques for school meals. One component of CATCH focused on training food service personnel to produce school meals that were lower in total fat, saturated fat, and sodium, resulting in decrease intake of saturated fat and dietary cholesterol by students at intervention schools (73, 108). When CATCH was replicated in low-income schools, students participating in the intervention experienced a slower rate of increase in obesity (26). Another school nutrition environment strategy is to make fruits, nonfried vegetables, and free water more accessible to students throughout the school day and on the entire campus. Schools might also consider implementing school garden programs, farm-to-school programs, and salad bars in the cafeteria (20). For example, the Riverside Unified School District Farmers' Market Salad Bar Program is a practice-based intervention example wherein students had access to a daily salad bar stocked with produce provided by local farmers. The program resulted in students consuming more servings of fruits and vegetables for lunch (22). In addition to changes in dietary habits, salad bar, school garden, and farm-to-school programs

OCCM: Obesity Chronic Care Model

can increase student knowledge, awareness, and preferences for fruits and vegetables (20).

Physical activity interventions play an important role in school-based obesity prevention by adding more time for physical activity and increasing the time students are engaged in moderate to vigorous physical activity. The Sports, Play, and Active Recreation for Kids (SPARK) program is a research-tested intervention that used PE specialists to implement instructional strategies to increase the amount of time students spend in moderate to vigorous physical activity in PE (99, 108). Students in the intervention ultimately participated in more minutes of moderate to vigorous physical activity and expended more calories during PE. In addition, SPARK demonstrated that having a trained PE specialist was a key strategy to achieving this effect (99). Examples of adding more time for physical activity through PE and before, during, and after school include Take 10!, which incorporated activity into elementary academic subjects (106), and the Lifestyle Education for Activity Program, which addressed PE and physical activity throughout the school day (88).

School-based obesity prevention has also been addressed in local school wellness policy examples. Each school district participating in the federal school meal programs must have a local school wellness policy with goals around nutrition and physical activity. For example, the policy must include goals for nutrition promotion and education, physical activity, and other school-based activities that promote student wellness, and nutrition guidelines for all foods available on each school campus (93). The School Nutrition Policy Initiative implemented a comprehensive intervention to address school nutrition through self-assessment using the CDC's School Health Index, staff training, nutrition education, nutrition policy, social media, and family outreach. Schools established nutrition standards based on the Dietary Guidelines for Americans for all foods served and sold in schools (21, 43). After two years, significantly fewer children in the intervention schools became overweight than in the control schools (43).

Health Care

Health care providers, including primary care physicians, nurse practitioners, nurses, and others are positioned to help address childhood obesity. With over 160 million health care visits every year (90), providers have the opportunity to engage individuals in chronic disease prevention, including children and families. Practitioners can influence practices, policies, systems, and environments where children spend time by incorporating the Obesity Chronic Care Model (OCCM) and obesity prevention recommendations into practice, and through advocacy, community involvement, and collaborations with local and state health departments, schools, recreation facilities, and community organizations (32). The OCCM framework highlights the ways in which health care provider interventions play an important role in reducing childhood obesity. In the OCCM, health care for individuals with obesity takes place in three overlapping arenas: (*a*) the entire community and its resources and policies, (*b*) the health care system and payment structures, and (*c*) the health care provider organization, from large delivery systems to smaller clinics and practices (32, 62). The OCCM centers on patient self-management and links the health care system with the environmental spheres, from the individual and family through the community and society.

The evidence base for health care strategies to address childhood obesity comes from several key sources. A Cochrane Review of lifestyle interventions for treating obesity included 54 trials in children and adolescents focusing on physical activity, diet, or combined behavioral approaches in the health care, school, or community setting. It found reductions in overweight and obesity up to 12 months postintervention (87). The U.S. Preventive Services Task Force conducted a systematic review and recommended that for children over 6 years of age, clinicians should screen for obesity using BMI and provide them or refer them to comprehensive moderate- to high-intensity behavioral interventions

