Obesity Prevention and Treatment

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Dr Rome has disclosed no financial relationships relevant to this article. This commentary does not contain a disussion of an unapproved/investigative use of a commercial product/device.

Objectives

After completing this article, readers should be able to:

1. Provide current definitions of pediatric obesity.
2. Identify strategies for recognition and management of the overweight and obese child and adolescent in the office setting.
3. Discuss community solutions for pediatric obesity, including those strategies targeting schools, the built environment, local food availability, and the home.
4. Describe the role of legislation in pediatric obesity, similar to legislative changes affecting other pediatric issues, such as tobacco control.

Introduction

Pediatric obesity has been viewed as a growing epidemic of the past few decades that requires intervention, similar to tobacco use and its accrued medical risks that has prompted multifaceted preventive efforts. Affecting as many as 34% of American children, (1) obesity can be viewed as a top public health threat due to its associated morbidity and mortality. (2) The medical consequences of obesity accounted for 40% of the health-care budget by 2006, with an expected $147 billion in health-care spending alone in 2008. (3) In 2006, obese adults had estimated medical costs $1,429 higher than those for persons of normal weight. (3) For children coming to a pediatric integrated health-care delivery system, expenses were $179 per year higher in obese children versus children who had normal body mass index (BMI). (4) Using the Medical Expenditure Panel Survey data from 2002 to 2005 for children ages 6 to 19 years, the total additional health expenditure in prescription drugs, outpatient appointments, and emergency department visits for children who had elevated BMIs was estimated to be $14.1 billion annually. (5)

Pediatric obesity affects all organ systems, (6) with its medical sequelae paralleling the increasing prevalence in younger children. Type 2 diabetes is being diagnosed in morbidly obese 9-year-olds, and bariatric surgery has been performed in children as young as 12 years. Prevention is paramount, and pediatricians need easy tools that help with early recognition of developing obesity, preventive counseling, and treatment. Bariatric surgery remains an option, albeit a last resort, because the morbidly obese individuals who suffer medical complications remain at risk for a shortened lifespan if they do not achieve significant weight loss. This article discusses trends in epidemiology, recognition, and treatment of obesity in the primary care office as well as community interventions and prevention.

Definitions

Obesity occurs when energy intake exceeds energy expenditure. BMI (defined as weight in kilograms divided by height in meters squared) is an indirect measure of weight status and is plotted against age- and sex-specific percentiles. In the United States, children and adolescents are defined as obese if their BMI exceeds the 95th percentile for age and overweight if their BMI falls within the 85th to 95th percentile range for age.

BMI is easily measured, has pediatric norms available on the Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO) websites, is easily calculated by available web programs, and can be used easily for tracking childhood obesity trends within a population. However, measuring overweight and obesity in children ages 5 to 14 years is challenging because, as noted by the WHO, there is no standard definition

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of childhood obesity applied worldwide (http://www.who.int/mediacenter/factsheets/fs311/en/index.html). Comparison of the CDC and WHO data and methodology reveals similar graphs, with small variations. (7)

Pragmatically, the pediatrician can use the WHO's downloadable growth charts for children from birth through 23 months, and the CDC website's downloadable BMI graphs for tracking for children ages 2 years and up. The electronic medical record can make tracking of BMI even easier through programs that calculate BMI automatically and record both the vital signs and BMI into the health supervision visit record.

However, BMI measurements do not reflect adiposity accurately because a muscular individual might have the same BMI as an oversized endomorph (for those in the United States, imagine Arnold Schwarzenegger in his competitive bodybuilding years compared with a life-size cartoon character such as Fred Flintstone). High lean body mass can elevate weight, leading to a higher BMI without corresponding high adiposity.

Epidemiology

The prevalence of pediatric obesity has grown in the past few decades, with increases occurring worldwide in developed more than in developing countries. Despite an increase in efforts to recognize and treat pediatric obesity, trends in obesity have not shown a decrease; at best, there is a plateau in rates. Ogden and associates (8) showed a prevalence of overweight of more than 33%, varying by ethnicity. The prevalence of obesity diagnosed in children ages 6 to 19 years tripled from 2003 to 2006; in children ages 2 to 5 years, the incidence of obesity rose from 5% to 12.4%. (9) A study of 11,653 children ages 5 to 17 years in a longitudinal set of eight cross-sectional surveys, with use of data from the Bogalusa Heart Study from 1973 to 1994 plus BMI data from routine school screening in 2008 to 2009, showed a threefold increase in the prevalence of overweight and obesity from 14.2% to 48.4%. (10)

Factors Contributing to Increased Childhood Obesity

Prenatal influences include the food milieu provided by the placenta, with prenatal nutritional deprivation, gestational diabetes, and high birthweight all positively correlated with obesity. In the first year after birth, BMI increases substantially, and the infant has a large number of adipose cells. Between 4 and 6 years of age, adipose cells reach a nadir and subsequently increase sharply in number in a process termed adipose rebound. The younger and heavier the child is at the time of adipose rebound, the more likely he or she is to become an obese adult. As Ariza and associates state, ". . . the adipose cells accumulated during this period will forever call out to be fed." (11)

