

American Heart Association Childhood Obesity Research Summit Executive Summary

Stephen R. Daniels, MD, PhD, FAHA, Chair; Marc S. Jacobson, MD, FAHA;
Brian W. McCrindle, MD, MPH, FAHA; Robert H. Eckel, MD, FAHA; Brigid McHugh Sanner, BS

Childhood obesity is one of the most pressing health threats facing the United States. Today, one third of American children and adolescents are obese or overweight. Over the past 30 years, the prevalence of obesity has nearly tripled for children 2 to 5 years of age and youth 12 to 19 years of age, and it has quadrupled for children 6 to 11 years old.¹

The Problem: Childhood Obesity—A Burgeoning Epidemic

Overweight children and adolescents are at risk for significant health problems both during their youth and as adults:

- Overweight children and adolescents are more likely than other children and adolescents to have risk factors associated with cardiovascular disease (eg, high blood pressure, high cholesterol, and type 2 diabetes mellitus).²
- Overweight children and adolescents are more likely to become obese as adults.^{3,4}
- Studies document the link between obesity and poor school performance and unhealthy or risky behaviors such as alcohol use, tobacco use, premature sexual behavior, inappropriate dieting practices, and physical inactivity.^{5,6}
- Overweight children and adolescents may experience other health conditions associated with increased weight, which include asthma, hepatic steatosis, sleep apnea, and type 2 diabetes mellitus.
- Obesity puts children at long-term higher risk for chronic conditions such as stroke; breast, colon, and kidney cancers; musculoskeletal disorders; and gall bladder disease.

As part of its strategic focus on childhood obesity, particularly the prevention of childhood obesity, the American

Heart Association convened a Childhood Obesity Research Summit to examine research opportunities where the obesity epidemic intersects with the healthcare system. The Childhood Obesity Research Summit provided an overview of childhood obesity, and participants identified key questions that need to be answered, as well as recommendations for future work in the areas of education, public policy, and research. The recommendations and outcomes of the conference will help inform the American Heart Association and the Alliance for a Healthy Generation broadly in terms that will help to focus ongoing research and public policy initiatives.

Medical Consequences of Childhood Obesity

The increasing prevalence and severity of obesity in children and adolescents have resulted in a higher prevalence of comorbid conditions, including high blood pressure, early development of atherosclerosis, type 2 diabetes mellitus, nonalcoholic fatty liver disease, polycystic ovary disorder, and disordered breathing during sleep.⁷ These complications can occur both in the short-term and in the long-term. Some complications, such as type 2 diabetes mellitus, previously thought to only occur in adulthood, have now been shown to occur in children and adolescents. This has raised concerns about whether the obesity epidemic might shorten the lifespan of the current generation of children. There is still much to be learned about the mechanisms for obesity development and related comorbid conditions. Translational research perhaps will lead to information that will help to identify children at higher risk for excessive weight gain and for the development of specific adverse outcomes due to obesity. This type of mechanistic research could also inform more

The American Heart Association makes every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

The opinions expressed in this manuscript are those of the authors and are not necessarily those of the editors or the American Heart Association. These proceedings were approved by the American Heart Association Science Advisory and Coordinating Committee on January 16, 2009. A copy of these proceedings is available at <http://www.americanheart.org/presenter.jhtml?identifier=3003999> by selecting either the "topic list" link or the "chronological list" link (No. LS-2026). To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

Expert peer review of AHA Scientific Statements is conducted at the AHA National Center. For more on AHA statements and guidelines development, visit <http://www.americanheart.org/presenter.jhtml?identifier=3023366>.

Permissions: Multiple copies, modification, alteration, enhancement, and/or distribution of this document are not permitted without the express permission of the American Heart Association. Instructions for obtaining permission are located at <http://www.americanheart.org/presenter.jhtml?identifier=4431>. A link to the "Permission Request Form" appears on the right side of the page.

(*Circulation*. 2009;119:2114-2123.)

© 2009 American Heart Association, Inc.

Circulation is available at <http://circ.ahajournals.org>

DOI: 10.1161/CIRCULATIONAHA.109.192215

specific strategies for treatment of comorbidities when weight management cannot be accomplished or is less than adequate.

Psychosocial and Societal Consequences of Childhood Obesity

Historically, studies to evaluate the psychosocial consequences of pediatric overweight have focused primarily on comparing the functioning of overweight children and adolescents with that of nonoverweight peers on dimensions of health-related quality of life, self-concept, body image, depressive symptomatology, and peer relationships. Studies demonstrate decreased health-related quality of life associated with increasing weight, lower body satisfaction, and lower physical appearance-related self-concept in overweight children and adolescents,⁸ as well as decreases in self-esteem from childhood to early adolescence among overweight children,⁹ and there is some evidence indicating increased risk for development of obesity among depressed adolescents.¹⁰ Overweight children experience more teasing; weight status is predictive of vulnerability to bullying in peer relationships^{11,12}; and some studies document a relationship between overweight status and decreased probability of employment, less financial support for college among women, and lower household incomes for both men and women.

Lifestyle Assessment: Diet and Physical Activity

Lifestyle assessment is an opportunity to identify potential targets for prevention and increase families' self-awareness of current behaviors. The situation may differ between routine well-child care visits and visits aimed at addressing a specific health issue, with childhood obesity lifestyle assessment requiring specific and more in-depth questions.

How assessment is conducted is critical. Because dietary or physical activity assessments are not typically taught in medical or other health-profession schools, a wide variability exists in how they are performed in primary care. Most assessment methods are not standardized, and it remains unclear how often standardized assessment methods are used.

Several tools have been developed in the research setting to assess dietary intake that potentially could be used in the primary care setting. In addition, emerging technologies may provide novel methods of diet and physical activity assessment that may prove helpful in the primary care setting.

