

Dealing with the childhood obesity epidemic: a public health approach

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Abstract

Childhood obesity is one of the most pressing public health and medical problems in the United States. In the US, prevalence rates of childhood overweight and obesity have tripled in the past 30 years and the health implications and related medical costs of the disease are already evident. For the first time ever, weight-related Type 2 diabetes is being diagnosed in youth. Experts suggest that even if obesity prevalence remains static in the US, the lifetime risk of Type 2 diabetes for children born in 2000 is estimated at 30% for boys and 40% for girls (Narayan et al. *J Am Med Assoc* 290(14): 1884–1890, 2003). Annual hospital-related costs associated with treating obese children increased from 35 million dollars in 1979 to more than 127 million dollars in 1997–1999, based on 2001 dollars (Wang and Dietz *Pediatrics* 109(5): E81–E86, 2002). In addition to financial costs related to treating obesity, there are myriad social and personal costs of being an obese child and adult. This alarming rise in obesity rates among youth has been followed by initiatives by both the medical and public health communities to find appropriate and effective treatments as well as ways to prevent obesity. The following offers an overview of current trends and initiatives from both sectors and concludes with some thoughts on what the future may hold.

Key words: Childhood obesity—Bariatric surgery

Background

Childhood obesity is one of the most pressing public health and medical problems in the United States. In the US, prevalence rates of childhood overweight and obesity have tripled in the past 30 years and the health implications and related medical costs of the disease are

already evident. For the first time ever, weight-related Type 2 diabetes is being diagnosed in youth. Experts suggest that even if obesity prevalence remains static in the US, the lifetime risk of Type 2 diabetes for children born in 2000 is estimated at 30% for boys and 40% for girls [1]. Annual hospital-related costs associated with treating obese children increased from 35 million dollars in 1979 to more than 127 million dollars in 1997–1999, based on 2001 dollars [2]. In addition to financial costs related to treating obesity, there are myriad social and personal costs of being an obese child and adult.

Since youth are still gaining stature, obesity risk for youth and children is based on body mass index (BMI) percentiles using national height and weight data from the 1970s and adjusting for gender and age [3]. For youth, a BMI between the 15th and 85th percentile classifies a youth as having a healthy weight; a BMI percentile at or above the 85th percentile classifies a youth as overweight; at or above the 95th percentile classifies as youth as obese. Additional criteria and terminology are being developed to describe the very obese and currently, there is not a single criterion standard to represent severe obesity in youth. National surveillance data report on prevalence rates of youth above the 97th percentile (termed “high BMI”) [4] while other criteria have been used to describe extreme obesity including a BMI-for-age that is >1.2 times the 95th percentile [5], a BMI \geq the 99th percentile for BMI [6], and a BMI that is ≥ 35 kg/m² [7], or ≥ 40 kg/m² [6].

The most recent national data on the prevalence of childhood obesity are from the National Health and Examination Survey (NHANES) 2007–2008 [4]. NHANES collects health data, including measured height and weight, from a nationally representative sample of adults and youth using a multistage probability sample of the US civilian, non-institutionalized population. According to the 2007–2008 NHANES data, 9.5% of infants and toddlers and 16.9% of boys and girls ages 2–19 were at or above the 95th percentile for BMI indicating that they are

obese. Nearly one-third (31.7%) of boys and girls were at or above the 85th percentile indicating that they are overweight. Obesity risk tracks strongly into adulthood if a youth is obese during adolescence; 18% of youth ages 12–19 are at the 95th percentile. According to NHANES 2007–2008 data, 11.9% of all youth (13% of boys and 10.6% of girls) are at or above the 97th percentile for weight [4].

Obesity risk differs by race and ethnicity. Obesity prevalence rates for all youth ages 2–19 for non-Hispanic white, Hispanic, Mexican–American, and non-Hispanic blacks are 15.3, 23.2, 23.4, and 20.0, respectively. The highest rates of youth in the “high BMI” category (BMI percentile >97) based on the NHANES 2007–2008 data are experienced by Mexican–American youth ages 6–11 where 19.6% are at the 97th percentile or higher. Hispanic youth ages 6–11 are close behind with 19.3% in the >97th percentile for BMI [4].