Table 1 outlines the correlation between pediatric obesity and adult obesity by age, as adapted from various studies. (12)(13)(14)(15) In a retrospective cohort study of 854 children that included longitudinal data, Whitaker and colleagues (14) found that 1 to 2 year olds who had a nonobese parent had an 8% chance of becoming obese adults, whereas 10- to 14-year olds who had at least one obese parent had a 79% chance of becoming obese adults. Using the National Longitudinal Study of Youth 1979 health data on 1,309 children born in 1965 to 1966 and tracked from 1981 to 2002, Wang and associates (13) found that 80% of male and 92% of female adolescents whose BMIs were greater than the 95th percentile became obese adults. These results are similar to the longitudinal findings from the Bogalusa Heart Study, (12) a cohort of 2,610 adolescents ages 15 to 17 years from 1975 who were followed into their early 30s by 1993, at which time 86% of boys and 90% of girls whose BMIs were more than the 95th percentile in adolescence remained obese as adults.

Protective factors for obesity include breastfeeding, being a part of families who have active lifestyles and minimal television usage, and having nonobese parents. (16)(17)(18)

Genes play a role in pediatric obesity but do not account for the dramatic recent increase in prevalence. Exogenous influences such as the demise of the family dinner, with more families eating fast food on the run; prepackaged foods that have high ratios of saturated fat (and trans fats until recently) and high-fructose corn syrup; less accessible and lower intake of fruits and vegetables in the average urban family; lack of safe areas to

Table 1. Risks of Adult Obesity (12)(13)(14)(15)(16)

- 14% chance if obese as an infant
- 25% chance if obese as a preschool age child
- 41% chance if obese at age 7 y
- 75% chance if obese at age 12 y
- 90% chance if obese in adolescence

play outside; sedentary lifestyles with more hours of television and video game use; and diminished school physical activity requirements are among many of the reasons for the recent trends. Sports for the elite child athlete are easily accessible, but affordable options for the recreational athlete, particularly the obese child, may be lacking.

The media also has contributed to the increase in childhood obesity, with advertisements to children significantly affecting their food preferences. The average parent often succumbs to a child's request for the latest high-calorie, low-nutrient craze in the grocery store. Feeding trends also have an impact. For example, toddlers who are fed more than they require learn to select and eat more than they need. In a culture in which providing food represents providing love and providing more is better, conspicuous consumption has obvious consequences. (19)

Risk of Underdiagnosis in the Pediatric Population

Underdiagnosis of pediatric overweight and obesity remains a concern. In a recent study using electronic medical records of 711 patients ages 2 to 18 years seen for well care between June 1999 and October 2007 in a large medical system in northeastern Ohio, (20) the prevalence of overweight and obesity was higher than typical, much more than the 10% seen in other countries. With overweight defined as BMI of at least the 85th percentile but less than the 95th percentile and obesity defined as BMI of at least the 95th percentile or at least 30, 19% of children were overweight, 23% were obese, and 33% of the obese group (8% of all children) were morbidly obese. Of note, when the assigned billing International Classification of Diseases (ICD)-9 code for obesity was used as the means to determine whether obesity was recognized and formally diagnosed, only 10% of overweight patients, 54% of the obese patients, and 76% of the morbidly obese patients were assessed accurately.

Among undiagnosed patients whose electronic medical records were reviewed manually (n=195), 10.8% of overweight patients, 38.2% of obese patients, and 40% of severely obese patients were given a diagnosis other than overweight or obesity by ICD-9 code. This trend may reflect the current lack of reimbursement in Ohio and other states for treating only obesity; ICD-9 codes reflecting the *medical complications* of obesity have better reimbursement. In this cohort, girls were more likely to be diagnosed than boys, as were African American and Hispanic patients more than white children and adolescents. However, a statistically significant trend was documented toward an increasing rate of diagnosis during the study period until 2005, when the percentage of patients diagnosed per year reached a plateau; this trend parallels the heightened awareness of the obesity epidemic by the public, including parents and medical personnel. (20)

Heightened awareness does not necessarily translate into vastly improved response, prevention, and treatment, as suggested by the plateau rather than decrease in prevalence of obesity in Ohio. Analogous to the challenges of opposing the tobacco industry with respect to smoking prevention and cessation, combating obesity begins with awareness of the problem followed by a steady progression of multilayered interventions leading to generational change. Benson and colleagues (20) found that use of automatic flagging of abnormal BMIs is insufficient to provide long-term increases in diagnostic rates; rather, more active strategies are necessary to encourage clinicians to diagnose pediatric obesity.

Clinician Awareness and Response

Similar to recognizing domestic violence, many primary care clinicians do not know what to do once they diagnose obesity in a pediatric patient. Besides determining BMI, electronic medical record software can automatically produce a proactive response by suggesting handouts, action steps, and even recipes that are downloadable at the time of a patient encounter if a patient has a high BMI. However, pediatricians may lack access to such resources.

