

## In Brief

In the midst of the global obesity epidemic, health care providers face the daunting challenge of prevention. Because of the complex interaction between the environment and genetics, individualized care plans for prevention and treatment of emerging premorbid and comorbid conditions must be formulated by a multidisciplinary team that ideally embraces the entire community in the promotion and maintenance of healthy lifestyles. Special attention must be given to multigenerational medical and psychosocial/spiritual history, coupled with a comprehensive physical and psychological (including family dynamics) assessment. The healing relationship between providers and patients can have a profound effect in encouraging sometimes radical lifestyle modifications, which can only be achieved by motivating and empowering children in the context of the family and community in which they live.

# The Role of Health Care Providers in the Prevention of Overweight and Type 2 Diabetes in Children and Adolescents

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The overweight/obese child is metaphorically a “canary in the coal mine” of an increasingly toxic environment. Health care providers face the daunting task of preventing childhood obesity, a “pandemic of the new millennium.”<sup>1</sup> Although some people are genetically predisposed to obesity and its comorbid cardiovascular and metabolic diseases, the causes of obesity are both social and biological. Preventing obesity requires an understanding of the ways in which two and a half million years of genetic evolution have made people vulnerable to rapid social and environmental changes of the past 50 years.<sup>2</sup>

Cardiovascular disease (CVD) is the number one cause of death for adults. For adolescents, moving vehicular accidents are the most common cause of death, followed by homicide and suicide. However, we are now seeing young people die more and more often from causes previously believed to be “adult,”<sup>3</sup> such as myocardial infarction and stroke, resulting from CVD, which is accelerated by obesity and more aggressive in the younger population. Atherosclerotic plaques have been observed in children as young as 3 years of age.<sup>4</sup> The increase in the prevalence of obesity in children is directly proportional to increases in insulin resistance and type 2 diabetes, as well as in cardiovascular risk factors.<sup>5</sup>

The fetal origins hypothesis<sup>6</sup> focuses on the importance of weight of both mother and infant and its subsequent impact on the development of obesity and CVD. Insulin resistance is proposed as a survival mechanism for small-for-gestational-age newborns. Mothers’ prepregnancy weight and the presence or absence of gestational diabetes mellitus (GDM) also affect children’s later adiposity.

Obesity and CVD are diseases that originate in utero and take hold during infancy or in early childhood. Therefore, prevention efforts must continue across the lifespan, with particular attention directed to three critical periods of development:<sup>7</sup> prenatally, the age of adiposity rebound (usually between the ages of 4 and 7 years, when BMI reaches its nadir and then begins to increase), and during puberty (when insulin resistance increases).

Euphemistic size labeling of clothes has contributed to complacency about large size, and certain ethnic groups equate being overweight with good health.<sup>8,9</sup> One study by Averett and Korenman<sup>8</sup> found that 44% of African-American women weigh > 120% of their recommended body weight, and yet African-American women are less likely than whites to perceive themselves as overweight. Although one interesting study exploring quality of life in overweight children discovered that these chil-

dren's life experience was comparable to that of children on chemotherapy for cancer,<sup>10</sup> a subsequent and more alarming review revealed overweight adolescents to be complacent about their condition.<sup>11</sup> This complacency, coupled with the high incidence of depression, apathy, and bullying by and of overweight children,<sup>12</sup> can affect these children's motivation and readiness to change their destructive lifestyles of excess consumption of foods of low nutritional value and reluctance or inability to exercise.<sup>13</sup>

Using the chronic disease model, obesity can be viewed as resulting from complex interactions between environment and genetics. Similar to our approach to diabetes, its prevention and treatment hinge on three basic aspects of management: diet, exercise, and medications. Each of these three areas is affected by psychosocial/environmental issues (Figure 1).<sup>14</sup> Ideally, obesity prevention and treatment plans for pediatric patients should incorporate the entire family and should include assessment of family dynamics. The guidelines presented below describe a workable approach.

#### Obtain genetic information and medical history

Because certain ethnic groups (Native Americans, African Americans, Hispanics, Pacific Islanders)<sup>5</sup> have a tendency to utilize foods more efficiently (the thrifty gene hypothesis), these populations would benefit from early counseling and anticipatory guidance regarding childrearing.