Skelton et al. [6] examined the incidence and prevalence of severe obesity using NHANES data from 1976 to 2004. They used a BMI ≥ 99 th percentile and an absolute BMI value that is $\geq 40 \text{ kg/m}^2$ as criteria for “severe obesity”. As of 2004, 4% or 2.7 million children in the US had a BMI \geq the 99th percentile. In addition, 1.3% or 418,000 youth had an absolute BMI that was $\geq 40 \text{ kg/m}^2$. Skelton et al. [6] also found that the risk for severe obesity differed by race, ethnicity, and poverty.

This alarming rise in obesity rates among youth has been followed by initiatives by both the medical and public health communities to find appropriate and effective treatments as well as ways to prevent obesity. The following offers an overview of current trends and initiatives from both sectors and concludes with some thoughts on what the future may hold.

Current trends in treating obese youth

A recent Cochrane review on treating obesity in children examined the efficacy of community, school, and clinic-based treatment programs (including lifestyle, drug, and surgical treatment) [8]. Studies included were limited to randomized control trials (RCT) published between 1985 and 2008. Sixty-four papers were included in the review; 54 papers reported on lifestyle interventions and 10 reported on RCT using drug interventions. There were no RCTs of surgical trials in the published literature.

The majority (36/54) of the lifestyle interventions focused on behaviorally oriented treatment programs while other lifestyle approaches focused on activity, reduction of sedentary behavior or on dietary changes. Behavioral treatment programs were defined as, “...therapy aimed at changing thinking patterns and actions, especially in relation to dietary intake and eating, physical activity and sedentary behaviors, and the family’s food and physical environments.” (page 11). These behavioral programs most typically target eating

and activity change in the obese child by working with parents to restructure the foods available in the home, positively impact how families cue and reinforce eating and activity behaviors, and providing counseling to both parents and the obese youth. The majority of interventions was clinic-based and is led by highly trained clinical and behavioral psychologists.

The pharmacological trials included in this review were conducted exclusively in adolescents. Three types of medication were evaluated for their effectiveness in reducing BMI and adiposity: metformin (a hypoglycemic agent), orlistat (a lipase inhibitor), and sibutramine (a serotonin and noradrenalin reuptake inhibitor). Some of the pharmacological trials also included a lifestyle intervention.

The review found that most studies reported a beneficial effect of the intervention as assessed from adiposity from baseline to end of the program or the follow-up. For youth under the age of 12, the family-targeted programs decreased BMI more than standard care at 6-month follow-up but treatment differences were not evident at a 12-month follow-up. For adolescents, the family targeted programs were found to be more effective than standard care at both 6- and 12-month follow-up. While the drug trials using orlistat and sibutramine in combination with a lifestyle intervention showed significant weight loss in adolescents, a range of adverse outcomes including those related to the gastrointestinal tract (i.e., fatty liver, cramps, and abdominal pain), gallstones, high blood pressure, and tachycardia were reported in a majority of the studies.

While there is good evidence that the most effective childhood obesity treatment programs to date are family-based behavioral pediatric obesity programs, the research in this area suffers from important limitations. The studies generally include a small number of participants that are treated in pediatric obesity research or obesity specialty clinics, thus greatly limiting the external validity of findings. In addition, there are few published studies that evaluate treatment efficacy in younger, non-white children [9]. These programs are dependent upon highly trained experts that can provide intensive, comprehensive treatment to family members; it has been quite difficult to take effective family-based behavioral treatment programs to scale.