to promote improvement in weight status (123). This recommendation was based on the assessment of a net moderate benefit for such interventions as measured by reductions in overweight and obesity at 12 months postintervention. National organizations have also recommended BMI assessment and behavioral counseling by health care professionals: In 2007, the Expert Committee convened by the American Medical Association, in collaboration with the CDC and Health Research Services Administration, provided recommendations on the clinical prevention, assessment, and treatment of childhood obesity (9). The committee divided treatment into steps that include BMI assessment, counseling, providing a structured weight-management plan, and using a comprehensive intervention delivered by multidisciplinary teams. The American Academy of Pediatrics (AAP) endorsed the committee's recommendations. Several federal organizations have also provided recommendations that health care providers and systems support BMI assessment and behavioral counseling for children and adolescents (121, 122, 126). There were no systematic reviews or studies of the role of health care providers or systems in role modeling healthy behaviors and lifestyles for the prevention of childhood obesity. However, the Surgeon General's Vision for a Healthy and Fit Nation recommended that health systems help providers practice and model healthy behaviors by providing and making healthier choices within hospitals and health care systems. Furthermore, at the population level providers can be agents of broader systems change, such as healthier food and physical activity choices, within their own communities and states (2, 69). The National Initiative for Children's Healthcare Quality profiles these systems strategies through the Be Our Voice campaign (79). Additionally, the AAP Expert Committee on the prevention and treatment of obese and overweight children recommended that health care providers advocate for safe parks and recreation centers, local initiatives that support walking and bicycle paths to provide opportunities for physical activity, and for other improvements to the built environment in communities, including access to grocery stores that offer low-cost healthy food (2, 9).

Interventions to improve behavioral outcomes can involve counseling and referrals to local resources. Use of counseling messages along with motivational interviewing improves some diet, physical activity, and sedentary behaviors (89, 112). Examples of nutrition messages that health care providers can incorporate into practice include counseling on increasing fruit and vegetable consumption and reducing sugar beverage consumption (74). Most investigations in children have included these messages in a multicomponent intervention along with physical activity and/or screen-time counseling. One multicomponent intervention restructured primary care practices and provided motivational interviewing by clinicians and educational modules for families of young children. Children in the intervention practices had increases in fruit and vegetable consumption and decreases in sugar beverage consumption, although not statistically significant, by as much 0.12 servings/day and 0.22 drinks/day over one year (112).

Younger children and their families should be instructed on appropriate types of physical activity and play and duration based on age. In young adolescents, interventions to increase physical activity can incorporate other modalities such as Web- or computer-based programs, as in PACE+ (89). In the PACE+ study, there was a statistically significant increase in physical activity in 11- to 13-year-olds of 0.3 active days/week compared with standard care (89). The AAP and several other groups have disseminated targeted, multicomponent behavioral counseling goals, such as the 5-2-1-0 toolkit (74). This toolkit includes daily recommendations for five servings of fruits and vegetables, fewer than two hours of screen time, one hour of physical activity, and no sugar beverages. It can aid in the clinical encounter and can be used to deliver consistent messages across settings.

Another example of promoting the incorporation of systems change into practice is

performance assessments, which can spur systems improvements in clinical care. The Healthcare Effectiveness Data and Information Set, developed by the National Committee for Quality Assurance, is a measure that health plans can use as a tool to track performance by providers and includes BMI assessment and behavioral counseling (77).

Health care providers have helped promote healthy nutrition and physical activity with policy and environment changes within their own clinics and hospitals. This approach can increase healthy options for employees, visitors, patients, and the neighboring community. Foods served in health care settings not only influence food choices on the day of the visit but also influence patients' perception of healthy foods. A fast food chain on hospital grounds has been associated with a four times higher rate of consumption of fast food the day of the health care visit, and respondents from the hospital with fast food rated the fast food as healthier than did respondents at other hospitals (98). Furthermore, health care providers and institutions can send important messages as role models for healthy food and physical activity. Written policies can provide access to fruits and vegetables, promote competitive pricing of healthy options, increase the proportion of healthy options in vending machines, and support physical activity breaks for employees. Environment changes can place healthy beverages at eye level or provide bike racks and safe and attractive walking trails for activity. Some health care facilities are increasing access to fruits and vegetables by incorporating fresh, local produce into health care food service (97) and hosting farmers' markets and community-supported agriculture programs for patients, families, employees, and the community (53). A competitive pricing strategy, as part of a multipolicy intervention in a hospital cafeteria, has been shown to effectively change consumer choice (22). The Healthy Food Environments Pricing Incentives, a practice-tested intervention example, can be used for children's menus and to encourage purchase (through a price decrease) of healthier food choices such as fruits and vegetables.

Some examples have improved the built environment to increase physical activity (14). Although these studies have assessed only adults, similar effects could be seen in the pediatric population. For example, developing policies for the use of stairs in health care facilities can increase physical activity as well as promote a culture of health.

Finally, health care providers are also in a position to improve the health of their patients through working with their neighboring communities. Education and support for policy and environment change by health care professionals is currently under way through the National Initiative for Children's Healthcare Quality (80). Health care professionals who provide information to school boards and city councils can help make the case for nutrition offerings and physical activity opportunities in ECE and schools. In some instances, health care providers' efforts to improve policies and environments can be a part of a coalition or food council that addresses hospitals, clinics, schools, and community-based settings.