The thrifty gene hypothesis provides an explanation for obesity within ethnic groups that were able to survive during times when the land on which they lived did not produce enough food. The bodies of those who survived stored more fat, and the genes responsible for this were passed on through the generations. However, once diets shifted from low sugar and low fat to modern Western fare and lifestyles became more sedentary (changes of the past 50 years), people in these groups rapidly became obese. Genetic changes that require hundreds to thousands of years are not able to meet the challenge of a dramatic 50-year environmental shift. Through serious obesity-related disease, these thrifty-gene populations are now dying sooner. Also, their fertility is decreased through poly-

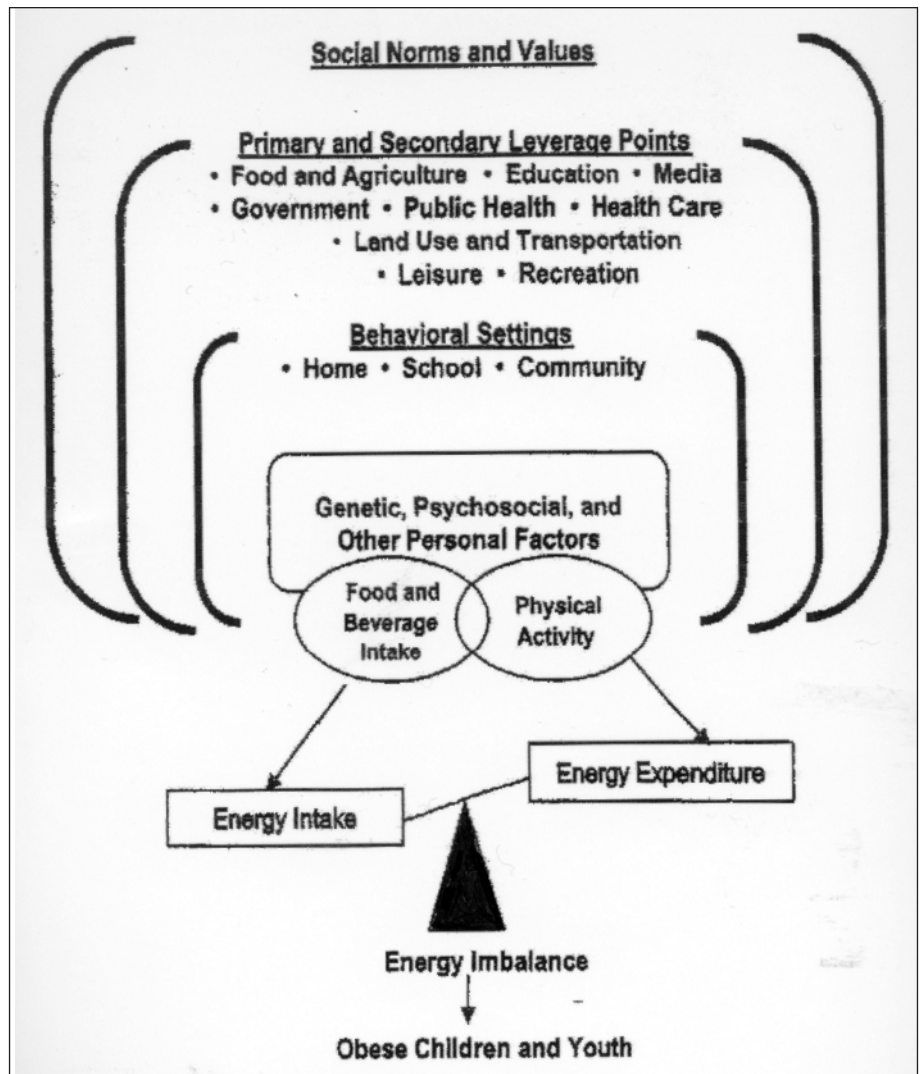


Figure 1. Framework for understanding obesity in children and youth. Energy intake is excessive when compared to energy expenditure, leading to an energy imbalance resulting in obesity. Reprinted with permission from Preventing Childhood Obesity: Health in the Balance, by the National Academy of Sciences, 2005, courtesy of the National Academies Press, Washington, D.C.

cystic ovarian syndrome, illustrating how a once-protective gene is now destructive.

When treating obese children, clinicians should obtain a thorough family history in order to identify the presence of any of these high-risk ethnicities. It is also helpful to have a history of any genetic and endocrine disorders that may be present, such as Prader-Willi syndrome, Down's syndrome, Cushing's disease, pseudohypoparathyroidism, or hypothyroidism. A strong positive family history for diabetes is cause for concern that an obese child may progress more rapidly to development of diabetes. It may also alert clinicians to the possibility of impending diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic syndrome, once a child's hyperinsulinism is unable to compen-

sate for high insulin resistance. Central nervous system (hypothalamic) disorders, though rare, should also be considered in the differential diagnosis of these underlying medical causes of obesity.