The US Preventive Service Task Force (USPSTF) [9] has the task of translating empirical evidence to the practice community. Based on their current view of the literature, which mirrors the results of the Cochrane review, the USPSTF concludes that pediatricians and family physicians treating obese children are left in an uncomfortable position of needing to offer treatment when effective treatment options are not widely available nor shown to be effective for all youth. They suggest, “Given the nature of the problem, effective solutions will likely require substantial collaboration between the medical and public health communities. Greater understanding of how to

expand the appropriate role of clinicians in community public health, such as through advocating necessary environmental and political changes, would be helpful.” (page e139)

Primary prevention efforts: research base

Most agree that preventing childhood obesity is the preferred solution. The majority of obesity prevention interventions have been at the school level. The focus on schools is driven by the fact that the vast majority of youth spend at least 6 h, 5 days a week, in school. The school setting provides an important physical and social environment where youth are presented opportunities to make food and activity choices and experience didactic lessons in the classroom and experiential lessons from school staff and peers on what are normative eating and activity behaviors for their peers and community. In addition, schools are public institutions given the responsibility for caring for children and, in that role, the public has the right to expect the school environment to be healthy.

Traditionally, school health education has been knowledge-based: teach children how their bodies work and the foods and activities needed to be healthy and positive health behaviors and outcomes will ensue. However, health education research has shown that knowledge alone does not result in behavior change and that behavioral choices occur in the context of what youth see as options in their environment and in what they see modeled by other people in their environment. In the 1990s primary prevention efforts expanded to include not only health education but also changes in the school environment such as changing foods available in schools or increasing physical activity options in schools.

There have been a number of reviews summarizing what has been learned about the effectiveness of obesity prevention programs. A Cochrane Review was published in 2005 [10] and reported on the results of 22 intervention studies that: (1) were published between 1990 and 2005, (2) examined an obesity-related variable as a study outcome (including BMI, percent body fat and ponderal index), and (3) that intervened on diet and physical activity of youth. Studies that were controlled trials (but randomization was not required) and had a minimal duration of 12 weeks were included. The vast majority of studies were school-based.

The conclusion of this review is that, with very few exceptions, our attempts to create intervention programs that reduce the risk of unhealthy weight gain in youth have been unsuccessful. This Cochrane review (2005) sites numerous problems with study design including the lack of power and limited generalizability. They suggest that studies may not have been long enough, that study design issues prevented impact from being detected, and

that interventions focused too much on changing student-level knowledge and motivation and not enough on changing environmental and cultural factors that influence obesity risk [10].

It is safe to say that we know more about what does not work than we know what does work in primary prevention programs in schools. Still, best practices suggest that environmental approaches are more effective than didactic education approaches and that multi-sectoral approaches will be needed to address the many behavioral risk factors for obesity.

More recently, primary prevention research efforts have begun to focus on very young children in preschools and also on family-based approaches to keep youth from becoming overweight or obese. We know very little about how successful those approaches will be; or, if they are successful, how effectively they will be taken to scale to impact the population at large.

Primary prevention efforts: medical practice and community approaches

In spite of the lack of empirical evidence to clearly identify a “cure” for obesity in terms of specific programs or approaches that are known to work, there is a need to do something. Primary prevention efforts are coming from the medical community, the federal government, as well as non-profit organizations.

The American Academy of Pediatrics offers suggestions to pediatricians for all levels of prevention. They recommend annual calculating and plotting BMI for all patients beginning at age 2. They suggest that primary prevention messages should include breastfeeding, family meals, limited screen time, regular physical activity, and yearly BMI monitoring. For children identified with a BMI between the 85th and 94th percentiles they specifically encourage five servings of fruits and vegetables daily, 2 h or less of screen time, 1 h or more of physical activity and eliminating all sugared drinks. If these efforts are not successful, more frequent follow-ups and written diet and exercise plans and possibly the use of exercise and behavioral specialists are recommended (www.aap.org/obesity/health_professional).