Communities also can improve efforts to treat obesity. For example, the Ohio Business Roundtable declared pediatric obesity a priority issue and worked with legislators, vested business partners, health professionals, children's hospitals in the state, and the state chapter of the American Academy of Pediatrics to pass legislation for greater physical activity in schools, higher nutritional standards in school cafeterias, and limited choices in school vending machines.

Challenges of Obesity

Unfortunately, the term obesity has been used for discrimination and teasing and not for recognizing a disease requiring treatment. This lack of disease nomenclature has been a barrier to insurance reimbursement, with

tertiary prevention paradoxically paid better than primary prevention; it is relatively easy to have an insurance company pay for an adult coronary bypass in the United States as opposed to funding treatment for obese patients who do not have associated comorbidities. Until 2004, even Medicare payment regulations contained the phrase, "Obesity itself cannot be considered an illness." (21) Proponents of the view that obesity is not a disease argue that one can be overweight yet physically fit, but that belief should be challenged, as suggested by the evidence that obese children as young as 10 years of age develop atherosclerosis, at 9 years of age develop type 2 diabetes, and at earlier ages develop other comorbidities associated with obesity.

Medical Consequences of Pediatric Obesity

Elevated BMI in childhood is associated with multiple comorbidities in the pediatric age group (Table 2). Blood pressure elevations can be seen in adolescence and rarely before that age. Table 3 outlines the simple positive changes associated with only a small drop in BMI. (22)(23)(24)(25)(26) Table 4 delineates recommended laboratory assessment for overweight and obese children. (27)(28) Overweight children tend to be taller, have advanced bone ages, and mature earlier compared with their nonobese peers. Early puberty correlates with higher adiposity in adulthood as well as an increase in truncal fat distribution in women. Adipose cells on the hips, once formed, last forever, and these cells increase in size more than number with age. Omental adipose cells, on the other hand, can increase in number with age. Central fat distribution, perhaps through an effect on insulin concentrations, appears to be an important medi-

Table 2. Medical Complications of Pediatric Obesity

- Hypertension (2.9 times higher in obese children and adolescents)
- Type 2 diabetes (2.9 time higher in obese children and adolescents)
- Coronary artery disease
- Hypercholesterolemia (2.1 times higher)
- Other hyperlipidemias
- Left ventricular hypertrophy
- Obstructive sleep apnea
- Increased severity of asthma
- Mechanical stress on joints, slipped capital femoral epiphysis
- Blount disease (tibia vara)
- Pseudotumor cerebri
- Hepatic steatosis, cholelithiasis
- Gastroesophageal reflux
- Insulin resistance, acanthosis nigricans
- Social stigma, depression, low self-esteem

Table 3. Potential Results of Reducing BMI (22)(23)(24)(25)(26)

If you reduce BMI by 10% . . .

- Blood pressure decreases by 10 mm Hg (average)
- Triglycerides decrease below 100 mg/dL (1.13 mmol/L) or by 200 mg/dL (2.3 mmol/L) (if genetic defect present)
- High-density lipoprotein cholesterol increases by 3 to 5 mg/dL (0.08 to 0.13 mmol/L)
- Low-density lipoprotein cholesterol sometimes lowers (diet/weight loss combined can lower by 25% to 30% if elevated)

Table 4. Laboratory Evaluation in the Office Setting (28)

All children

- Serum cholesterol assessment once in childhood if family history for hypercholesterolemia, once in adolescence

BMI 85th to 94th percentile

- Fasting lipid panel
- ALT and AST, fasting glucose (Note: complete metabolic panel contains both studies and may be less expensive in certain health-care systems)
- Complete blood count to screen for iron deficiency anemia and other nutritional depletion

BMI >95th percentile

- Fasting lipid panel
- ALT, AST, fasting glucose (complete metabolic panel as above)
- Abdominal ultrasonography to evaluate for fatty liver
- Other laboratory tests, as dictated by the evaluation (eg, thyroid enlargement, history suspicious for Prader-Willi syndrome, headaches consistent with pseudotumor cerebri)
- Urinalysis to screen for type 2 diabetes

ALT=alanine aminotransferase, AST=aspartate aminotransferase, BMI=body mass index

ating variable between lipid concentrations and obesity. Leptin, produced by adipocytes, is elevated in obese women, and a raised leptin value is associated with higher rates of infertility. (29) Early maturation can lead to lower self-esteem in girls, with a marked increase in unhealthy dieting behaviors.

Treatment: The Pediatrician's Role

As noted earlier, the first step in the office setting is to recognize when overweight or obesity occurs; in simplest terms, pediatricians need to include in their practice the tracking of a patient's BMI with the same rigor applied to following other growth parameters. The second step is to react to an increasing BMI with an approach that promotes positive family change without decreasing the child's or the parent's self-esteem. For example, when confronted with a BMI at the 85th percentile and a weight percentile that is higher than the height percentile, the pediatrician can tell an 8-year-old child, "You are awesome, and together with your parents, we are going to keep you healthy and have your weight stay the same this year, while you keep getting taller!" Pairing this statement with small, steady changes that the parent can implement with close medical follow-up evaluations tends to work better than a remonstrative approach.