The family history should include psychiatric as well as medical issues, because there is an increased incidence of depression in the obese, and this condition may either precede or follow the development of obesity.<sup>15</sup> Certain medicines, including psychotropics (e.g., resperidol and other second-generation antipsychotic medications), contraceptives (e.g., medroxyprogesterone acetate), antiepileptics (e.g., valproic acid or gabapentin), and anti-inflammatory agents (e.g., prednisone), can predispose individuals to increased weight gain. A careful review of all prescribed medicines and

their potential side effects is always indicated. Over-the-counter medicines and herbal products should be included in this comprehensive history.

### Counsel about comorbid conditions

Though scare tactics are not a wise strategy for patient care, it is important to educate parents and older pediatric patients about comorbid and premorbid conditions associated with abnormal weight gain. In a recent provocative editorial,<sup>16</sup> Joffe resurrected the 40-year-old Health Belief Model illustrating the importance of patients' perceived beliefs of their susceptibility to disease, severity of disease, and benefits of and barriers to specific courses of preventive action. He cited studies showing that adolescents who perceive risk (e.g., related to drug use or sex) decrease their high-risk behaviors.

In presenting the list of comorbid conditions to pediatric patients and their families, clinicians should explain that their goal is not to frighten them, but rather to inform them that obesity is a serious disease and that it is associated with other very serious diseases.<sup>16,17</sup> The daunting list of these conditions, shown in Table 1, includes conditions of high morbidity and mortality and can serve as strong motivation for families and clinicians alike to address pediatric obesity.

Families of obese children must also be educated that having overweight parents predisposes children to being overweight. The intrauterine environment presented by a mother who is overweight is also significant. Overweight pregnant women may develop GDM, which can affect their fetus, which may be either small for gestational age (and likely insulin resistant) or large for gestational age (with an increased number of fat cells and an overworked pancreas). The combination of low birth weight and subsequent high adult BMI is correlated with higher CVD risk.<sup>6</sup> There is also a direct correlation of high birth weight with high adult BMI and an association between rapid infant weight gain and subsequent childhood obesity.

### Monitor BMI regularly

The definition of obesity is based on the simple calculation of BMI (weight in kilograms divided by height in meters squared). In the pediatric population, absolute BMI is not as useful as BMI percentile. A

**Table 1. Comorbid Conditions Associated With Obesity**

<p><b>Metabolic</b></p> <ul style="list-style-type: none"> <li>• Type 2 diabetes</li> <li>• Early puberty</li> <li>• Accelerated bone age</li> <li>• Premature adrenarche</li> <li>• Polycystic ovarian syndrome (hyperandrogenism)</li> </ul> <p><b>Cardiovascular</b></p> <ul style="list-style-type: none"> <li>• Poor cardiovascular fitness</li> <li>• Hypertension</li> <li>• Hypertrophic cardiomyopathy</li> <li>• Heart failure</li> <li>• Stroke</li> <li>• Dyslipidemia</li> <li>• Hyperfibrinogenemia</li> <li>• Elevated C-reactive protein</li> <li>• Venous thrombosis</li> </ul> <p><b>Pulmonary</b></p> <ul style="list-style-type: none"> <li>• Obstructive sleep apnea, excessive daytime sleepiness</li> <li>• Hypoventilation</li> <li>• Asthma</li> </ul> <p><b>Gastrointestinal</b></p> <ul style="list-style-type: none"> <li>• Nonalcoholic steatohepatitis</li> </ul> <p><b>Cancers, including</b></p> <ul style="list-style-type: none"> <li>• Breast</li> <li>• Prostate</li> <li>• Colon</li> </ul> <p><b>Dermatological</b></p> <ul style="list-style-type: none"> <li>• Acanthosis nigricans</li> <li>• Candida</li> </ul>	<ul style="list-style-type: none"> <li>• Necrobiosis lipoidica diabetorum</li> <li>• Striae</li> <li>• Intertrigo</li> <li>• Perleche</li> <li>• Skin tags</li> </ul> <p><b>Infectious</b></p> <ul style="list-style-type: none"> <li>• Candidiasis</li> <li>• Lymphadenitis</li> <li>• Poor wound healing</li> </ul> <p><b>Orthopedic</b></p> <ul style="list-style-type: none"> <li>• Pes planus</li> <li>• Blount's disease</li> <li>• Slipped capital femoral epiphysis</li> <li>• Osteoarthritis</li> </ul> <p><b>Neuropsychiatric</b></p> <ul style="list-style-type: none"> <li>• Pseudotumor cerebri</li> <li>• Learning disabilities</li> <li>• Depression</li> <li>• Anxiety</li> <li>• Social isolation/marginalization</li> <li>• Bullying</li> <li>• Eating disorders/body image angst</li> <li>• Adolescent adjustment disorders, exacerbated by:               <ul style="list-style-type: none"> <li>▶ Anger/rage</li> <li>▶ Early puberty</li> <li>▶ Pseudoacromegaly</li> <li>▶ Concealed penis</li> <li>▶ Gynecomastia</li> </ul> </li> </ul>
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BMI  $\geq$  the 85th percentile but  $<$  the 95th percentile is considered overweight, whereas a BMI  $\geq$  the 95th percentile is considered obese. These are standardized for age and sex by Centers for Disease Control and Prevention growth curves. BMI must be considered in relation to the growth chart because the significance of absolute numbers changes relative to age (e.g., a BMI of 17 kg/m<sup>2</sup> in a 4-year-old is at the 85th percentile, whereas the same BMI in an 18-year-old would be below the 5th percentile). BMI should be considered a significant vital sign to be checked at each physician visit to discern trends or shifting trajectories.