Clinical Assessment

Evaluation of obesity begins with calculation of body mass index (BMI), which has clinical validity because it correlates with adiposity,¹³ adult adiposity,¹⁴ cardiovascular risk factors,¹⁵ and long-term mortality.¹⁶ Unfortunately, there is no perfect cutpoint for BMI that identifies all children with elevated body fat. Because BMI norms change with age and differ between boys and girls, absolute BMI is not an appropriate screen in children. Practitioners need to plot BMI on the Centers for Disease Control and Prevention's percentile curves to identify the BMI percentile category (www.cdc.gov/growthcharts).

Clinicians should assess obesity risk in all children, integrating information about the patient's BMI, medical risk, and current eating and physical activity behaviors and attitudes. This assessment should guide initiation of preventive or treatment strategies.

Psychosocial/Behavioral Assessment

Current practices for psychosocial screening assessments include quality-of-life assessments, readiness assessments, and family context assessments. The available data indicate that greater depressive symptoms at baseline are associated with higher dropout rates in clinical weight-loss programs,¹⁷ and greater parent distress and child social problems at baseline are associated with poorer weight-loss outcomes.¹⁸ The existence of fewer social problems at baseline predicted better long-term maintenance of weight loss at 2 years.¹⁹ Improvements in weight status were shown to be associated with improvements in the child's social problems and psychological adjustment, with reduction in maternal distress.²⁰ Participation in intervention alone has a positive effect on self-esteem.²¹

To help clinicians tailor treatment approaches, randomized clinical trials are needed in relation to the appropriateness of psychological treatment before clinical treatment, referral for concurrent psychological and clinical treatment, or treatment of psychosocial issues within a weight-management model. In addition, an understanding of the readiness to change in a family can be useful. Currently, there are no well-validated measures in widespread use to evaluate readiness to change. Studies of the potential for harm from intervention in a family that is not ready for an intervention are also needed.

The final area that requires evaluation is the family structure. A family assessment is recommended to determine who will do what in providing/monitoring care, what the favored parenting style is, and how the family functions.

Implementing Effective Prevention and Treatment Options: Diet

Prevention and treatment of obesity usually require a decrease in energy consumption and an increase in energy expenditure, to improve energy balance. Dietary interventions that may help reduce or prevent childhood obesity include breast-feeding for infants, a high-fiber diet, and calcium intake.

Dietary factors that promote obesity include high-calorie beverages (sugared soft drinks or fruit juice), energy-dense foods, excess refined carbohydrates, excess dietary fat, and large portion sizes.²² The increase in the prevalence of obesity has coincided with an increase in portion sizes of foods both inside and outside the home, which suggests that larger portions may play a role in the obesity epidemic.²³

To outline a dietary treatment plan and to provide adequate education, counseling by a health professional with expertise in dietary management is often required. The use of a qualified, experienced health professional, preferably a registered dietitian, for dietary counseling and to implement an

optimal dietary plan for achieving and maintaining a healthy body weight is recommended.

Implementing Effective Prevention and Treatment Options: Exercise and Sedentary Behaviors

Even with specific recommendations for intensity, duration, frequency, or modality of exercise for the management of pediatric obesity, implementation may be difficult. Over time, consistent exercise will result in a multitude of metabolic and physiological benefits by promoting weight loss through increased energy expenditure and possibly through inhibition of food intake.²⁴ Physical activity also facilitates maintenance of a desirable weight and helps reduce risk factors for cardiovascular disease in children.²⁵ Frequent vigorous exercise periods have been shown to be associated with decreased abdominal fat in youth,²⁶ and strength training has been shown to be an independent predictor of lower insulin resistance in children.²⁷ Unfortunately, the positive effects of exercise training will only be realized if the overweight child complies with the prescribed physical activities. Careful consideration must be given to selecting the most appropriate intensity, frequency, duration, and modality of exercise for each overweight child.

Overweight children may experience negative consequences of participation in activities considered appropriate for normal-weight children. Activities that are easily mastered should be considered. Recommendations based on clear, attainable goals that gradually increase in volume and intensity over time should be established. Such structuring will help ensure that overweight children experience initial success. Because overweight children will expend more energy performing exercise of the same intensity as normal-weight children, they should not be prescribed running activities in which they must compete with normal-weight youth. Resistive weight-lifting exercise activity should be performed under the close supervision of trained personnel.

Implementing Effective Prevention and Treatment Options: Family and Behavioral Approaches

Family involvement is an important part of childhood overweight-prevention programs. A common focus of family or parental involvement in prevention programs is the peripheral inclusion of parents in school- or community-based programs, which usually takes the form of newsletters or postcards sent to parents and occasional family-based events held at the school or in the community.

In contrast to childhood overweight-prevention programs, childhood overweight treatment often takes the form of a family-based behavioral intervention, in which parents are intricately involved in treatment.^{28,29} Family-based behavioral interventions are the most widely studied type of intervention, with evidence of long-term success among 8- to 12-year-old children.³⁰ Such interventions are more consistently successful than no treatment or education-only interventions.²¹ The core behavioral skills of these intervention programs, including monitoring, contingency management, and environmental control to help already overweight chil-

dren make eating and activity changes, are highly dependent on caregivers' implementation.

Behavioral Management

The Family Lifestyle Overweight Prevention Study (FLOW) has suggested that a school-based treatment of sufficient intensity can be an effective means for promoting initial weight loss. The study findings indicate that the nutrition elements of such programs should be simple and easily integrated into lifestyle; physical activity components should focus on fun activities.³¹

Some of the most promising studies in the management of childhood overweight were performed with homogenous samples. There are few data on the use of behavioral management in minorities, children from low-income families, or significantly overweight children. Given the increased rates of overweight in minority and low-income children and the increased health and emotional problems for overweight adolescents, methods and strategies that are effective with these groups must be developed. Recruitment, adherence, and retention need to be better understood, and culturally and economically appropriate behavior-based interventions are necessary to meet the unique needs of various populations.