Community

Community-based obesity intervention approaches can reach large sectors of the population in an attempt to promote healthy nutrition and physical activity choices for adults and children. Communities are commonly referred to as networks or groups of individuals who share common beliefs, values, or culture (e.g., faith-based community, social organizations, nonprofit organizations, residential communities) but can also be individuals who reside and work in common geographic locales and share a variety of common institutions (e.g., local government) and resources (e.g., grocery stores).

A variety of strategies can be implemented in the community setting. The 2011 Cochrane review of interventions for preventing child obesity found that environmental and cultural practices that support children eating healthier

foods and being more active throughout each day, which includes their time in the community, was a promising strategy (125). Although a recent Cochrane Review of communitywide interventions for physical activity in adults was unable to support the hypothesis that multicomponent communitywide interventions would increase population levels of physical activity, it identified a clear need for well-designed intervention studies to evaluate this (8). Also relevant to the community setting are the Community Guide (14) recommendations on interventions aimed at increasing physical activity, including community- and street-scale urban design and land use policies, the creation or enhancement of places for physical activity with informational outreach activities, and community-wide campaigns to promote physical activity. Community-based strategies suggested in the Recommended Community Strategies and Measurements to Prevent Obesity in the Unites States include improving access to outdoor recreation facilities, enhancing infrastructure for bicycling and walking, locating schools within easy walking distance, improving public transportation, and zoning for mixed land use (65). Also, the community's built environment can influence residents' access to healthy affordable foods and beverages, which can be increased through supportive changes in food retail venues such as farmers' markets, community gardens, and convenience and grocery stores (67). The AAP Expert Committee on the Prevention and Treatment of Obese and Overweight Children stated that efforts in the community can support obesity-prevention behaviors through increased access to healthy foods, media campaigns, and other policy strategies that support healthy active living (2, 9). Finally, the 2005 and 2007 IOM reports (60, 61) outline broad recommendations for communities and their partners, including public health agencies, schools, and community organizations, to encourage healthy eating and physical activity. Specific strategies for communities include programs aimed at promoting healthy eating and expanding opportunities for physical activity. As demonstrated by these reviews of key literature, many recommendations include ways for children and adults to access healthy foods and be active. Additional strategies that can be implemented as part of a communitywide intervention include community-wide educational campaigns, individual education, screening, counseling, community events, and low-cost lifestyle modifications (30, 36, 63). In addition, policy and environmental strategies can be included in organizations within the community such as faith-based groups, public service venues including government facilities (e.g., libraries, government workplaces), and park and recreation facilities.

Interventions have increased healthy food access in the community to support healthy food choices by children and families. Examples include policy and environmental changes that increased access to corner and grocery stores, community gardens, and farmers' markets that provide healthy food options as well as through educational and behavioral interventions that increase knowledge and decrease barriers to their use. Interventions can aim to improve the availability of nutritious foods in urban corner stores, as was the goal of the Baltimore Healthy Stores (22) initiative. This research-tested intervention provides low-income urban community residents with increased knowledge and access to healthy foods. It also helps store owners with stocking and promoting healthier food options (22). State and local governments can take an active role in promoting healthy nutrition through policy and environmental changes. Pennsylvania's practice-tested Fresh Food Financing Initiative (22) focused on providing access to healthy foods by giving grocery stores and supermarkets financial incentives in the form of grants and loans to operate stores in underserved communities. In another example, Health Bucks (22), funded by the New York City Department of Health and Mental Hygiene and other local government agencies, aimed to increase access to fruits and vegetables by directly providing low-income New York City residents and recipients of the Women, Infants, and Children program and the

Supplemental Nutrition Assistance Program with $2 coupons to redeem in local farmers' markets to purchase fruits and vegetables. This emerging intervention has documented increases in the distribution of Health Bucks and their redemption rates, and the number of farmers' markets accepting Health Bucks has increased annually from 2005 to 2009 (22). Finally, community gardens are a potential intervention that may help to increase children's fruit and vegetable knowledge and intake and impact tastes and preferences. Gardens may aid in the promotion and knowledge of healthy food consumption among youth by providing multiple levels of exposure to fruits and vegetables, from planting to harvesting (95). Although currently there is relatively little peer-reviewed literature on the topic, garden-based nutrition interventions have the potential to promote increased intake and willingness to taste fruits and vegetables. Many programs, such as the National Gardening Association's Kids Gardening Program (115), have been implemented around the country.