In a study by Beeman et al.,<sup>19</sup> neither parents, nurses, resident physicians in training, nor attending physicians could accurately assess whether a child was overweight by appearance alone. This underscores the need for regularly measuring and

tracking BMI.<sup>20</sup> When gradual increases are noted, clinicians can provide important counsel before a child reaches the overwhelming and inert state of obesity.

### Address diet and exercise issues throughout childhood

Issues of nutrition and physical activity must be raised throughout childhood. Following are some of the key considerations.

**Breastfeeding.** Clinicians should encourage breastfeeding of infants because it helps prevent obesity in infancy and offers a protective factor against obesity (and possibly cardiovascular disease) in later childhood.<sup>21,22</sup> A 60% increase in obesity has been observed in children who are not breastfed.

**Sweets in infancy.** Infants are being given too many sweets in the form of daily desserts and candy. A 2002 Gerber Products research study,<sup>23</sup>

which involved 3,000 infants and toddlers, showed that 40% had received sweets daily by the age of 7–8 months and 70% had received them by the age of 15–18 months.<sup>23</sup> By the age of 2 years, 43% of infants are given soft drinks daily.<sup>23</sup> An article in the June 2000 issue of *Children's Business* noted that brand loyalty can be gained by the age of 2 years.<sup>24</sup> One can of nondiet soft drink contains ~ 150 calories, the equivalent to 10 teaspoons of sugar. Soft drinks also displace nutrient-rich milk in the diets of children who drink them.

**Vending machines in schools.** Available to students in some schools as early as pre-kindergarten, vending machines can interfere with good nutrition by making foods of minimal nutritional value readily available. Although the size of these packaged “treats” may be double or triple that of a single serving, most people will eat an entire package at once.

One of the most detrimental and ubiquitous additives found in snack foods is the sweetener high fructose corn syrup, which is used in place of or in addition to sucrose. Although it is classified as a carbohydrate, high fructose corn syrup is metabolized as a fat. Fructose enters the liver cell abruptly (in contrast to glucose, which stimulates insulin release and subsequent orderly uptake by the liver), where it disrupts glucose metabolism. The result is hypertriglyceridemia postprandially, a time when such fats do the most damage to artery walls, also increasing insulin resistance.<sup>25</sup> High fructose corn syrup also causes carbohydrate craving, which can compound the problem of overeating. (This occurs through the mechanism of increased insulin resistance, resulting in hyperinsulinism.)<sup>26</sup> It is estimated that fructose consumption constitutes about 20% of the average child's diet.<sup>26</sup>

To address this concern, many communities across the nation are passing legislation to curb the sale of foods of minimal nutritional value in vending machines at schools, and adult guidance is suggested in helping the child purchase appropriate vended items. These efforts are focusing especially on soft drinks and foods containing high fructose corn syrup, which the American Academy of Pediatrics' Committee on Nutrition have deemed to be major culprits in the obesity pandemic.<sup>27–29</sup>

**Family meals and family activity.** The importance of shared family meals has been objectively studied and found to be an important preventive factor for the entire spectrum of eating disorders from obesity to anorexia nervosa.<sup>30,31</sup> This relates not only to the nutritional content of foods eaten, but also to the emotional issues surrounding food.