Ideally, a child in the overweight category (BMI 85th to 95th percentile) should be seen at least quarterly, with dietitian visits for both child and family to help with portion sizes, healthier choices, and positive changes in family behaviors. Children in the obese category (BMI ≥95th percentile) should be seen monthly, with steady change promoted in positive terms. Reimbursement remains a challenge, but improvements may result from advocacy with groups such as the American Academy of Pediatrics and the Alliance for a Healthier Generation, community partnerships such as the Ohio Business Roundtable, and health-care organizations such as the Cleveland Clinic.

Interventions in the office setting tend not to work until the child (and parent) is ready for change; premature interventions can lead to learned helplessness ("This diet will never work") and ongoing dieting attempts and disordered eating ("Maybe this diet will work"). The result can be long-term weight gain and physiologic changes supporting the disordered eating ("Skip the diet or either overeat or undereat accordingly"). In the very young child, the pediatrician requires parents (and other family members involved in food preparation and portioning) to modify diet and exercise willingly to ensure success.

Motivational interviewing can be used to help manage change, such as asking open-ended questions about how the child feels about his or her weight: Has she ever been teased about her weight or bullied, and if so, how did she feel? What did she do at the time or after? Together, what do you think you (the child) could do the next time teasing or bullying happens? How and in which ways do you want your parents involved? Families can learn active listening strategies and ways to avoid weight-related teasing in the home and to advocate for the child at school.

Family members should be encouraged to cut out their own weight-related talk and promotion of dieting with a "talk less, do more" philosophy, as promoted by Dr Diane Neumark-Sztainer (30)(31) and others. As she artfully notes, ". . . if the child is not a good reader, you don't want to make them feel stupid to help them read more" (presented in a talk to the Society for Pediatric and Adolescent Gynecology, Las Vegas, Nevada, April 16–18, 2010).

Similarly, body dissatisfaction should not be used as a motivator for change in the obese child. Rather, obese children should be encouraged to feel great about themselves, and the pediatrician should play to their strengths, working to maintain an active and healthy lifestyle. Other simple solutions include removing television sets from the bedrooms and limiting television and video game use from infancy onward. Another simple intervention is encouraging families to discourage eating in front of the television or computer to stop the child (and parent) from eating more than anticipated.

In the office setting, the pediatrician may be asked to prescribe medications to "treat" obesity, despite a paucity of data on drug effectiveness in the pediatric population. Metformin has been associated with modest weight loss of 5 to 10 lb in adolescents who have insulin resistance. Orlistat, which prevents absorption of fat, has been associated with some weight loss due to dietary fat malabsorption, but the associated gastrointestinal distress has limited its effective use. Sibutramine, which has been approved for use in adolescents 16 years of age and older, inhibits reuptake of norepinephrine and serotonin and has been associated with BMI decreases of more than 5% when used in combination with behavioral therapy. Diet pills, stimulant medications, and caffeine pills should not be prescribed because misuse increases the risks of sudden cardiac death. (32)

Dieting interventions often have resulted in weight "yo-yoing," or a cycle of loss followed by further gain. Weight Watchers®, a company that offers various food products and services to help lose weight and maintain weight loss, can add value by helping with portion control as determined by "points," but adolescents usually need to be reminded not to put all their "points" into one meal. Fad diets do not tend to help, and the Ornish diet, a combination of a specific lifestyle and a high-fiber, low-fat vegetarian diet, does not provide the fat grams necessary for adolescent brain development.

For a select few highly motivated adolescents or young adults who require more than 30 lb of weight loss, the protein-sparing modified fast, which works like a medically monitored Atkins™ diet with low overall energy (usually 1,500 to 1,800 kcal/day), protein, and fat intake, is intended to promote ketosis and breakdown of fat for energy. Adolescents monitor their urine daily for ketones, with monthly blood sampling to detect electrolyte abnormalities or uric acid elevations due to rapid lysis of fat cells. Rarely, a patient who needs to be on this diet may require allopurinol when uric acid concentrations increase beyond 10 mg/dL (594 μmol/L). The protein-sparing modified fast diet has been associated with weight losses of 30 to 50 lb.

Typically, a patient is on the protein-sparing modified fast diet from fall to Thanksgiving, with a dietitian allowing weight gain of no more than 5 or 10 lb during the holiday season; resumes the diet from New Year's day to spring break; and eats a stable diet as he or she goes off the strict meal plan. Keys to success include monthly physician and dietitian visits, positive parental support, and high motivation by the adolescent.