Creating task forces including those specific to the food system, such as food policy councils or advisory coalitions, is an approach to improving the nutritional environment of communities outside of traditional government leadership and is a recommended community strategy to prevent obesity. The CDC's Recommended Community Strategies for Obesity Prevention encourage the organization of task forces or councils at the state or community level that can aid in the choice and implementation of strategies to increase access to and availability of healthy foods and beverages (65). Given the diversity of stakeholders in childhood obesity, sound leadership from a broad cross-section of individuals who effectively pool their influence, talents, and resources is needed (61). Food policy councils typically include in their membership local community members from public, private, and nonprofit sectors such as health, nutrition, agriculture, policy, industry, and education. Many councils are involved in activities that increase access to and production and consumption of healthy foods, including partnering with and encouraging farmers' markets and stores to accept food assistance benefits, and encouraging state and local governments to consider policies to enhance the nutrition environment (65).

Population-based built environment approaches that have potential to increase physical activity include complete streets, joint use agreements, and opportunities for recreational activity in parks and open spaces. Interventions may increase access to sidewalks, bike paths, and safe parks and recreational facilities and help children become more physically active. For example, Safe Routes to Schools, through which states and local communities are awarded federal dollars to develop street crossing and promote walking and active commuting to school, appears to be promising. Staunton and colleagues (104) found that youth who took part in Safe Routes to Schools in Marin County, California, reported an increase in walking (64%) and biking (114%) to school.

Media interventions may help to support environmental initiatives for obesity prevention and appear to be cost-effective (50). For healthy eating, these include counter-advertising and/or reducing the marketing of unhealthy foods to young children. Research indicates that children who are exposed to high levels of unhealthy food advertising are more likely to request and consume such foods (59). One example of a physical activity media intervention is the VERB^{TM} campaign (54), which was a national social marketing campaign aimed at encouraging daily physical activity for children ages 9 to 13 years. Messages targeted children in the home, school, and community settings. The VERB campaign was found to positively influence physical activity outcomes in children exposed to the campaign.

Other ways to promote community-based obesity interventions include targeting specific settings or community organizations within high-risk communities. Overweight and obesity is particularly high among certain racial ethnic minority populations, including Mexican American boys (40.5%) and non-Hispanic black girls (41.3%) (86). Although many

initiatives that include racial/ethnic minority communities (42) have not been formally evaluated, they warrant further investigation because they provide an opportunity for culturally targeted approaches to reduce obesity in high-risk groups.

Home and Family

The most proximal setting that influences childhood obesity is the home environment. For children, the home environment represents the first and primary socialization point for healthy eating and adequate physical activity. Interventions in home/family environment at an early age may be important for obesity prevention because eating habits and taste preferences are established early in life and track into adulthood (11, 28, 92, 105), and older children begin to exercise more developmentally appropriate control over their eating and physical activity, and peers become more important influences. Previous research indicates that parents and other primary caregivers influence children through various behaviors including feeding practices (12) and modeling of healthy eating (12) and physical activity (10, 34). Parental involvement is a critical aspect of the short- and long-term success of obesity interventions and has been used to develop childhood obesity prevention and intervention programs (60). Furthermore, there is evidence that family-based interventions for youth who are already overweight are effective and cost saving (50).

Reports from the Cochrane Collaborative (125), U.S. Surgeon General (121), IOM (60), and AAP (29) underscore the role of parents in preventing obesity and provide recommendations to help aid them in this effort. For example, the Cochrane review of obesity prevention strategies recommends that parents support home activities that encourage children to be more active, eat more nutritious foods, and spend less time in screen-based activities (125). The Community Guide also recommends behavioral interventions to reduce screen time as a way to improve child and adolescent weight status across a variety of settings (19), including the home. Organizations such as the IOM encourage obesity prevention strategies such as limiting children's screen time and their exposure to food and beverage marketing as well as the consistent use of social marketing to promote obesity prevention strategies (55). In addition to limiting screen time and encouraging portion control, the AAP recommends family meals and authoritative parenting practices as strategies to prevent childhood obesity (29). Federal recommendations mirror those recommendations of national organizations. For example, the Surgeon General's Vision for a Healthy and Fit Nation recommends that parents breastfeed their infants, encourage their children to be physically active, eat small portions, and be role models by limiting their own television viewing. The document also recommends that parents talk to elected officials and law enforcement about increasing neighborhood safety in an effort to promote physical activity (121).