Family meals have been shown to reduce unhealthy eating patterns, including binge eating disorder, which is seen in a high percentage of overweight people, because emotional needs for nurturing are met through meaningful family interaction in a pleasant and relaxed setting.<sup>30,31</sup> Many family therapists have investigated the strong positive relationship between dysfunctional families and eating disorders.<sup>32</sup> The content of family conversation has also been studied, revealing that times of emotional conflict negatively affect intake, resulting in “emotional eating.” Having scheduled meals in a nonchaotic environment also helps children learn to anticipate meals and to self-regulate snacking more sensibly.

Families should also be encouraged to be physically active together. Television, with its numerous unhealthy food messages, computer and video games, and Internet use all increase emotional isolation and encourage a sedentary lifestyle. Families do not play physically together as often as in the past.

**Individualized nutrition and exercise plans.** A recent report of the Dietary Intervention Study in Children<sup>33</sup> noted that fruit and vegetable intake remains low, and snacks, desserts, and pizza continue to predominate children's diets. The authors called for more aggressive, innovative, and realistic approaches for additional dietary counseling, and they even suggested that children be given greater access to whole-grain and vegetarian pizza and fruit desserts. Simple diet sheets with calorie counts are not recommended for obese pediatric patients. Instead, nutrition education must be individualized and focused on the entire family.

Physical activity is a vital component of obesity prevention. But when it comes to exercise, one size does not fit all. Energy expenditure, including the possibly deconditioned state of people unaccustomed to exercise, must be assessed with regard to each person's dietary intake, and the exer-

cise prescription should be maintained below lactate threshold (muscle pain) so that the exercise can be sustained. For children, special consideration must be given to the fact that they are growing and have different needs from adults who have achieved their full stature and physical maturation. Exercise is useful in addressing the increased insulin resistance associated with puberty and adolescence.

### Address the psychological aspects of obesity

The psychological milieu<sup>34–36</sup> of this pandemic is perplexing and underlies each aspect of treatment and prevention. Following are some of the key psychological considerations in obesity prevention and treatment.

**Motivation.** Motivation to change is key to any lifestyle intervention because when patients lack the desire to effect what often can be radical lifestyle changes, nothing can be accomplished. Often, changes occur in the short term but are not sustained over time, and long-term maintenance of weight loss is not achieved.

One psychological counseling technique that is short term in nature and has relatively low rates of recidivism is motivational interviewing, a patient-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence.<sup>37</sup> This method may be useful even in very unmotivated patients. Although initially time consuming, it may prove over the long term to be cost-effective in addressing the complex motivational issues of obesity.

**Depression.** Depression, which can be challenging to diagnose in the pediatric population, is often an important component of obesity prevention and treatment.<sup>36</sup> The authors have identified a condition they call Paliacchi syndrome, or smiling depression, seen predominantly in overweight individuals who act as “class clowns” but inside are experiencing intense emotional pain. Depression also can lead to overeating, both for biological reasons (i.e., efforts to increase serotonin levels) and to provide emotional comfort.

**Eating disorders.** The incidence of binge eating, including binge eating disorder, is increased among the overweight and obese.<sup>38</sup> Also, many binge eaters may be purging (with emetics, laxatives, or cathartics) to maintain a normal weight and BMI. Other types

of disordered eating associated with being overweight include grazing, night eating, overeating at meals, and nonperceived overeating.<sup>38</sup> It is not known whether obesity precedes eating disorders or vice versa.

The use of validated tools for assessing these problems, such as the EAT-26 (an eating disorder screening tool),<sup>39</sup> along with an age-appropriate Beck Depression Inventory, might be beneficial in the primary care context. Emotional eating, including binge eating, has been correlated with depression. According to Eaton et al.,<sup>40</sup> "numerous studies have found that adolescents with unhealthy weight control practices are at increased risk for suicidal ideation, suicide attempts, and death by suicide." A recent study of U.S. high school students with perceived high BMI showed increased suicidal ideation and attempts.<sup>40</sup>

The importance of a relationship of trust between health care providers and patients cannot be overemphasized with regard to obtaining accurate psychosocial and medical histories to help patients with high-risk hidden behaviors.

**Media counseling.** Educating and counseling families of obese children about their media use is vital.<sup>41</sup> Excessive use of the Internet, television, and electronic games contributes to a sedentary lifestyle and can have negative psychological effects on children.