Bariatric surgery still is an extreme treatment, although a potentially lifesaving one, that is associated with a significant decrease in the comorbidities of morbid obesity. (22)(23)(26) Surgical rates in adolescents have tripled from 2000 to 2003, with better outcomes reported by those surgeons who specialize in pediatric bariatric surgery and who perform more surgeries per year. (33) Adolescents being considered for bariatric surgery require pre- and postoperative medical, dietary, and psychological assessment and support to ensure healthy long-term outcomes. Suitable surgical candidates must have achieved abstract thought or the ability to foresee consequences; have the ability to follow through with needed medical follow-up; and be forewarned that they may need plastic surgery later for excess skin reduction, which may not be covered by health insurance in countries such as the United States. Long-term monitoring of the adolescent patient is imperative for achieving optimal physical and psychosocial outcomes.

Most successful programs for weight loss in the office setting are grounded in theories of behavior change, with a goal of finding the right motivation for the right constituency. For example, the office pediatrician sets a goal of small, manageable changes aimed at motivating the child and parent rather than following what would personally motivate the pediatrician.

In our institution, key objectives for weight loss include: 1) preventing obesity as part of every routine child health supervision visit; 2) enhancing primary care clinicians' skills in identifying and treating overweight and obese children, including comorbidities; 3) expanding services regionally, working collaboratively with schools and community; 4) enhancing care for the rare teenager who needs bariatric surgery before, during, and after the operation; and 5) performing the outcome analyses to measure the impact of the program.

One Center's Approach: The Cleveland Clinic Pediatric Obesity Initiative

To give readers a tangible example of a current program that is evolving successfully, we share the experience of the Cleveland Clinic. This program addresses a number of the dimensions of the obesity problem and adds a community perspective. Incorporating lessons from other institutions, the Cleveland Clinic developed evidence-based best practices (Fig) for treating obesity. For an office-based approach, the Cleveland Clinic looked at the success of the Maine Youth Overweight Collaborative, which used a 5-2-1-0 behavioral approach to counseling in 12 pediatric offices. Their "Help ME Grow!" Project proposes 5-a-day fruits and vegetables, 2 hours or less of television or screen time, 1 hour or more of exercise, and 0 sugar-sweetened beverages. After initiation of the program in Maine, BMI assessment increased from 38% to 94% and BMI screening went from 0% to 92%. Parents at the intervention sites received more nutritional and exercise counseling than did non-intervention parents. Pediatricians reported improvements in their own skills in managing pediatric obesity. Schools in southern Maine participated in the Maine Youth Overweight Collaborative, using a resource kit containing strategies to promote the 5-2-1-0 goals. Teachers appreciated the tool kit but found difficulty with implementation.

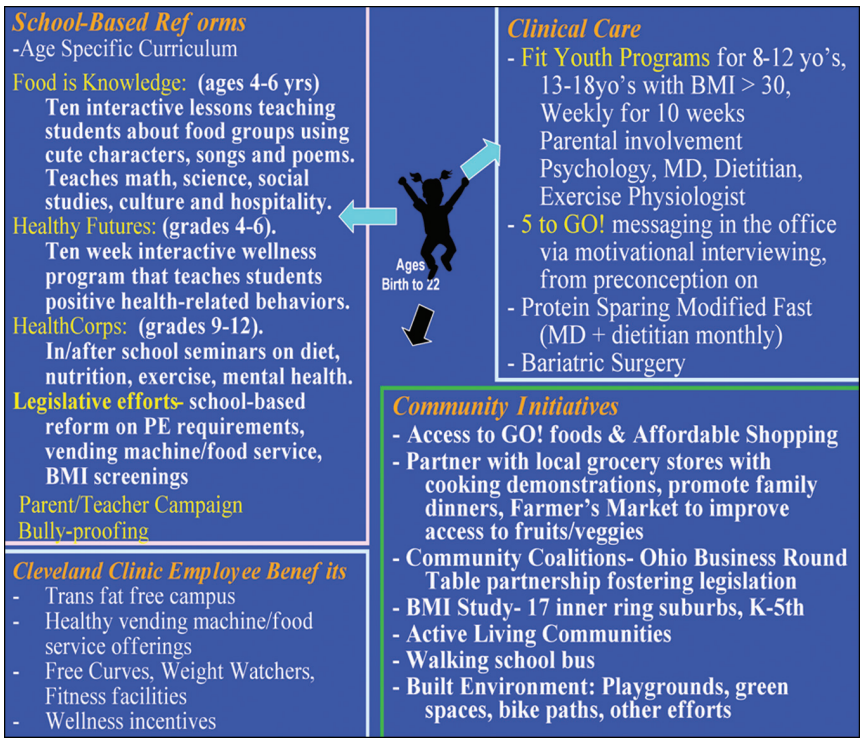

Figure. Components of a pediatric obesity program: the Cleveland Clinic example.