Caretakers can be a key focus of interventions in the home, addressing parenting skills and education, modeling practices, and changing the home environment. Research evidence to date suggests that obesity interventions in the home environment focusing exclusively on parents are effective (48). One example that has a parent-only focus is an add-on to the Parents as Teachers program, a national parent education program that uses in-home visitation to help parents develop the skills needed to promote health and developmental readiness for children. An extension of the base program is High 5 for Kids, a nutrition intervention example through which parents of preschool children, ages 2 to 5 years, receive instruction from parent educators through four in-home visits during which they are provided with information about how to teach their children about fruits and vegetables and how to change the home environment and their own feeding practices in ways that promote healthy eating. Results indicate that parents of normal-weight children and their children who took part in the High 5 intervention were more likely to

consume fruits and vegetables than were participants in the control group with no nutrition intervention (51). Similarly, a randomized control trial of the Obesity Prevention Plus Parenting Support (OPPS) intervention for American Indian mothers with preschool-age children (ages 9 months to 3 years) used home visits to provide support in making changes in lifestyle behaviors including nutrition, physical activity, and parenting. Mothers who were in the intervention group engaged in less-restrictive child feeding practices over time, and their children consumed fewer calories (52).

Multicomponent family-based interventions that include behavioral and educational strategies such as behavioral counseling, promotion of physical activity, parent training/modeling, dietary counseling, and nutrition education are successful in helping youth between the ages of 5 and 12 (94). One example, the Mind, Exercise, Nutrition . . . Do It! (MEND) Program is an obesity prevention program that promotes healthy lifestyles for children ages 2 to 4 years regardless of weight status and children 5 to 13 years who are overweight. Parents and children attend the sessions together in various community settings (e.g., recreation centers, schools), where they are provided with developmentally appropriate methods for preventing or treating obesity through workshops, discussion groups, and physical activity time. The MEND program efforts for youth 7 to 13 years are associated with the achievement of healthier weight status and improvement in physical activity levels, cardiovascular fitness, sedentary behaviors, and self-esteem (96). Hip-Hop to Health Jr. is a program for younger children with similar components including parental involvement through parent newsletters, aerobics, and incentives such as coupons. Hip-Hop to Health Jr. was evaluated in a randomized control trial that focused on healthy eating and physical activity among low-income, predominantly African American, 3- to 5-year-old children enrolled in Head Start. Children in the intervention group had smaller BMI increases than their peers in the control group at one- and two-year follow-ups (41).

The family meal is another setting in which healthy eating can be promoted. Children who eat regular meals with their families are more likely to eat fruits and vegetables (46) and less likely to be overweight (113). Although much of the research in this area has focused on adolescents, obesity interventions have incorporated family meals into their messaging. For example, the USDA's Team Up at Home (116) and Eat Better, Eat Together (124) initiatives have incorporated family meals into their messaging through various means including toolkits and helpful tips for parents. Other organizations such as the Nemours Foundation provide online tips to help parents promote family meals (84).

Social marketing campaigns can provide an additional intervention to prevent childhood obesity by educating families to reduce screen time, take part in physical activity together, and provide other opportunities for caregivers to model and introduce various forms of physical activity to children. These campaigns have increased physical activity among children. Examples of social marketing campaigns include Turnoff Week, sponsored annually by the Center for Screen-Time Awareness (23), and the Campaign for a Commercial-Free Childhood (16), encouraging communities, especially families, to turn off their electronic media (e.g., televisions, computers) for one week, replace screen time with physical activities, and consider establishing rules limiting screen time for the family. In some instances, entire communities take part in the campaign and engage in various activities in lieu of screen time.

Not only is family and parent involvement part of interventions in the home setting, but often it is embedded in obesity interventions that address multiple settings. Most frequently, family-based programs that encourage healthy nutrition and physical activity are integrated with interventions in the school setting, such as CATCH (73). Other settings are also integrated with family-based programs. For example, We Can! (Ways to Enhance Children's Activity & Nutrition) is a national obesity prevention initiative that targets parents and youth

(ages 8 to 14 years) (78). The program, which was developed as a result of a collaborative effort of four institutes of the National Institutes of Health, provides parents with tools and methods for promoting healthy eating and physical activity and decreasing screen time among the entire family. The program has three components: community outreach, community partnership development with national organizations, and media messaging. Results indicate that there were improvements in knowledge, behaviors, and attitudes related to nutrition, physical activity, and screen time for both parents and children (81).