Medical and Pharmacological Management

Recommendations from the National Heart, Lung, and Blood Institute (NHLBI) for adults emphasize that the addition of antiobesity drugs to a regimen of lifestyle modification can produce more weight loss than lifestyle modification alone. NHLBI guidelines note that antiobesity drugs should only be given as part of a comprehensive program of lifestyle modification, and different antiobesity agents should not be combined. The risks associated with long-term pharmacotherapy must be balanced against the increasing risks of continued weight gain.

Studies have shown that the weight-loss drugs sibutramine and orlistat, together with behavioral therapy, have a similar magnitude of BMI-lowering effects ($\approx 4\%$) and that the effects of the drugs are additive with behavioral therapy. The 6- and 12-month studies of sibutramine in overweight adolescents were not designed to provide information on weight maintenance. It is currently not possible to determine whether these adolescents will require chronic treatment with weight-loss medications into adulthood and beyond or whether weight loss over a 12-month period will be sufficient to result in consistent behavior change over time. All of these studies tested orlistat or sibutramine as adjunctive therapy to complement the well-known effects of behavior modification. All patients received dietary, exercise, and lifestyle modification instructions and counseling.³²

Surgical Management

The 40-year evidence base for bariatric surgery in adolescents is small. Research methodology and quality of studies vary, and few studies provide more than 3 years of follow-up data. Outcomes clearly demonstrate weight-loss effectiveness compared with the weight loss achieved with intensive

dietary/behavioral interventions for severe pediatric obesity.^{33,34} Limited data suggest that important comorbidities improve after bariatric surgery in adolescents, perhaps more so in youth than in adults, given that most pediatric comorbidities are of shorter duration. Analysis of perioperative complications indicates that bariatric surgical procedures are generally safe, with complications that are similar to those seen in adults. There are insufficient data to permit assessment of long-term risks or recidivism in young patients.

Several unique concerns have been raised about bariatric surgery in pediatric populations, including questions about timing of intervention, costs, informed consent, risk-taking behaviors after successful weight loss, compliance, durability of weight loss, and comorbidity resolution.³⁵ These questions point to the importance of well-designed, prospective research efforts to better inform important decisions.

Preparedness of Providers

Despite the identification of specific risk behaviors related to overweight, primary care systems have often been ineffective at developing methods to implement guidelines for the assessment of children and adolescents who are overweight or obese.³⁶ Some of the reluctance to fully implement screening measures may be due to the lack of well-defined, validated preventive and therapeutic interventions that could be given to children, adolescents, and their families. Given that a series of studies now demonstrate the effectiveness of screening for health risk behaviors initiated during adolescence, it is incumbent on healthcare systems to learn from the decade of preventive interventions that embraced screening measures in clinical practice. These efforts need to be coordinated through public policy interventions that target reimbursement practices at the public and private level.

Models of Coverage and Care

Important gaps exist between what is being done to prevent and treat childhood obesity and what is covered by health insurance. This is especially true in light of the guidelines published by the Centers for Disease Control and Prevention and the American Heart Association (see <http://www.americanheart.org/presenter.jhtml?identifier=3054245>). Healthcare organizations should be able to promote continuity coordination, encourage quality through leadership and incentives, organize and equip healthcare teams, use information systems, and support self-management and prevention of overweight and obesity. Community organizations need to focus on raising awareness and mobilizing resources. Policy plays a role in these types of activities by creating and supporting environments in which leadership and advocacy for childhood obesity are provided, and cross-sector partnerships (eg, between health care, schools, and transportation networks) are developed and sustained. As policy support is developed and implemented, monitoring, benchmarking, and reporting of progress are needed.

Challenges and barriers to be addressed include program recruitment and retention, financing, apathy at the policy level, and clinical apathy. In addition, healthcare stakeholder

organizations vary in terms of the priority they place on childhood obesity.

Uninsurance and Underinsurance Among Children and Families

Currently, more than 1 of 5 children rely on Medicaid or the State Children's Health Insurance Program for coverage, with these numbers higher among children from low-income families.³⁷ Most uninsured children are eligible for Medicaid or the State Children's Health Insurance Program, but they are not getting enrolled. Although 85% of low-income parents say they would enroll their children if told their child was eligible, fewer than half of those who would be eligible are aware of that fact, despite all but 8 states having set eligibility at 200% of federal poverty levels. Some parents indicate concerns that the Medicaid, and to an extent the State Children's Health Insurance Program, enrollment processes are complicated.

Employer-sponsored coverage is the predominant form of healthcare coverage for children in the United States.³⁸ As fewer parents obtain such coverage from employers, coverage diminishes for their children.

Healthcare Providers and Settings as Role Models

Healthcare providers are doing a poor job of identifying and managing childhood obesity. Clinicians appear to be selective about the morbidities that receive focus when medical history is taken and physical examination is performed. One study of pediatricians showed that only 27% of overweight pediatric patients were identified as such, whereas 86% of obese children were identified as such.³⁹ Yet, if overweight and obesity were identified, growth charts kept current, and BMI plotted, these activities would lead to increased odds that the patients would receive counseling for diet and physical activity.

Healthcare providers perceive a number of barriers that affect obesity identification and treatment. On the basis of primarily self-reported data, most practitioners indicated a belief that although childhood and adolescent obesity treatment is needed, treatment is probably ineffective. Another issue that may impact the engagement of healthcare providers is that in many instances, healthcare providers may only be minimally healthier than their patients. Studies have shown that a physician's personal weight status and health habits influence their counseling practices and how their patients perceive that counseling.⁴⁰ Additionally, healthcare institutions are subject to the same market forces that are driving the obesity epidemic, and this leads to these institutions being poor role models.