Rich<sup>42</sup> has studied functional magnetic resonance imaging scans of children while viewing various types of media violence. Primitive neuronal survival pathways (the amygdala and hippocampus) light up, and these paths are permanently imprinted and stored in long-term memory for potential later activation into violent behavior. Rich observes that the association between media violence and childhood violence is stronger than that between passive cigarette smoke and lung cancer and stronger than that between calcium consumption and bone density.

Additionally, the media further isolate children who already may be suffering from other social stigmas. This social isolation, coupled with obesity-related stigmatization, tends to engender further antisocial behavior.<sup>43</sup> Children become desensitized to violence against others.

Rich also reported that 8- to 18-year-olds spend an average of 6 hours

and 43 minutes per day using media—more time than they spend in school or with parents. Juxtaposed with the observation of the Higher Education Research Institute at the University of California at Los Angeles<sup>44</sup> that of 400,000 college freshman in 2004, only 34% studied > 6 hours/week in high school, this illustrates the enormity of the challenge of improving health literacy and decreasing social risk factors.

**Puberty and sexuality.** The age of puberty is decreasing. In some cases, this is related to obesity in that increased levels of luteinizing hormone are associated with hyperinsulinism, and fat cells produce estrogen. Therefore, teaching about menses and sexuality needs to be done at younger ages. Even girls who are of normal weight will probably have classmates who are not and who are therefore at risk for early menarche. For obese boys, increased estrogen levels can result in significant gynecomastia. This, coupled with concealed penis secondary to an increased suprapubic fat pad, can contribute to significant teasing and psychological harm. The pseudoacromegaly associated with obesity can further contribute to obese children feeling out of step with their peers.

**Teasing.** A 2003 study by Eisenberg et al.<sup>45</sup> showed that adolescents who are teased by peers and family members have a higher prevalence of emotional health problems. Those with low self-esteem<sup>36</sup> are also more likely to engage in risky behaviors involving substances (tobacco and alcohol as gateway drugs). Teasing also increases anxiety and depression. Wise counsel for all children, overweight or not, should be given regarding teasing, which is a form of bullying.<sup>46</sup>

**Values, goals, and spirituality.** In their book *Rescuing the Lives of Overweight Children*,<sup>47</sup> Rimm and Rimm present a careful and systematic comparison of the characteristics of obese children to those of nonobese children. Their surveys examined the core values and life goals of children from rural and urban areas, from public, private, and parochial schools. They found that overweight children were more likely to want to be rich and famous, whereas normal-weight children were more concerned with having a happy home life and a satisfying job and making a contribution to the world.

However, neither group had a remarkably high interest in the latter. This once again underscores the need to improve the spiritual environment of all children and to address the problems of growing up in an age of immediate gratification.

#### **Work within the community.**

The need for a multidisciplinary team approach in preventing childhood obesity cannot be stressed enough.<sup>48,49</sup> Within the health care community, the multidisciplinary team might include a primary physician, an obesity specialist, a diabetes educator, a nurse, a dietitian, a fitness counselor, and a social worker, as well as the patient and family. But for such a complex societal issue, the effort must also extend to schools and to the community at large. The fight against obesity must involve people from all walks of life, settings, and disciplines joining together in creative ways. Following are some community-based considerations in the fight against obesity.

**Homes, grocery stores and restaurants.** Visiting the households and grocery stores of patients' families can be a productive endeavor for teaching better nutrition practices. Educating the family about finding the information they need on food labels is essential. Products labeled "no fat" may well be high in calories or contain high fructose corn syrup. Those labeled "low calorie," may be high in harmful fats. Many food companies are hurrying to comply with the requirement that trans fats must be listed separately on food labels starting in early 2006. Some, thankfully, are beginning to adjust their content to be more marketable to better-informed consumers.

A home and grocery store outing also provides a chance to teach about portion sizes and calorie counts relative to these and to offer tips for stocking the home pantry in more healthful ways. Particularly with younger children, knowledgeable parents can be advised to refrain from buying or keeping on hand those items which would be most likely to contribute to unhealthy weight gain.

Many fast-food restaurants have available upon request the nutritional breakdown and calorie counts of all the foods they sell. Books and pamphlets containing this information are also available. Although the greater goal of family mealtimes around a

common table may not be met through fast-food lines, families should at least be advised to look for the fruits, vegetables, and other healthier selections some fast-food restaurants are now offering in response to the societal problem of obesity.

**Community resources and initiatives.** Clinicians may find it helpful to compile and disseminate a list of community resources for the families of obese children.

Health care professionals should also become involved in setting up new community programs to promote healthier lifestyles and in efforts to make neighborhoods safe places in which to exercise.