Multiple Settings

Interventions do not need to be limited to a single setting but instead can span multiple settings. Strong evidence exists that child obesity prevention programs have beneficial effects on BMI. Synthesis of this literature indicates that supporting children's healthy eating and activity throughout each day (thus a multi-setting strategy) was a component of the intervention programs that contributed most to beneficial effects on weight status (125). The IOM recommends a comprehensive approach, and all the environments of the socioecological model have the potential to collectively promote energy balance (61). Additionally, as another strategy that spans settings and provides linkages between the settings, community health workers (lay health workers who are widely used to provide care for a broad range of health issues including those that intend to improve child health) can aid in cross-setting childhood obesity prevention. A recent Cochrane review found that community health workers provided promising benefits in promoting the evaluated interventions when compared with usual care (72). A policy statement by the American Public Health Association also supported community health workers as a way to increase health access and reduce health inequities (5). Linkages can be formed between community partners (e.g., community coalitions), families and care, or health care and community resources.

Promising findings are emerging from multi-setting, multi-level interventions for childhood obesity such as Shape Up Somerville (35) and the California Healthy Eating Active Communities Initiative (24, 100). Shape Up Somerville (35), a multi-setting intervention example, focused on environmental and policy change to help children increase physical activity and improve nutrition through the integration of initiatives in numerous settings including homes, schools, after-school programs, and the wider community. Results of this study indicated a reduction in children's BMI z-scores in comparison with control communities and illustrates that a multifaceted intervention involving multiple environments encountered by young children can successfully prevent obesity (35).

A final intervention, effective in other areas of chronic disease management, is utilizing community health workers (CHWs) to provide education on obesity risk factors and to link families to resources in multiple settings. CHWs are individuals with additional training whose services can be incorporated into health care or community interventions to help reach low-income, minority, or hard-to-reach populations. CHWs, also known as lay health workers, community health advisors, outreach workers, or *promotoras*, typically share similar ethnic, socioeconomic, and geographic characteristics of the patients and families they serve. CHWs have effectively worked within communities to reduce health disparities and improve health outcomes associated with chronic diseases such as diabetes and cardiovascular disease (7, 15, 39, 91). CHWs can provide home-based counseling and education, serve as the bridge between families and the health care system, and engage different sectors of the community (e.g., in faith-based centers) (15). Families with young elementary school-aged children receiving a *promotora* intervention focusing on child nutrition and physical activity were more likely than were control families to exhibit improvements in parental behaviors such as closer monitoring of their child's nutrition and physical activity, use of positive

reinforcement, and support for physical activity (6). Other parenting changes in the intervention group included less use of controlling strategies, reduced television viewing during evening mealtime, and less eating outside of the home (6). CHW interventions have the potential to reduce health care costs by linking patients and families to community resources, promoting healthy behaviors, and helping patients manage chronic diseases, possibly averting other expensive health care services or unnecessary hospitalizations (15, 18).

FUTURE DIRECTIONS

Future research directions include further exploration of combining public health and primary care interventions through multi-setting, multi-level models to address childhood obesity. A multi-level, multi-setting framework for childhood obesity prevention is depicted in **Figure 2**. Best available evidence from interventions across various settings and constructs can be applied in multiple settings (ECE, school, health care, home, and community) and levels (through education, social support, policy, systems, and environmental change) to support nutrition and physical activity choices in a coordinated model for obesity prevention. To date, the majority of research and evaluation efforts have been a one-setting analytic approach (e.g., in a school, without ascertaining the role of the home environment, the community, and the health care setting) despite a general understanding that influences on eating and activity across multiple settings are part of the complex problem and solution for obesity. As more initiatives are implemented across multiple settings, examination of interventions for success in childhood obesity should incorporate multiple settings in their design to assess the attribution and/or contribution of the other important settings that impact decisions and behaviors. Along with this emerging research involving multiple settings, levels, and influences comes new decisions regarding the choice of analytic approaches. These new models can attempt to assess the synergy of combining multiple approaches, try to tease out which elements of these models are the most successful, and attempt to determine factors affecting generalizability so that effective models can be applied in other diverse communities. Also, research efforts should assess means of providing linkages between and across settings; for example, linkages among community partners, community health workers, families and institutions, and integrating consistent messages across the settings. Given limited resources, cost-effectiveness analyses and impacts on health equity should be included as well.

Future research priorities also may include further assessment of tailored interventions for high-risk populations that may be included in population-level initiatives; the use of technology such as novel electronic approaches, social media, and electronic health records; examining healthy beginnings for infants and young children (e.g., breastfeeding, introduction of complementary foods, feeding styles and practices, sleep); identifying successful processes to implement strategies such as in the formation of community coalitions; and assessing sustainability and long-term effects of interventions. Additionally, new research in other disciplines such as behavioral economics can aid our understanding of the interaction of the environment and individual factors impacting behavior.