The Centers for Disease Control and Prevention (CDC) was one of the first government organizations to realize the potential that schools have in creating healthy environments for children that go beyond providing health education and a school nurse. In 1996 the CDC published the Guidelines for School Health Programs to Promote Lifelong Healthy Eating [11] and was followed in 1997 by the Guidelines for School and Community Programs to Promote Lifelong Physical Activity among Young People [12]. In 2000 [13], the CDC released the School Health Index that led schools through a self-evaluation of the healthfulness of their schools, including examining the foods and beverages available in vending,

in snack lines and in concessions for after school programs. In 2002 the CDC conducted the first School Health Policies and Program Study (SHPPS), using a nationally representative sample of schools across the country to document policies and practices in schools related to school health, including obesity-related issues such as nutrition education, physical education, exposure to food advertisements, and food and activity opportunities available during the school day [14]. SHPPS is implemented every 6 years and is an important surveillance tool for assessing the progress that our schools are making with regard to creating healthy environments for youth. The second SHPPS survey [15] showed some positive changes in schools but continued need for improvement.

Most recently, a new initiative to help prevent childhood obesity came from the Obama White House; “Solving the problem of childhood obesity within a generation” [16] was released in 2010 and includes Michelle Obama’s Let’s Move! Campaign (www.letsmove.gov). The stated goal of this initiative is to solve the problem of childhood obesity in a generation by returning to the childhood obesity rate of 5% by 2030 [16]. This initiative identifies three broad areas that put children at risk for obesity including: (1) economic conditions that make it difficult for families to purchase healthy foods and, instead, incentive energy-dense foods; (2) the social environment where the eating and activity habits of friends, families and the cultural at large set social norms about appropriate and reinforced behavior; and (3) the physical environment of our schools and neighborhoods, including the availability of grocery stores and safe places to play and walk in our neighborhoods. The Task Force report provides 70 specific recommendations which are summarized broadly into five categories: (1) Getting children a healthy start on life including good prenatal care, support for breastfeeding, limiting screen time in early life, and improving the environment of child care settings; (2) Empowering parents and caregivers including improving nutritional labeling, reducing the marketing of unhealthy products to children, and improving health care services for children including BMI measurements for all children; (3) Providing healthy food in schools including the most major revamp of the federally supported school lunch and breakfast program in decades, improving nutrition education, and the overall school environment; (4) Improving access to healthy, affordable foods by eliminating “food deserts” in urban and rural America, by lowering the prices of more healthy foods and by asking food manufacturers to reformulate food products to make them healthier; and (5) Getting children to be more physically active by increasing activity opportunities before, after and during school days, by creating “built environments” of neighborhoods that make it easier to be active and by improving access to places for youth to

play and move. The Task Force report focuses on what the private sector, state and local leaders, and communities and families can do to help prevent childhood obesity.

A number of non-profits have also sprung up with the goal of reducing childhood obesity. As an example, the Alliance for a Healthier Generation was launched in 2005 as a collaborative effort between the American Heart Foundation and the Clinton Foundation with the goal of reducing the prevalence of childhood obesity by 2015 (www.healthiergeneration.org, 2011). Their programs include a Healthcare Initiative, engaging insurers, employers, and provider associations in an agreement to reimburse physicians and registered dietitians for obesity-related services and a Kid’s Movement social marketing campaign (“empowerMe” Campaign) to inspire youth to make healthy changes. They also have a Healthy Schools Program that provides tools and resources to school leaders who are trying to improve their school environment and an Industry Initiative that engages industry partners (including PepsiCo and Coca-Cola) in pledging to provide healthier options to schools. Their objectives focus on improving the school environments so that youth are exposed to healthier options for being active and eating healthier foods during the school day.

The Robert Wood Johnson Foundation (RWJF) committed 500 million dollars to reverse the childhood obesity epidemic by 2015 by improving access to affordable healthy foods and increasing opportunities for physical activity in schools and communities across the nation. The RWJF initiatives includes a Healthy Kids, Healthy Communities initiative that is funding 50 communities to implement community-level strategies to prevent childhood obesity as well as a National Policy and Legal Analysis Network to support policy innovation and implementation by empowering advocates and decision makers (www.rwjf.org/childhoodobesity, 2011). The efforts from non-profits such as RWJF and the Alliance have potential to make a difference but their actual impact is not known.

What might clinicians and health professionals expect in the future?