Motivational Interviewing for Pediatric Obesity

Motivational interviewing is a client-centered, directive method for enhancing intrinsic motivation to change behaviors by exploring and resolving ambivalence. It has been applied successfully to obesity management.⁴¹ The technique involves active listening, advising, informing, and asking. Barriers to motivational interviewing from the clinician's

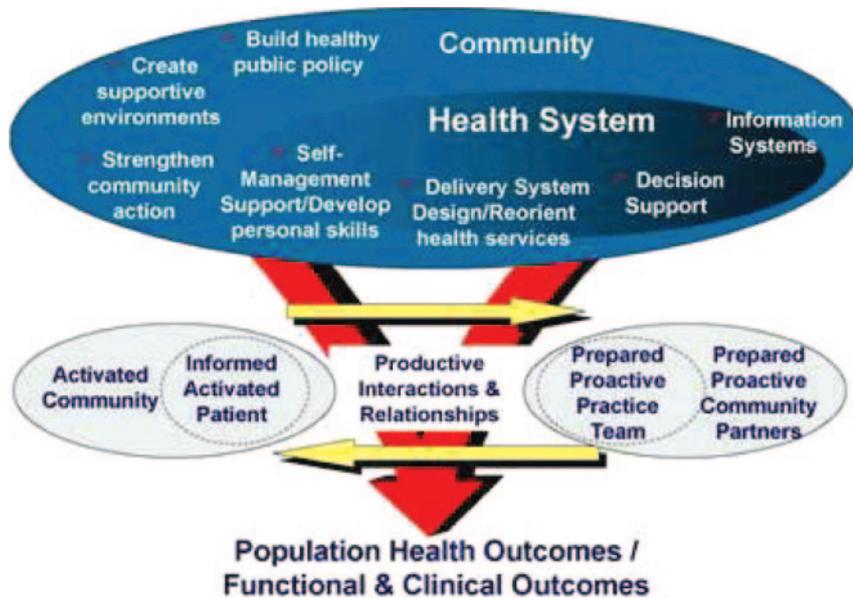


Figure. Population health outcomes/functional and clinical outcomes. Reprinted with permission from the American College of Physicians from Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract.* 1998;1:2–4.

perspective are a combination of time limitations, a sense of treatment futility (the belief that patients and their parents won't listen), and concerns about efficacy (a belief that it will really work).⁴²

Psychosocial Factors Influencing Behavior Change

Recent research suggests that there are 3 psychosocial variables that may negatively influence the quality of life of obese children and that can also be barriers to the adoption of a healthier diet and healthier physical activity patterns: weight-related teasing, social isolation, and depression. These issues can coexist in the daily life of certain obese children, although they may be reluctant to discuss them with parents or healthcare providers.

Environmental Factors Influencing Behavioral Change

It is critical to understand the major environmental determinants of healthy eating and physical activity and the most effective intervention points to improve these behaviors among children. An ecological framework is well suited for understanding behaviors and developing public health interventions and policies to improve healthy eating and physical activity among children. Four broad levels of influence—individual, social environment, physical environment, and macrolevel environments—all interact, both directly and indirectly, to impact eating and physical activity behaviors. The research on determinants of eating and physical activity behaviors in children and adolescents has focused predominantly on individual-level determinants of these behaviors (for example, attitudes, preferences, intentions, and self-efficacy). Recently, there has been a shift in attention to environmental determinants of eating behavior and the built environment, but the empirical evidence on environmental factors is scant, especially for the food environment.

Models From Other Disciplines: Adult Chronic Care Model

Improving Chronic Illness Care, a national program of the Robert Wood Johnson Foundation, presents the chronic care model as a framework for management of conditions such as obesity.⁴³ The Improving Chronic Illness Care program is supported by the Robert Wood Johnson Foundation, with directional and technical assistance provided by Group Health's MacColl Institute for Healthcare Innovation (www.improvingchroniccare.org).

The chronic care model identifies the essential elements of a healthcare system that encourage high-quality chronic disease care (Figure). The chronic care model can be applied to a variety of chronic illnesses, healthcare settings, and target populations to produce healthier patients, more satisfied providers, and cost savings. The chronic care model has been evaluated for diabetes mellitus, asthma, congestive heart failure, and depression with mixed results; however, application of the chronic care model to the provision of obesity care remains untested.

Models From Other Disciplines: Treatment for Heart Failure

Many studies indicate that multidisciplinary teams that incorporate disease management strategies can lead to improved outcomes for heart failure and thus fewer hospitalizations, improved adherence to medications, improved adherence to lifestyle changes, improved mortality, more likely treatment of depression, and a greater likelihood of overcoming barriers.

Models From Other Disciplines: Treatment of Type 2 Diabetes Mellitus

Research shows that diabetes self-management is effective in improving metabolic control and quality of life in patients with diabetes mellitus.^{44,45} The Diabetes Initiative of the Robert Wood Johnson Foundation sought to show that

diabetes self-management could be implemented successfully in settings such as neighborhood health centers and community organizations.⁴⁶ Based on what has been learned from the Diabetes Initiative, as well as the American Academy of Family Physicians Foundation program *Peers for Progress* (supported by the Eli Lilly and Company Foundation), the implications for approaches to childhood obesity are as follows:

- Self-management works in real-world settings; sustained behavior change requires varied intervention modes and ongoing support.
- Choice is key for reaching audiences and engaging those with diverse needs and preferences; program planning should identify and implement many good practices rather than obsess over identifying and limiting offerings to a few best practices.
- Identification of key program ingredients and approaches provides a base from which individual programs can be flexibly developed to ensure the best fit to settings, organizational and community strengths, and population needs and perspectives.

Models From Other Disciplines: Treatment of Childhood Asthma

Many different initiatives have been undertaken to improve childhood asthma outcomes, including the RAND Corporation report on improving childhood asthma outcomes,⁴⁷ the National Asthma Education and Prevention Program report on key clinical activities,⁴⁸ and the Expert Panel Report 3 Guidelines Implementation Panel (ongoing). These 3 documents demonstrate the importance of distilling information from detailed documents to the activities or messages most likely to produce a significant impact on asthma care processes and outcomes. A related ongoing project, the ASTHMA IQ Project, demonstrates a more technological approach to improving asthma care in the specialist's office.