CONCLUSIONS

Creating supportive settings through policy, system, and environmental interventions as well as accompanying interventions that address individual knowledge, decision making, and social environments is recommended for childhood obesity prevention. Each setting documented here has a role to play in supporting children through their day. As the field continues to move forward, this summary of current population-level intervention strategies and intervention examples for childhood obesity prevention can aid stakeholders involved in childhood obesity prevention efforts.

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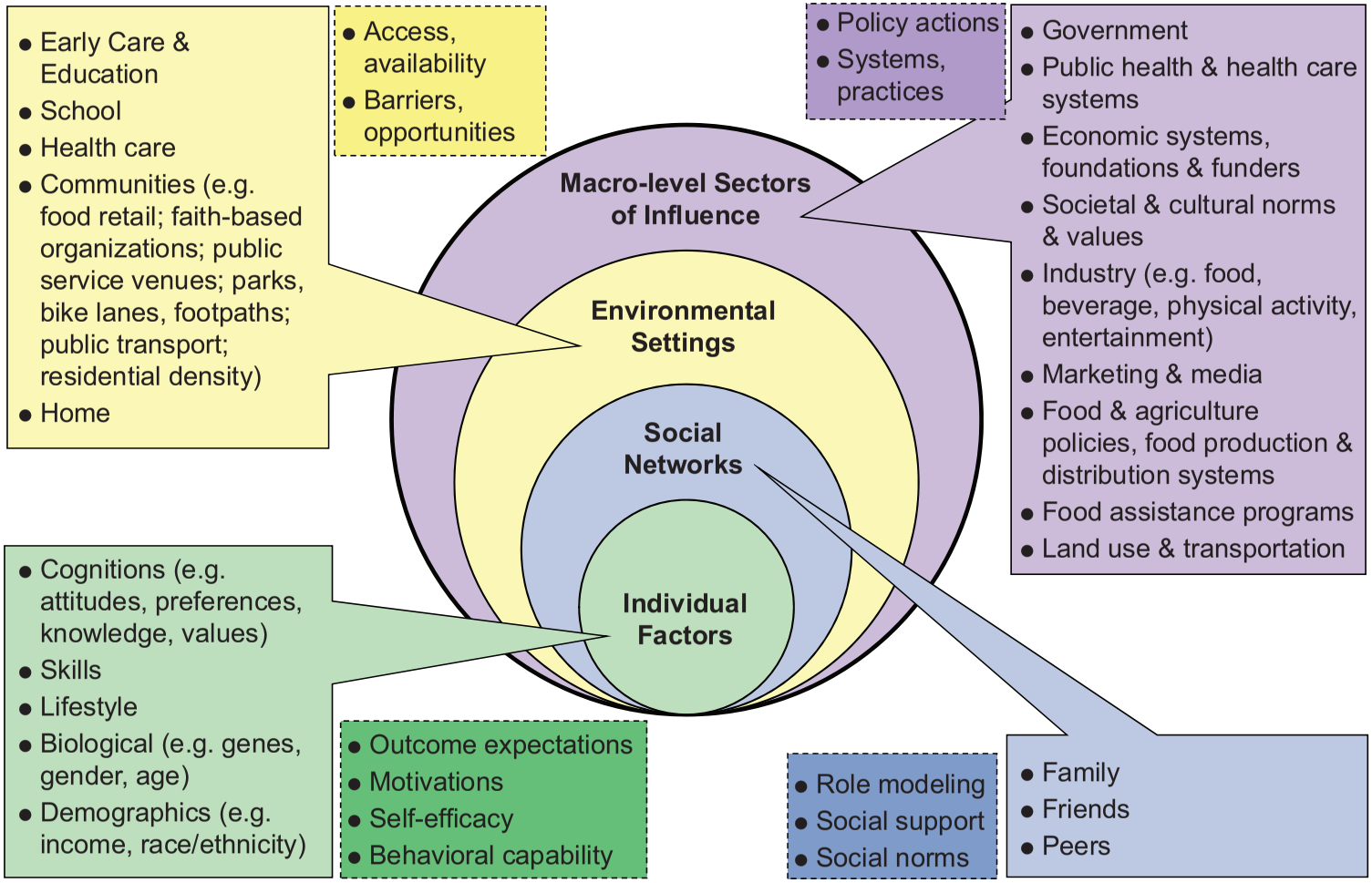

Figure 1

An ecological framework depicting the multiple influences on child eating and physical activity. (Adapted from Reference 107, with permission.)

