The Center for Health and Health Care in Schools
School of Public Health and Health Services
The George Washington University Medical Center

Childhood Overweight
What the research tells us

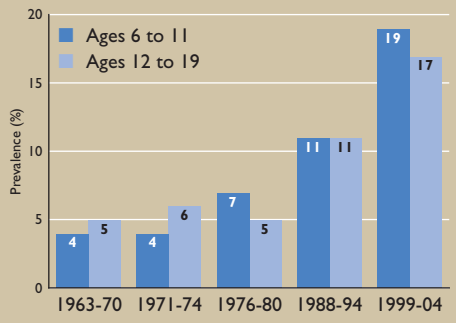
Updated September 2007

Overview

The rapid increase in overweight among children and adolescents has generated widespread concern. Between 1980 and 2004, the prevalence of overweight tripled among children and adolescents aged 6-19 years.[1] When those of both sexes between 2 and 19 years are considered, more than one-third (33.6%) are either at risk for overweight or are overweight—see definitions—and 17.1% are overweight.[1] In one study, during the 2003-4 and 2004-5 school years, 38% of Arkansas students were found to be overweight or at risk for overweight.[2]

Boys are becoming overweight at a greater rate than girls. The rate of increase of overweight in boys rose at a greater pace than that for girls. For the years 2003-2004, 34.8% of boys ages 2-19 were at risk for overweight or were overweight, compared with 28.9% in 1999-2000. Among girls ages 2-19 during the same time period, 32.4% were at risk for overweight or were overweight, up from 27.4% in the earlier survey.[1]

Prevalence of Overweight* Among Children and Adolescents ages 6-19 years[1]



*Gender-and age-specific BMI≥the 95th percentile
Data from NHANES studies for years cited.[1]

Some groups of children are more affected by overweight than others. In the most recent data, Mexican-American male children and adolescents (22.0%) were significantly more overweight than their non-Hispanic white (17.8%) and non-Hispanic black (16.4%) male counterparts. Mexican-American (16.2%) and non-Hispanic black (23.8%) female children and adolescents were significantly more likely to be overweight than non-Hispanic white female children and adolescents (14.8%). Adolescents were more likely to be overweight than children.[1]

Definitions

Body mass index (BMI) is the ratio of weight-to-height, a formula in which a person's body weight is divided by the square of his or her height. For children ages 2-20 years, BMI is plotted on a growth chart specific for age and gender (BMI-for-age). The resulting percentile indicates the relative position of the child's BMI number among children of the same sex and age.[3]

For children and adolescents, BMI ranges are labeled "at risk of overweight" and "overweight," and are defined to take into account normal differences in body fat between boys and girls, and at various ages.[4]

The CDC uses the following ranges for childhood overweight:[3]

- **At risk of overweight:** BMI-for-age ≥ 85th percentile to < 95th percentile
- **Overweight:** BMI-for-age ≥ 95th percentile

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Overview

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Health Consequences of Childhood Overweight

Heart disease, high blood pressure, hardening of the arteries, type 2 diabetes, metabolic syndrome, high cholesterol, asthma, sleep disorders, liver disease, orthopedic complications, and mental health problems are some of the health complications of carrying excess weight.[5]

Consequences of overweight for children:

- Children are more vulnerable to obesity-related health problems–including skeletal and reproductive irregularities–because their bodies are growing and developing.[5,6]
- Health conditions once thought applicable only to adults, such as hypertension and type 2 diabetes, are now seen in children with increasing frequency.[5]
- It is possible that, given the increasing prevalence of severe overweight, some children will live shorter and less healthy lives than their parents.[7]

Cardiovascular risk – According to the CDC, almost 60% of overweight children aged 5 to 17 years had at least one cardiovascular disease risk factor, such as high blood pressure, and 25% had two or more risk factors.[8]

Type 2 diabetes – A CDC study estimated that one in three American children born in 2000 will develop diabetes in their lifetime.[9] As many as 45% of newly diagnosed cases of diabetes in children and adolescents are now type 2 diabetes,[10] once called "adult-onset diabetes." Type 2 diabetes in children and adolescents can result in complications such as cardiovascular disease and kidney failure.[11]

Sleep apnea – Sleep-disordered breathing, if left untreated, can lead to bedwetting, attention-deficit disorder, behavior problems, poor academic performance, and cardiopulmonary disease.[12] One study found that a third of young severely overweight patients had symptoms associated with obstructive sleep apnea (OSA) and 5% had severe OSA.[13]