It is helpful to encourage schools, religious institutions, shopping malls, and other community meeting places to become involved, as well. These locations could serve as safe locations for evening physical activity programs, for example. Community workplaces might be approached about hosting health fairs and promoting healthy lifestyles in the workplace. Health professionals might offer public lectures on obesity prevention and related topics.

Within local schools, a responsible person might be identified to coordinate a healthy lifestyle campaign including health education, physical activity, and healthful food choices. The school is the workplace of the child, as well as a crucial meeting place for families and the larger community. And children can carry their wellness education back to their families.

Involving as many sectors of the community and as many parents as possible is key to obesity prevention at the community level.

### Provide parents with simple recommendations and advice

Through a collaborative effort between the University of Tennessee at Memphis (UT Memphis) divisions of pediatric endocrinology and general pediatrics, we have developed a set of basic guidelines for rearing healthy children as a way to prevent families from experiencing both weight and psychosocial problems. A slightly modified version is also used for the parents of children who are already overweight.

These guidelines are based on our own clinical experience and not formal research. However, before imple-

menting them, we sought the scrutiny of professionals experienced in the broad spectrum of eating disorders to safeguard against precipitating anorexia nervosa or other patterns of disordered eating. We have received no indication that any of these recommendations might be harmful.

Although many of these guidelines may have been taken for granted by previous generations, our goal in setting them out is to establish order amid the chaos of our patients' hectic modern lifestyles. Following are some of our most common recommendations.

- Create a daily schedule with regard to eating, physical activity, homework, and bedtime. Decreased sleep leads to insulin resistance and decreased serotonin levels, which in turn cause carbohydrate craving and exacerbate depression.<sup>50</sup> Lack of sleep also increases ghrelin and decreases leptin, thus stimulating the appetite and decreasing satiety.
- Eat three meals and one to two snacks each day, finishing each meal in 30–45 minutes and never eating in front of the television or computer.
- Eat as many meals as possible together as a family, with wholesome food choices and positive family interactions.
- Portion sizes are critical and should be monitored carefully. For overweight children, a food and exercise log is recommended.
- Read food labels carefully with regard to both portion size<sup>51</sup> and content. Avoid high fructose corn syrup. Decrease portion sizes of starchy foods, such as rice, potatoes, bread, and pasta. Include more colorful vegetables.
- Choose whole-wheat or other whole-grain breads.
- When children want “seconds,” have them choose only one item (not one serving of each item) from the meal before adding any additional food. Perhaps that one extra food might be a glass of skim milk, fruit, or a vegetable. These are also ideal bedtime snacks if the child is hungry before sleeping.
- Children 1–2 years of age should be given whole or 2% milk to aid in myelination of the nervous system. Older children should drink nonfat milk. Younger children require 2 cups of milk per day, and adolescents need 3 cups per day to meet their daily recommended calcium

requirements. Lactose-free milk is an option for milk-intolerant children, and yogurt and cheese might also be substituted.

- It is now being recognized that the daily recommended amount of vitamin D may not be adequate. As a safeguard, children should have daily careful exposure to sunlight as well as foods fortified with vitamin D.
- Limit saturated fats, such as butter, margarine, chicken skin, bacon, and sausage. Oils such as olive, canola, and peanut are to be used in moderation, and lean meats are preferred over fatty ones. These should be steamed, broiled, baked, or grilled, but not fried. In order to increase cardio-protective omega-3 fatty acids, certain nuts (almonds and walnuts, preferably unsalted) and fish (salmon, light tuna, catfish, or shrimp) should be included.
- Avoid eating fish from the same body of water more than once a month to avoid possible toxins, such as mercury. This is especially pertinent for pregnant women and young children.
- Season foods with herbs and spices rather than sugar, salt, and fat. Salt is an acquired taste. Do not add salt to any foods offered to infants.
- Because thirst and fatigue can be mistaken for hunger, offer children water or fat free milk if they complain of hunger between meals.
- Strictly limit or reserve for special occasions foods of low nutritional value, including cakes, cookies, candies, chips, French fries, and sugared beverages.
- Limit fast food and processed or prepared food such as TV dinners to no more than once a week. Also, prepare school lunches at home, including only unprocessed foods such as apples, carrots, and skim milk and avoiding excessive saturated fat and carbohydrates. Good desserts might include fruit, sugar-free jello or pudding, and canned fruits drained of any syrup.
- Ration sugary, fatty treats at holidays and discard leftovers, including candies with a long shelf life, after 3–5 days.
- Discourage eating in the car, giving only water to drink while in transit.
- Avoid using food as a reward.
- Get daily physical activity. Younger children should walk or play outside for at least 30 minutes a day,

and older children need at least an hour of physical activity, perhaps including indoor activities such as video games featuring dancing or exercising.<sup>52</sup>

- Limit media use to < 1 hour/day. This includes watching television, talking on the phone, playing sedentary video games, and using the computer other than for homework assignments. These media should not be available in children's bedrooms.