Public Health Measures for Childhood Obesity

There have been notable public health successes with respect to certain threats to health. Questions have arisen regarding whether public health efforts to control tobacco might provide insight into how to prevent childhood obesity. Tobacco control has aspects both similar to and different from obesity as a public health problem:

- Both problems have guidelines for clinical care and policy interventions.
- For both, the evidence base for interventions is less robust for children and youth than for adults, and interventions for adolescence and adulthood are poorly defined.
- Progress in tobacco control required, and still requires, sustained advocacy and political leadership. Progress in addressing obesity will require the same.

There are also some important differences. Nicotine is highly addictive, and there is no safe level of use or exposure, whereas food is not a deadly product, and people need to eat

every day. This is one reason why the public health response to overnutrition has focused on strategies that rely on the need for individuals to change behavior. However, this approach may be ineffective, because companies spend substantial resources on advertising to influence what is eaten, and the food industry is often resistant to public health attempts to change current practices. Thus, a more comprehensive response may be needed, similar to that used against the tobacco industry. The experience with tobacco control suggests that broad, well-networked coalitions, along with strong leadership, are needed to help develop and sustain the range of strategies needed to address obesity as a public health problem.

Specifying Priorities in the Context of a Complex, Multifactorial Problem

Patients often receive comorbidity-specific medical care; comprehensive care and understanding may be limited by lack of coordination. As a result, all patient needs may not be identified and treated. This may affect care planning, staffing, and reimbursement. In addition, the interrelationship among comorbidities may not be addressed clinically. Thus, interventions often are not designed or assessed for their impact on all health risk factors.

Taking a Developmental Approach

A developmental approach to obesity prevention considers the extent to which events during early human development affect obesity-related consequences over a lifetime. It follows the developmental timeline of obesity to better understand differences at different development stages and examines what can be done to alter these events in a developmentally appropriate manner.

Interventions to prevent pediatric obesity may need to start before pregnancy and continue throughout gestation and the postpartum period for both the mother and child. Pregnancy may be an optimal time to start, because women may be more willing to change their behavior at that time. In addition, pregnant women receive frequent clinical care.

Engaging Stakeholders

Health promotion and obesity prevention in the community are shared responsibilities between many entities, organizations, and interests, including healthcare-delivery organizations, public health agencies, other public and private entities, and the people of the community. The obesity epidemic and the public health threat it represents mandate application of a social ecological model in which the healthcare community plays an integral role in the clinical setting and members serve as advocates for programs in communities that help teach and support healthy behaviors.⁴⁹

Stakeholders include those who are involved with implementing the initiatives, those who are impacted by the initiatives, those with inherent interest in the issue, and necessary partners, including funders.⁵⁰ Engagement of all relevant stakeholders optimizes the evaluation process, improves sustainability, increases feasibility and relevance, maximizes communication, and facilitates optimal implementation.

Targeting the Appropriate Outcome

One standard for classifying childhood obesity is based on sex- and age-specific cut points for BMI, which correspond to BMI of 25 and 30 kg/m² at 18 years of age.⁵¹ It is possible to use simple weight change in pediatric studies; however, the change in height over time complicates interpretation of the change in weight over time.

Of importance in both adults and children is whether modifying obesity improves other health outcomes. Thus, the next sets of outcomes to consider are the physiological and metabolic responses to obesity, including blood pressure, dyslipidemia, and glucose metabolism. There are no prospective long-term studies of lifestyle-intervention-induced weight loss in children and adolescents that demonstrate a beneficial effect on cardiovascular disease outcomes. The potential outcomes to consider for trials in overweight/obese youth are weight change, with special consideration of reduction in percent overweight or BMI *z* score and consideration of fat mass lost; intermediate physiological/metabolic measures; subclinical atherosclerosis measurements; and outcomes that include incidence of diabetes mellitus, cardiovascular disease events, and mortality.

Research in the Busy Practice

To stimulate change in practice, focus must be placed on changing provider behaviors within the context of a comprehensive understanding of the clinical office as a complex system with competing demands. Factors to examine include physician philosophy and style; characteristics of practice organization, such as office efficiency, diversity, and clarity of staff roles; and communication patterns among physicians and staff.

Practice interventions that use a single intervention strategy have limited influence on changing physician performance. Successful interventions are multifaceted and include combinations of audit and feedback, reminders, local consensus processes, and marketing.

Bring Research Into Practices: Web-Based Assessment for the Pediatric Obesity Clinic

E-health is an emerging field in the intersection of medical informatics, public health, and business; it refers to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development but also a state of mind, a way of thinking, an attitude, and a commitment for networked, global thinking to improve health care locally, regionally, and worldwide by use of information and communication technology.⁵² The benefits of e-health include more complete and accurate data with fewer errors, cost-effectiveness, ability to use online assessment tools, ease of sharing data, more security, elimination of the need to store paper documents, and shorter time for analysis. Disadvantages include the learning curve for investigators; developer availability; intellectual property concerns; logistics (computers/Internet on site); language or translation issues; compatibility with institutional charting; computer literacy of staff,

patients, and others involved in the study; and the potential of higher cost.

Research Agenda: NHLBI and the Pediatric Heart Network

One of the NHLBI's main approaches to pediatric research involves the Pediatric Heart Network, a collaboration of clinical sites and a data coordinating center that conducts research studies in children with congenital or acquired heart disease. The network approach attempts to offer an effective, flexible way to study adequate numbers of patients with uncommon diseases through a common infrastructure for recruiting, monitoring, and following up patients whose conditions will be characterized in a standard fashion. To date, the Pediatric Heart Network has not been used for the study of childhood obesity.

Two NHLBI programs in the area of pediatric obesity are We Can! and Girls Health Enrichment Multi-site Studies (GEMS). We Can! is a turnkey obesity-prevention program designed to engage the entire community. The Girls Health Enrichment Multi-site Studies program is a family-based intervention that emphasizes improved dietary intake and increased physical activity.