Similar to the Maine Youth Overweight Collaborative, the Cleveland Clinic pediatric obesity initiative embraces the "5 to GO!" message (Table 5). The "5 to GO!" message was introduced gradually into the Cleveland Clinic workplace as well as into local and statewide sites. Besides "5 to GO!," the Stoplight diet (34) also was introduced, featuring foods associated with the colors red, yellow, and green. Red light foods (eg, cakes, fried chicken) mean "stay away," yellow light foods (eg, ground beef, dark chocolate, olive oil) mean "proceed with caution," and green light foods (eg, salmon, brown rice, low-fat yogurt) mean "GO!". "GO!" foods meet the following nutritional criteria: they contain 100% whole grain and minimal saturated fat, no trans fat, minimal added sugars and syrups, and minimal sodium. In markets and other food services, "GO!" foods are placed at eye level and labeled as such with caloric/energy descriptions. In Cleveland, "GO!" foods now are sold commercially at the national sports team's arena and at local stores, "GO!" foods discounts are highlighted, and easy-to-use recipes are provided at these locales.

A typical behavioral intervention at the Cleveland Clinic is identifying who is bringing the red foods into the house; brainstorming about what red foods could easily be changed to yellow or green; and generating solutions, such as weekly meal planning, packing a lunch rather than relying on the school lunch, or having a scavenger hunt for "GO!" foods in the grocery store.

As noted by Lawrence and associates, (35) leading by example provides a powerful means of behavior change. At the start of the "GO!" foods initiative, fewer than half of health-care facilities surveyed, including the Cleveland Clinic, had started shifting away from high-calorie, low-nutrient-dense vending machine options or eliminating fast food. The Cleveland Clinic, the second largest employer in Ohio, now has no trans fats, no nondiet soda pop, and only healthy options in its vending machines and food services on its main campus, 9 regional hospitals, and 12 family health centers. All employees receive free use of the fitness facilities, with a $100 gift for going 10 times a month for 10 months; Curves® and Weight Watchers® are also free to employees. Over the first year, employees lost 121,000 lb cumulatively, with other incentives for

Table 5. "5 to GO!" Message

0 to 10 Years
5: Eat FIVE fruits and veggies a day.
4: Give and get FOUR compliments a day.
3: Consume THREE dairy a day.*
2: No more than TWO media hours a day.
1: At least ONE hour of exercise a day.
0: NO sugar-sweetened drinks, ever.
GO: Be well, inside and out!
11 Years +
5: Eat FIVE fruits and veggies a day.
4: Consume FOUR dairy a day.
3: Give and get THREE compliments a day.
2: No more than TWO media hours a day.
1: At least ONE hour of exercise a day.
0: NO sugar-sweetened drinks, ever.
GO: Be well, inside and out!

*According to the American Academy of Pediatrics/United States Department of Agriculture, children up to 10 years of age need only three servings of dairy per day.

wellness. Recent advocacy efforts include coverage of benefits for the offspring of families as well as continuing kickbacks for ongoing participation in a weight management group (Fit Youth program, based on the Epstein model (36)) that consists of 12 weeks of intervention by a dietitian, exercise physiologist, psychologist, and pediatrician, with mandatory parental involvement plus longer-term plans for meeting quarterly with support groups. In preliminary analysis, children and adolescents have been shown to break the cycle of gain, with achievable weight maintenance or modest weight gain. Longer analysis should help determine efficacy over time and the appropriate follow-up necessary to sustain family changes.

School-based Interventions

Schools also can promote change. In Cleveland, before efforts to reduce obesity began, schoolchildren could consume 3,500 kcal daily just through the subsidized breakfast and school lunch options. Packing a lunch can decrease caloric intake during the school day. In a study of 2,774 adolescents in California, Hastert and Babey (37) found that adolescents who brought lunch from home 5 days a week ate less fast food, drank less soda pop, ate less fried potatoes and less high-sugar foods, and consumed more fruits and vegetables compared with adolescents who never brought lunch to school.

Local, state, and national efforts, including the National School Lunch Program and the Alliance for a Healthier Generation, have targeted improvements in school lunch menus. An agreement between the Alliance for Healthier Generations and the soft drink companies promoted the following changes: in elementary schools, soda pop is to be replaced with water and 8 oz nonsugar-sweetened 100% juice as well as fat-free and low-fat flavored and regular milk. In middle schools, the same standards hold, with juice portions increased to 10 oz. For high schools, 50% of choices are water, with light juices and sports drinks that contain no more than 100 kcal per container making up the other 50% (http://healthiergeneration.org).

Does BMI Screening Make a Difference?

BMI screening provides baseline data for evaluating various interventions in the office, school, or community setting. Screening itself does not accomplish weight change; it is the precursor to intervention. Layered interventions; interventions at multiple sites, including the home, the medical home, the school, and the community; and legislative interventions are likely to promote the generational change necessary to reverse the trends in pediatric obesity.