None of these recommendations can be accomplished without the help and support of children's family and community. Family, friends, teachers, babysitters, and others who have frequent contact need to be told about planned lifestyle changes and enlisted to help.

If plans for making lifestyle changes become derailed, helping families realize that no one is perfect can minimize discouragement and get them back on track as quickly as possible.

### Encourage active parenting

Health care providers should discuss with families the emotional development of children and ask parents to initiate discussions with their children about such topics as feelings and friends and, later on, about sex, drug use, and other high-risk behaviors. This encourages both the physical and emotional availability of the parents. Call attention to issues such as bullying in schools and the anger prevalent in today's society. Address self-esteem, and encourage parents to teach good manners and respectful behavior.

Children need parents, not buddies.<sup>37,53</sup> Health care providers should call on parents to reclaim their roles as those in charge of and responsible for their children. Children mirror the behaviors of their parents.

Families of low socioeconomic status and those with two parents working outside the home face extra challenges in providing adequate supervision for children.<sup>54</sup> In addition, exercise opportunities may be less available to them and nutritious fruits and vegetables perhaps less affordable.

Children of affluent families can face equally challenging problems, however. Despite abundant material resources, they may not have proper parenting with regard to nutrition, exercise, and high-risk behaviors or may suffer from "affluenza,"<sup>55</sup> or

overindulgence resulting in insatiability. Often, these children become detached from self-absorbed parents who have not properly focused on their children's emotional and spiritual needs. Personal responsibility is not fostered in a materialistic environment of immediate gratification. This results in families' desires for a magic cure or easy prevention strategy and lack of willingness to focus on a disciplined and balanced lifestyle plan.

### Summary and Conclusions

Extreme measures, such as ketogenic diets and surgery,<sup>56</sup> have been tried to deal quickly with obesity, but recidivism is high. There are no quick preventions or cures. The answer—permanent behavior change—is amazingly simple in description but formidable in implementation. Obesity prevention will require radical lifestyle change across the lifespan. Such change takes time, discipline, perseverance, and daily effort. And if it is not viewed as permanent, the efforts will be in vain.

So what do we know, and what can we do?

We know that overweight adolescents are at high risk of becoming obese adults. We know that this is a problem that may begin in utero, and insulin resistance and oxidative endothelial cell damage are basic to the disease. We know that obesity is a disease of all ages and all nationalities, not just those with thrifty genes.

The morbidity and mortality associated with this pandemic and their concomitant costs are monumental, with the potential of bankrupting the health care delivery and Social Security disability systems if the situation is not curbed. Human suffering associated with obesity further feeds the epidemic through depression, resulting lack of motivation to change, increased emotional eating and social isolation, and decreased physical activity.<sup>35</sup>

Hopelessness prevails among health care professionals trying to care for these patients.<sup>57</sup> Their lament: "Nothing works."<sup>58</sup> And indeed, there is little evidence thus far for success, at least not in the long term. There is an extreme paucity of evidence-based study, but the few trials reporting success, albeit short term, are multidisciplinary, involving psychological, dietary, and exercise components.

We at the University of Tennessee

Health Science Center are encouraged by our experience to date using our "Guidelines for Rearing Healthy Children," and we are now collecting data as to its effectiveness, both short term and with the intention of longitudinal follow-up.

The American Academy of Pediatric policy statement on prevention of childhood overweight and obesity<sup>59</sup> focuses on health supervision and advocacy in bringing about desperately needed societal changes. This statement calls for individualization of the plan for each child within the broader context of societal reforms related to issues ranging from vending machines to safe playgrounds to sound public health policies. Also suggested are advocacy efforts to obtain reimbursement for delivery of preventive medical care and education and funding for further research.

The power of health care professionals to impact the lives of their patients cannot be overstated. When careful compassionate words create an informed, positive environment, this voice is heard above the media din, and the self-fulfilling prophecy of hope<sup>37</sup> can begin its mission. We must be optimistic enough to believe in the ability of people to change and heal. Despite occasional steps backward, meaningful and permanent lifestyle changes can be effected. If we do not believe this to be so, neither will our patients.

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