Research Agenda: The Children's Oncology Group

The Children's Oncology Group is the world's largest cooperative cancer research organization. As obesity increases in children and adolescents, the Children's Oncology Group has observed that obese children over 10 years old are at increased risk of cancer recurrence. Underweight and overweight children with acute myeloid leukemia experience more life-threatening or fatal complications of treatment than children of normal weight. The organization is undertaking a study to examine drug levels according to height and weight (body mass index) in children with acute lymphoblastic leukemia. They are also participating in pilot studies on nutrition and exercise that may prevent the obesity that occurs during and after treatment for childhood cancer.

Research Agenda: Centers for Disease Control and Prevention

The Centers for Disease Control and Prevention's Division of Nutrition, Physical Activity, and Obesity has a goal to decrease the prevalence of obesity through the prevention of excess weight gain and the maintenance of healthy weight loss. (<http://www.cdc.gov/nccdphp/publications/aag/dnpa.htm>). The Division of Nutrition, Physical Activity, and Obesity is currently engaged in a strategic planning process to identify focus areas for obesity and obesity research. Among criteria that guide the selection of priorities are the potential for impact, the needs of the funded state program, the recommendations of others, and the division's resources and capacity.

Research Agenda: Foundations

A number of national foundations support efforts related to childhood obesity issues. The Robert Wood Johnson Foun-

dition has developed 3 integrated strategies to reverse the childhood obesity epidemic: evidence, action, and advocacy. The W.K. Kellogg Foundation Food & Fitness Initiative is working to create vibrant communities that support access to locally grown, healthy, affordable food and safe, convenient places for physical activity and play for everyone. The California Endowment, a private statewide health foundation created as a result of Blue Cross of California's creation of WellPoint Health Networks, a for-profit corporation, has supported policy and advocacy organizations such as the Public Health Institute, the California Center for Public Health Advocacy, and California Project LEAN to initiate and implement efforts to inform key policymakers and community leaders about this crisis and the factors that contribute to its escalation.

From Practice to Policy to Practice

It is important that healthcare providers recognize the relationship between practice and the development of evidence-based policy. This approach serves as the basis for understanding the role practice plays in policy development, which in simple terms occurs across 4 critical steps: adequate scientific evidence, social will, political will, and expected outcomes.

Evidence to guide intervention and the social will to promote action are key to building the political capital or will needed to initiate policy development and change. Substantive data suggest that states have moved at more rapid rates than the federal government to address issues related to childhood obesity.^{53,54} Data suggest that legislative initiatives by the states do reflect evidence presented in key scientific reports. It also appears that policy interventions are most likely to be focused on healthy eating in schools.⁵⁵

Summary

Childhood obesity is a significant threat to the long-term health and well-being of American children. Obesity contributes to a significant burden in terms of chronic diseases, rising healthcare costs, and, most importantly, disability and premature death. It appears that this burden will increase in the future.

Because obesity is usually the result of a complex, interdependent constellation of factors, the goal of reducing childhood obesity can only be achieved through a comprehensive and coordinated effort that incorporates a range of multidisciplinary strategies. For that reason, it makes sense that a national effort to address childhood obesity must be integrated and coordinated across multiple professional disciplines, and it must be inclusive of key research, health, advocacy, education, media, and consumer organizations. This need for collaboration cannot be overstated. Some excellent foundation-laying research has already been done in relation to childhood obesity, and there are several excellent programs and resources available. However, ongoing research and continued program development must be further supported and more widely disseminated, or the likelihood of widespread replication will be diminished. It is hoped that the Childhood Obesity Research Summit will serve as a tool to help inform collaborative efforts across multiple stakeholders to develop and test new strategies for prevention and treatment of childhood obesity.

Sources of Funding

Financial support for the Childhood Obesity Research Summit was provided by members of the American Heart Association's 2006 Pharmaceutical Roundtable: Bristol-Myers Squibb Company; Astra-Zeneca, LP; GlaxoSmithKline; Merck/Schering-Plough Pharmaceu-

Disclosures

Writing Group Disclosures

Writing Group Member	Employment	Research Grant	Other Research Support	Speakers' Bureau/Honoraria	Expert Witness	Ownership Interest	Consultant/Advisory Board	Other
Stephen R. Daniels	University of Colorado Denver School of Medicine	None	None	None	None	None	Abbott Laboratories*; Merck, Schering-Plough*	None
Robert H. Eckel	University of Colorado Denver School of Medicine	Sanofi-Aventis†	None	Cardiometabolic Health Congress†; Merck*; Sanofi-Aventis*	None	None	None	None
Marc S. Jacobson	Schneider Children's Hospital	Sankyo/Medpace†	None	None	None	None	None	None
Brian W. McCrindle	The Hospital for Sick Children	None	None	None	None	None	Abbott*; Roche*	None
Brigid McHugh Sanner	Sanner & Company	None	None	None	None	None	American Heart Association†	None

This table represents the relationships of writing group members that may be perceived as actual or reasonably perceived conflicts of interest as reported on the Disclosure Questionnaire, which all members of the writing group are required to complete and submit. A relationship is considered to be "significant" if (1) the person receives \$10 000 or more during any 12-month period, or 5% or more of the person's gross income, or (2) the person owns 5% or more of the voting stock or share of the entity, or owns \$10 000 or more of the fair market value of the entity. A relationship is considered to be "modest" if it is less than "significant" under the preceding definition.

*Modest.

†Significant.

tics; Novartis Pharmaceuticals Corporation; Pfizer, Inc; Sanofi-Aventis Group; and Takeda Pharmaceuticals, North America, Inc.