As noted by Homer in a recent supplement to *Pediatrics*, state-specific data are needed to inform and craft local solutions, with BMI as a user-friendly tool. (38) In one of Cleveland's inner-ring suburbs, the Lakewood school system analyzed BMI data, finding that the poorest children had the highest BMIs, correlating with the lowest academic achievement (Cleveland Clinic data in partnership with Lakewood Hospital, 2009). These findings were correlated without implied causality other than poverty as a barrier to both academic achievement and healthier food choices. The Lakewood community has collaborated with the Cleveland Clinic in several efforts: 1) Nutritional analysis of food content in the schools; 2) Promotion of a farmer's market showcasing local produce; 3) Establishing "walking school buses" in which parents walk children through different blocks to provide a safe and more active route to school in certain neighborhoods; 4) Acquiring support by the local police force and school superintendents to ensure safe places to play; 5) Adding the "Food is Knowledge" program that targets kindergarten children, teaching language arts, social studies, math, science, and other parts of the curriculum by using healthy food as the medium; and 6) Adding the "Healthy Futures" program for 4th to 6th graders that targets healthy lifestyle habits, including nutrition and exercise. These efforts plus Ohio legislation hope to promote generational change.

Early detection of childhood obesity predicts better outcomes long term. In a British study, the strongest predictor for successfully reducing BMI was younger age at time of diagnosis (specifically elementary school age or younger) (39). In a German pediatric obesity clinic, children younger than 12 years of age had a fourfold greater success rate at BMI reduction than did adolescents. (40) As mentioned, although BMI screening in the pediatrician's office is the natural starting place for office-based interventions, more needs to be done.

In the Live, Eat, and Play ("LEAP") primary care randomized trials, family doctors screened and applied systemic interventions for children who had high BMIs in the United Kingdom, with high investment of resources and only modest results. (41) In the school setting, several states, including Arkansas, Pennsylvania, and Tennessee,

have routinely sent the results of BMI screening home to parents via a confidential report card. In contrast, in the United Kingdom program, parents could request their children's data, but the data were not routinely sent home. A recent analysis of findings from Arkansas, (42) where the Governor and State General Assembly mandated BMI screening in 2003 at year 4, showed:

1) An increase in policies for school personnel concerning the selection of foods for school-sponsored activities and prohibiting the sale of junk foods.

2) A policy shift in schools and school districts away from using physical activity as a punishment and toward requiring lifetime physical activities to be included in physical education programs.

3) Increased use of certified physical education teachers in elementary schools.

BMI screening in the pediatrician's office has been found to be safe and acceptable, especially if paired with recommendations and resources that are affordable and accessible (39)(43)(44) BMI surveillance programs, in which individual data are used to shape policy but are not individually reported back to parents, are deemed safer than BMI screening in the schools in which individual BMI report cards are shared with families. (45)(46)(47) Surveillance data provide a means to track population change without affecting individual students or putting them at risk for potential bullying, inappropriate dieting, or other negative sequelae. BMI screening in schools remains controversial because not every program meets the American Academy of Pediatrics recommendation that screening be paired with effective, affordable treatment options. (45)(46)(47) Methods for screening matter; use of a private room and trained personnel can avoid the discomfort expressed previously by one third of obese United States 5th through 8th graders who were publicly screened. Nonprivate screenings for BMI may increase weight-related teasing, bullying, and inappropriate dieting behavior, leading to rebound weight gain and lowered self-esteem. (47)

The Role of the Urban Corner Store

Food availability affects food choices. Some communities do not have a readily available large grocery store. In a study of 833 urban school children in 4th to 6th grades, Borradale and associates (48) found that children shopped at corner stores frequently, purchasing energy-dense, low-nutrient foods and drinks with an average of more than 1,497 kJ (356.6 kcal) per purchase. More than 50% of these children were eligible for free or reduced-price meals. The children spent little money on these purchases, averaging $1.07+0.93 on an average of two items, usually consisting of chips, candy, and sugar-sweetened beverages. Ludwig and colleagues (49) found that among nearly 550 Massachusetts school children from diverse ethnic backgrounds, each additional serving of sugar-sweetened beverages accounted for an increase in both BMI and prevalence of obesity, adjusting for anthropometric, demographic, dietary, and lifestyle variables. Children now drink 3 cups of soda pop for every 1 cup of milk, with an increase in consumption of fast foods by many urban and suburban children. (50)

In areas of New York City, including the Bronx and Harlem, ethnic and local neighborhood stores have been found to offer only whole milk; shifting offerings to skim and low-fat milk represents one small change. (51) Another change is offering baked rather than fried chips at reduced rates in attractive packaging at eye level for children. One more option is having fresh produce that is affordable. In Omaha, Nebraska, a neighborhood food-growing project has resulted in significant food distribution of their own grown produce. Such urban gardening projects bring pride to the local children and affect their food choices.

Children in cities such as Detroit, Michigan, run after food distribution trucks adorned with pictures and playing music similar to local ice cream trucks, clamoring for their favorite homegrown fruits and vegetables. (52) In addition to Cleveland's Department of Public Health neighborhood food growing project, the Cleveland Clinic has its own farmer's market that has changed urban neighbors' buying patterns, promoted by coupons for local produce. The change has been confirmed by simple survey tools measuring the number of fruits and vegetables consumed and the number of family dinners per week.