How will these public health initiatives impact prevalence rates of childhood obesity and, importantly for surgeons and radiologists, incidence rates of extreme obesity in children? Will initiatives that attempt to get the food industry on board with providing and promoting healthier food options continue or will they be abandoned when public outrage decides to focus on a different issue? Will urban planning continue to support the idea that neighborhood environments should be encouraging of active transport or will that type of design become passé? Will the policies and practices recommended, and to an extent, legislated in schools be

successful in creating school environments that help youth make healthier eating and activity choices? Will those initiatives become institutionalized or will they fall prey to further school funding cuts and abandoned as ideas that are not practical? Will national, state, and local initiatives (that hope to impact parental shopping, child feeding practices, and family activity behaviors) result in home environments that are less obesogenic? Will the population awareness of the extent and cost of childhood obesity continue to motivate parents, physicians, teachers, community leaders, industry leaders, urban planners, policy makers, and politicians to try to do better in creating a healthier society for our kids?

The answers to these questions are unknown. We do know that the latest surveillance data suggest that levels of overweight and obesity have leveled off in women. Flegal et al. [5] report that the most recent NHANES data showed no statistically significant change in the prevalence of obesity from 1999 to 2008 for adult women. For men, prevalence rates appear to have leveled off since 2003. As for youth, NHANES data from 2007 to 2008 also suggest that the prevalence of obesity of girls ages 6–18 has leveled off since 1999. For boys ages 6–18 a statistically significant trend in higher BMIS was seen between 1999–2000 and 2007–2008. Importantly, this increase was most evident in the boys in the 97th or greater percentile for BMI [4]. More good news comes from the Pediatric Nutrition Surveillance System that is conducted with children ages 0–5 from low-income families. No increases in obesity prevalence were seen between the 2003 and 2008 surveillance data [17]. Likewise the Youth Risk Behavior Surveillance System conducted with high school students nationwide reported a plateau in obesity rates between 2005 and 2007 [18].

While these are good signs, for clinicians trying to come to terms with the likelihood of needing to find appropriate and effective treatment options for the severely obese youth, the options for care are limited and magnitude of the problem is daunting. The American Academy of Pediatrics (AAP) presents a four stage approach to dealing with childhood obesity; Stages 1 and 2 (Prevention Plus and Structured and Structured Weight Management) can likely be done in a primary care setting but Stages 3 and 4 (Comprehensive Multidisciplinary Intervention and Tertiary Care Intervention) will require highly specialized pediatric centers [19]. The AAP recommends that adolescent candidates for bariatric surgery should have a BMI of 40 kg/m², have attained skeletal maturation and have co-morbidities related to obesity [19]. Len Epstein, who has conducted some of the most successful family-targeted obesity treatment programs to date, warns: “If current trends are predictive of the future, there is likely to be an increase in prevalence of very overweight youth who require more powerful interventions than those that are currently available. Replications of the treatment effects observed in efficacy

studies to clinical populations in effectiveness studies and development of more powerful treatments for pediatric obesity represent challenges for the future” [20]. (page 391)

As previously stated, approximately 2.7 million children, ages 2–19 were at or above the 99th percentile for BMI in 2004 and nearly half a million had a BMI that met or exceeded 40 kg/m². In particular, among those youth living in families below the poverty threshold, the rates of severe obesity tripled in the last decades, increasing from 0.7% in 1980 to 4.3% in 2004 [6]. Therefore, the families that are least likely to be covered by medical insurance and for which access to highly specialized care may be particularly challenging are most likely to need to proceed to Stage 4, Tertiary Care.

While public health and clinical interventions appear to be in high gear to prevent and treat childhood obesity, it would be naïve to believe that the childhood obesity will be eradicated like other epidemics of the past. We are no more likely to find a “cure” for obesity than we were for finding a “cure” for cancer. Both diseases are highly complex and have biological, behavioral, psychological, social, and environmental etiologic factors that are not easily fixed. It is prudent for the medical community to prepare for the need for increased medical care and treatment of obese youth and for the obese adults that most obese adolescents will become. Those of us in public health need to do what we can to help create physical, social, and cultural environments that promote, reward, and incentivize a lifestyle that allows all of our children to achieve the highest degree of health and wellness possible.

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