References

1. *Progress in Preventing Childhood Obesity: How Do We Measure Up?* Washington, DC. Institute of Medicine Report Brief. September 2006. Available at: http://www.iom.edu/Object.File/Master/36/984/11722_reportbrief.pdf. Accessed January 7, 2008.
2. Freedman DS, Dietz WH, Srinivasan SR, Berenson GS. The relation of overweight to cardiovascular risk factors among children and adolescents: the Bogalusa Heart Study. *Pediatrics*. 1999;103:1175–1182.
3. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med*. 1997;337:869–873.
4. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med*. 1993;22:167–177.
5. Miller JW, Naimi TS, Brewer RD, Jones SE. Binge drinking and associated health risk behaviors among high school students. *Pediatrics*. 2007;119:76–85.
6. Neumark-Sztainer D, Story M, French SA, Resnick MD. Psychosocial correlates of health compromising behaviors among adolescents. *Health Educ Res*. 1997;12:37–52.
7. Daniels SR. The consequences of childhood overweight and obesity. *Future Child*. 2006;16:47–67.
8. Ricciardelli LA, McCabe MP. Children's body image concerns and eating disturbance: a review of the literature. *Clin Psychol Rev*. 2001;21:325–344.
9. Lowry KW, Sallien BJ, Janicke DM. The effects of weight management programs on self-esteem in pediatric overweight populations. *J Pediatr Psychol*. 2007;32:1179–1195.
10. Richardson LP, Davis R, Poulton R, McCauley E, Moffitt TE, Caspi A, Connell F. A longitudinal evaluation of adolescent depression and adult obesity. *Arch Pediatr Adolesc Med*. 2003;157:739–745.
11. Neumark-Sztainer D, Falkner N, Story M, Perry C, Hannan, PJ, Mulert S. Weight-teasing among adolescents: correlations with weight status and disordered eating behaviors. *Int J Obes Relat Metab Disord*. 2002;26:123–131.
12. Griffiths LJ, Wolke D, Page AS, Horwood JP; ALSPAC Study Team. Obesity and bullying: different effects for boys and girls. *Arch Dis Child*. 2006;91:121–125.
13. Field AE, Laird N, Steinberg E, Fallon E, Semega-Janneh M, Yanovski JA. Which metric of relative weight best captures body fatness in children? *Obes Res*. 2003;11:1345–1352.
14. Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics*. 2005;115:22–27.
15. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *J Pediatr*. 2007;150:12–17.e2.
16. Must A, Strauss RS. Risks and consequences of childhood and adolescent obesity. *Int J Obes Relat Metab Disord*. 1999;23(suppl 2):S2–S11.
17. Zeller M, Kirk S, Claytor R, Khoury P, Grieme J, Santangelo M, Daniels S. Predictors of attrition from a pediatric weight management program. *J Pediatr*. 2004;144:466–470.
18. Epstein LH, Wisniewski L, Weng R. Child and parent psychological problems influence child weight control. *Int J Eat Disord*. 1994;2:509–515.
19. Wilfley DE, Stein RI, Saelens BE, Mockus DS, Matt GE, Hayden-Wade HA, Welch RR, Schechtman KB, Thompson PA, Epstein LH. Efficacy of maintenance treatment approaches for childhood overweight: a randomized controlled trial. *JAMA*. 2007;298:1661–1673.
20. Myers MD, Raynor HA, Epstein LH. Predictors of child psychology changes during family-based treatment for obesity. *Arch Pediatr Adolesc Med*. 1998;152:855–861.
21. Wilfley DE, Tibbs TL, Van Buren DJ, Reach KP, Walker MS, Epstein LH. Lifestyle interventions in the treatment of childhood overweight: a meta-analytic review of randomized controlled trials. *Health Psychol*. 2007;26:521–532.
22. Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: a randomized, controlled pilot study. *Pediatrics*. 2006;117:673–680.
23. Ebbeling CB, Garcia-Lago E, Leidig MM, Seger-Shippe LG, Feldman HA, Ludwig DS. Altering portion sizes and eating rate to attenuate gorging during a fast food meal: effects on energy intake. *Pediatrics*. 2007;119:869–875.
24. Daniels SR, Arnett DK, Eckel RH, Gidding SS, Hayman LL, Kumanyika S, Robinson TN, Scott BJ, St Jeor S, Williams CL. Overweight in children and adolescents: pathophysiology, consequences, prevention, and treatment. *Circulation*. 2005;111:1999–2012.
25. Monzavi R, Dreimane D, Geffner ME, Braun S, Conrad B, Klier M, Kaufman FR. Improvement in risk factors for metabolic syndrome and insulin resistance in overweight youth who are treated with lifestyle intervention. *Pediatrics*. 2006;117:e1111–e1118.
26. Sothorn MS. Obesity prevention in children: physical activity and nutrition. *Nutrition*. 2004;20:704–708.
27. Cruz ML, Shaibi GQ, Weigensberg MJ, Spruijt-Metz D, Ball GD, Goran MI. Pediatric obesity and insulin resistance: chronic disease risk and implications for treatment and prevention beyond body weight modification. *Annu Rev Nutr*. 2005;25:435–468.
28. Epstein LH, Myers MD, Raynor HA, Saelens BE. Treatment of pediatric obesity. *Pediatrics*. 1998;101(pt 2):554–570.
29. Jelalian E, Saelens BE. Empirically supported treatments in pediatric psychology: pediatric obesity. *J Pediatr Psychol*. 1999;24:223–248.
30. Epstein LH, Paluch RA, Roemmich JN, Beecher MD. Family-based obesity treatment, then and now: twenty-five years of pediatric obesity treatment. *Health Psychol*. 2007;26:381–391.
31. Johnston CA, Tyler C, McFarlin BK, Poston WS, Haddock CK, Reeves R, Foreyt JP. Weight loss in overweight Mexican American children: a randomized, controlled trial. *Pediatrics*. 2007;120:e1450–e1457.
32. Berkowitz RI, Fujioka K, Daniels SR, Hoppin AG, Owen S, Perry AC, Sothorn MS, Renz CL, Pimer MA, Walch JK, Jasinsky O, Hewkin AC, Blakesley VA; Sibutramine Adolescent Study Group. Effects of sibutramine treatment in obese adolescents: a randomized trial. *Ann Intern Med*. 2006;145:81–90.
33. Levine MD, Ringham RM, Kalarchian MA, Wisniewski L, Marcus MD. Is family-based behavioral weight control appropriate for severe pediatric obesity? *Int J Eat Disord*. 2001;30:318–328.
34. Lawson ML, Kirk S, Mitchell T, Chen MK, Loux TJ, Daniels SR, Harmon CM, Clements RH, Garcia VF, Inge TH; Pediatric Bariatric Study Group. One-year outcomes of Roux-en-Y gastric bypass for morbidly obese adolescents: a multicenter study from the Pediatric Bariatric Study Group. *J Pediatr Surg*. 2006;41:137–143.
35. Inge TH, Xanthakos SA, Zeller MH. Bariatric surgery for pediatric extreme obesity: now or later? *Int J Obes (Lond)*. 2007;31:1–14.
36. Cabana MD, Rand CS, Powe NR, Wu AW, Wilson MH, Abboud PC, Rubin HR. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA*. 1999;282:1458–1465.
37. National Association of Children's Hospitals and Related Institutions. *Medicaid: General*. http://www.childrenshospitals.net/AM/Template.cfm?Section=Medicaid_Matters&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=155&ContentID=31671. Accessed March 2009.
38. Kaiser Family Foundation. Kaiser Commission on Key Facts. *Health Coverage of Children: The Role of Medicaid and SCHIP*. September 2007. <http://www.kff.org>. Accessed October 2008.
39. Barlow SE, Bobra SR, Elliott MB, Brownson RC, Haire-Joshu D. Recognition of childhood overweight during health supervision visits: does BMI help pediatricians? Obesity (Silver Springs). 2007;15:225–232.
40. Perrin EM, Flower KB, Ammerman AS. Pediatricians' own weight: self-perception, misclassification, and ease of counseling. *Obes Res*. 2005;13:326–332.
41. Miller WR, Rollnick S. *Motivational Interviewing: Preparing People for Change*. 2nd ed. New York, NY: Guilford Press; 2002.
42. Kolagotla L, Adams W. Ambulatory management of childhood obesity. *Obes Res*. 2004;12:275–283.
43. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? *Eff Clin Pract*. 1998;1:2–4.
44. Fisher EB, Brownson CA, O'Toole ML, Shetty G, Anwuri VV, Glasgow RE. Ecological approaches to self management: the case of diabetes. *Am J Public Health*. 2005;95:1523–1535.
45. Norris SL, Lau J, Smith SJ, Schmid CH, Engelgau MM. Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. *Diabetes Care*. 2002;25:1159–1171.
46. Fisher EB, Brownson CA, O'Toole ML, Shetty G, Anwuri VV, Fazzino P, Housemann RA, Hampton AD, Kameron DB, McCormack LA, Burton JA, Orleans CT, Bazzarre TL. The Robert Wood Johnson Foundation Diabetes Initiative: demonstration projects emphasizing self-management. *Diabetes Educ*. 2007;33:83–84, 86–88, 91–92, passim.