The Built Environment and Other Necessary Community Components

Safe playgrounds, green spaces, bike paths, and "walking school buses" remain integral contributors to community wellness and constitute the "built" environment. Communities can promote tax incentives for supermarket development in indigent areas, supplementing healthy food availability with urban gardening projects that provide direct benefits to self-esteem.

In New York City, child care laws (NYC Department of Health and Mental Health, Amendment Article 47) have been enacted to prohibit television and video use for all children younger than 2 years, with a 60-minute limit

per day on educational programs for children older than 2 years. (53)(54) New York child care centers are also required to ensure 60 minutes of physical activity for all children, to eliminate sugar-sweetened beverages, and to provide only 1% or skim milk. (53)(54)

Community solutions require an integrated approach, with emphasis on health promotion efforts; opportunities for physical activity through the built environment and mandated in-school activities; use of certified physical education instructors in schools to ensure a lifetime wellness approach with necessary skills-building; provision of appealing and high-quality school meals and a la carte options; stocking of nutrient-dense, low-calorie choices in vending machines and in neighborhood stores; and establishment of nutritional standards for beverages and snacks while removing supersized portions. As articulated succinctly by Sandra Hassink (personal communication, 2010), "Children can't learn well if they are poorly nourished; children can't learn well if they are not active and physically fit; and children can't learn well if they are bullied." Models of care must include models of communication between the school and the patient's medical home, with BMI report cards that are used sensitively as private screening tools to open doors to needed resources.

To view the Reference list for this article, visit http://pedsinreview.aappublications.org and click on the article title.

Summary

Pediatricians can exert a positive influence to combat the widespread epidemic of obesity and associated morbidities through the following actions:

- Promote breastfeeding.
- Plot BMIs and discuss with parents the significance of the BMI with other growth curve measurements during office visits from infancy through childhood and adolescence.
- Schedule frequent visits with children who have elevated BMIs, emphasizing small, manageable changes using motivational interviewing techniques. In growing children, weight maintenance alone may be a good goal.
- Write a prescription for exercise. Encourage lifetime physical activity and serve as a role model for active play in the community. Tips include suggesting family bowling rather than dinner and a movie, family walks with conversation during which parents can learn much from their children (and vice versa), and family tennis.
- Promote the family dinner as many nights a week as possible. Keep mealtimes pleasant, with parents setting out offered foods in healthy portions and the child having some choice in which foods are served and how much is served per meal. In food wars, parents tend to lose; the child who is gaining and growing likely is meeting his or her needs. Every meal does not have to be perfect.
- Help families stop the "weighty talk," that is, calling attention to the need for dieting.
- Encourage parents, schools, and communities to find rewards other than food.
- Help families and schools create "tease-free" environments, especially because weight-related teasing starts in the home and spreads to the community and school, with potentially devastating effects on a child's self-esteem.
- Teach media literacy to decrease the "pester power" of children for high-calorie, low nutrient-dense food choices.
- Join a school health advisory board or other community collaborative network to be an agent of change.
- Link with academic medical centers to help with program design and evaluation that can measure impact and disseminate evidence-based best practices and policies.

PIR Quiz

Quiz also available online at http://www.pedsinreview.aappublications.org.

1. The prevalence of obesity in children and adolescents in the United States:

   A. Has remained stable since 1950.
   B. Is lowest among poor children.
   C. Is indirectly measurable by tracking BMI trends.
   D. Is primarily explained by immigration patterns.
   E. Is unrelated to the prevalence of type 2 diabetes mellitus.

2. Office pediatricians in the United States generally:

   A. Accurately identify overweight patients.
   B. Code correctly for obesity.
   C. Ignore obesity.
   D. Overdiagnose obesity.
   E. Underdiagnose obesity.

3. In general, obese elementary school children:

   A. Are happier than their nonobese schoolmates.
   B. Are more physically fit than their nonobese schoolmates.
   C. Are shorter during childhood than their nonobese schoolmates.
   D. Become normal-weight adults.
   E. Mature earlier than nonobese children.

4. To be most effective at reducing the prevalence of overweight and obesity among their patients, office pediatricians should focus on:

   A. Eating habits of families with young children.
   B. Bariatric surgery.
   C. Penalties for overeating.
   D. Prescription of weight-loss medications.
   E. Rapid weight-loss programs.

5. The *most* promising interventions aimed at reducing the overall prevalence of overweight and obesity:

   A. Are broadly community-based.
   B. Depend on public service announcements.
   C. Focus on altering adolescent eating behaviors.
   D. Rely on the relationship between patients and their personal physicians.
   E. Target patients with obesity-related complications.

Parent Resources from the AAP at HealthyChildren.org

The reader is likely to find material to share with parents that is relevant to this article by visiting this link: http://www.healthychildren.org/english/health-issues/conditions/obesity/pages/default.aspx.