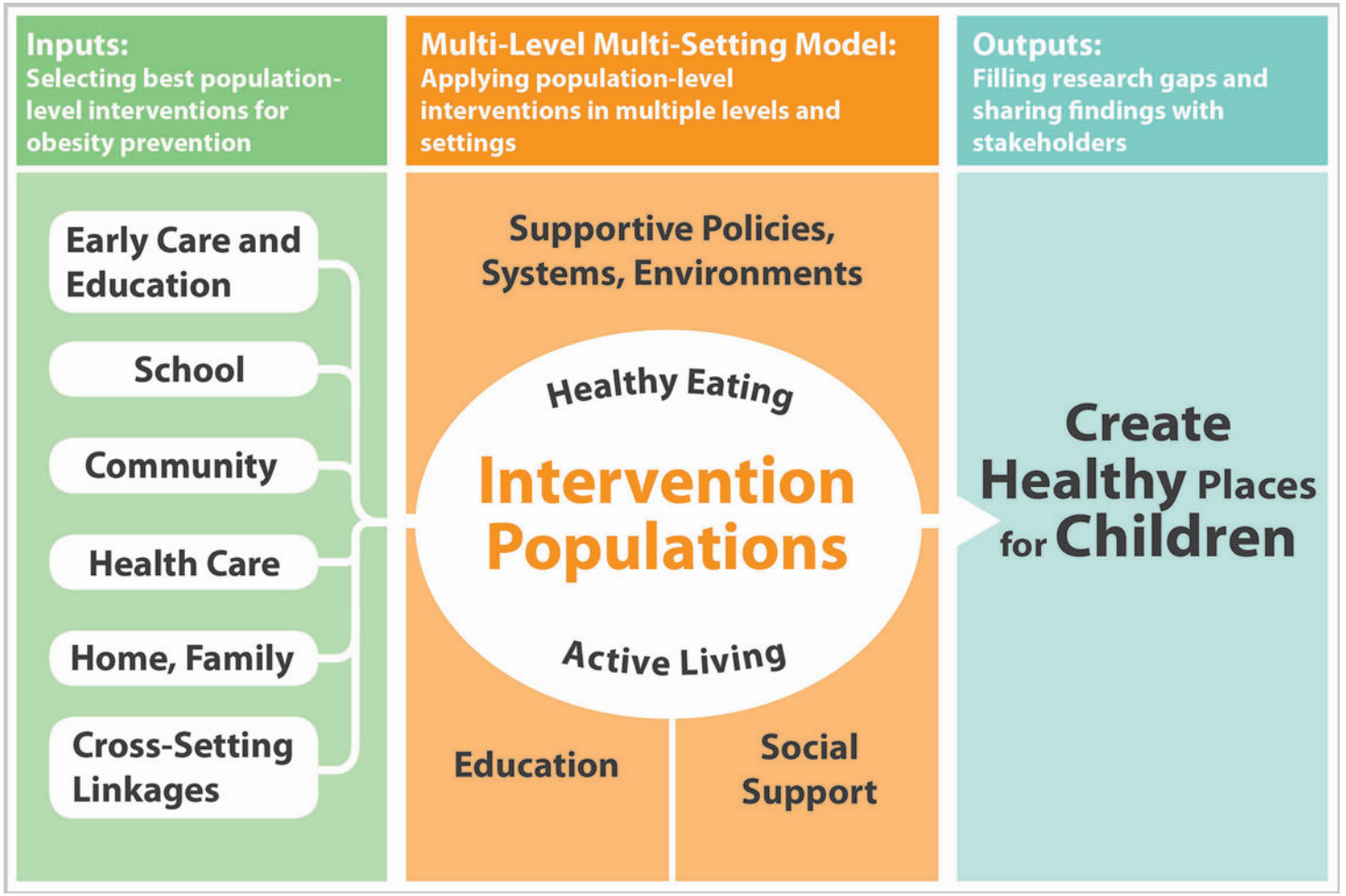

Figure 2

Framework for multi-setting, multi-level interventions for obesity prevention in children. The best population-level interventions can be selected for each setting and for providing linkages and integration across settings (e.g., community health workers or community coalitions). These can be applied in multiple settings and supported by multiple levels (e.g., education, social support, policy, system, environment change) of interventions in a population (e.g., neighborhood, city, county, state). The goal of this model is to create healthy places for children; the outputs can fill research gaps, and the findings can be shared with stakeholders such as policy makers and other communities in order to support children in healthy eating and physical activity.

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Errata

An online log of corrections to *Annual Review of Nutrition* articles may be found at http://nutr.annualreviews.org/errata.shtml