47. Lara M, Rosenbaum S, Rachelefsky G, Nicholas W, Morton SC, Emont S, Branch M, Genovese B, Vaiana ME, Smith V, Wheeler L, Platts-Mills T, Clark N, Lurie N, Weiss KB. Improving childhood asthma outcomes in the United States: a blueprint for policy action. *Pediatrics*. 2002;109:919–930.
48. Fuhlbrigge AL, Adams RJ, Guilbert TW, Grant E, Lozano P, Janson SL, Martinez F, Weiss KB, Weiss ST. The burden of asthma in the United States: level and distribution are dependent on interpretation of the National Asthma Education and Prevention Program guidelines. *Am J Respir Crit Care Med*. 2002;166:1044–1049.
49. Stoto MA, Abel C, Dievier A, eds. *Healthy Communities: New Partnerships for the Future of Public Health*. Washington, DC: National Academy Press; 1996. Available at: <http://www.nap.edu/catalog/5475.html>. Accessed November 1, 2007.
50. Baker QE, Davis DA, Gallerani R, Sanchez V, Viadro C. *An Evaluation Framework for Community Health Programs*. Durham, NC: Center for the Advancement of Community Based Public Health; June 2000. Available at: <http://www.cdc.gov/eval/evalcbph.pdf>. Accessed October 31, 2008.
51. Cole TJ, Bellizzi MC, Flegal KM, Deitz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ*. 2000;320:1240–1243.
52. Eysenbach G. What is e-health? *J Med Internet Res*. 2001;3:e20.
53. Haire-Joshu D, Fleming C, Schermbeck R. The role of government in preventing obesity. In: Kumanyika S, Brownson RC, eds. *Handbook of Obesity Prevention: A Resource for Health Professionals*. New York, NY: Springer; 2007:129–170.
54. 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. *Annu Rev Public Health*. 2006;27:341–370.
55. Boehmer TK, Brownson RC, Haire-Joshu D, Dreisinger ML. Patterns of childhood obesity prevention legislation in the United States. *Prev Chronic Dis*. 2007;4:A56.

KEY WORDS: AHA Conference Proceedings ■ children ■ obesity

American Heart Association Childhood Obesity Research Summit: Executive Summary
Stephen R. Daniels, Marc S. Jacobson, Brian W. McCrindle, Robert H. Eckel and Brigid
McHugh Sanner

Circulation. 2009;119:2114-2123; originally published online March 30, 2009;
doi: 10.1161/CIRCULATIONAHA.109.192215

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 American Heart Association, Inc. All rights reserved.
Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the
World Wide Web at:

<http://circ.ahajournals.org/content/119/15/2114>

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in *Circulation* can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the [Permissions and Rights Question and Answer](#) document.

Reprints: Information about reprints can be found online at:
<http://www.lww.com/reprints>

Subscriptions: Information about subscribing to *Circulation* is online at:
<http://circ.ahajournals.org/subscriptions/>