Asthma – Studies have established an association between asthma and childhood overweight.[14,15] The risk of new-onset asthma is higher among children who are overweight, and boys have a higher risk compared with girls. Paradoxically, the effect is greater in nonallergic children.[16] Asthma is also a barrier to physical activity, which can provide benefits for students with either asthma or overweight, or both.[17]

Psychosocial consequences – Overweight children and adolescents are targets of early and systematic social discrimination. The psychological stress of social stigmatization can cause low self-esteem which, in turn, can hinder academic and social functioning.[18,19] Although peer victimization occurs commonly among adolescents, obese adolescents are more susceptible than their average weight peers.[20] The likelihood of a severely obese child or adolescent having impaired health-related quality of life was 5.5 times greater than a healthy child or adolescent, and similar to a child diagnosed as having cancer.[21]

Adult overweight – Overweight adolescents have a 70% chance of becoming overweight or obese adults. This increases to 80% if one parent (or more) is overweight or obese. Overweight or obese adults are at risk for a number of health problems, including heart disease, type 2 diabetes, high blood pressure, and some forms of cancer.[6,22]

Potential health care costs – Researchers found that spending on overweight and obesity together accounted for 9.1% of total annual US medical spending, a total rivaling the estimated medical costs attributable to smoking.[6,23]

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What We Have Learned

While no single factor has led to the increase in children's overweight, since the 1980s many complementary changes have raised children's energy (calorie) intake and lowered their energy expenditure. The challenge in addressing childhood obesity is learning how best to change the environment that affects children's energy balance.[24]

Where did the obesity problem come from?

- High-calorie foods have become available at school. Kids consume more soda and other sugar-sweetened beverages, and less milk, both at school and away from it.[25]
- Food, beverage, and snack products are heavily advertised to children.[26,27]
- Dual-career or single-parent working families may have increased demand for food away from home or for prepared foods.[27,28]
- Energy expenditure has been reduced. Fewer students walk or bike to school.[29]
- More time is spent in sedentary activities, such as viewing television, using computers, and playing video games.[30,31]

Across the country, in schools, communities, and research labs, we have learned that:

- Initiatives to prevent or mitigate child and adolescent overweight and obesity have not shown remarkable success. Recent reviews have indicated a lack of consistency in the studies, insufficient information about the subjects, and inappropriate study designs, all of which mean it is difficult to tell what kind of program will be successful.[32,33,34,35]
- Poverty increases the likelihood of children becoming overweight, as does being a member of a minority population.[36,37,38,39]
- Parents have trouble identifying overweight in their children.[40,41] Many don't see a reason to be concerned.[42]
- Eating meals together as a family has benefits long after mealtimes.[43] Younger children who eat dinner with their families are less likely to be overweight than those who have fewer family dinners.[44] And parental presence at the evening meal means adolescents eat more fruits, vegetables, and dairy foods.[45]
- On the other hand, parents' use of obesity-promoting foods and beverages in the home is a robust predictor of adolescent consumption of unhealthy foods.[46]
- Children who eat in large groups consume as much as 30% more.[47] And children presented with larger amounts of food tend to eat more.[48,49]
- Parents who model weight control find that their children follow suit—with results lasting for the long term.[50,51]
- Reducing "screen time" and increasing physical activity can help achieve a healthy weight, and improve management of diabetes.[30,52,53,54]
- Doctors have little formal training in weight-management practices, and lack time to spend with patients on education and behavior change.[55] Insurance companies rarely reimburse clinicians who spend the time it takes to help kids learn a new approach to eating.[56]

What can be done?

The US General Accountability Office (GAO) asked national experts to describe good approaches to improving children's and adolescents' weight and health profiles. The suggested strategies[57] were:

- Increase physical activity and spend some time walking each day. If possible, add vigorous physical activity.
- Improve nutritional intake—replace sodas, sweets and salty snacks with fresh fruits, vegetables, and milk.
- Reduce "screen time" and other sedentary activities. *(Continued Next Page)*

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What We Have Learned *(Continued from page 3)*

Other strategies have shown some value:

- Schools shifting to more healthful foods in cafeterias and vending machines have done so without losing revenue.[58,59]
- Reduce advertising in schools by food companies and fast food restaurants. They can contradict health messages students receive in class.[60,61]
- Ensure children and adolescents get enough sleep. Poor quality and reduced duration of sleep are associated with obesity. Sleep loss has a direct effect on eating behavior.[62] Sleep-deprived humans show increased appetite, particularly for high-carbohydrate, calorie-rich foods.[63] Lack of sleep is a bigger risk factor for overweight and obesity than other known contributors, including parental obesity, family income, or screen time.[64,65]
- Don't let up during breaks. What can be accomplished during the school year may be undone over summer vacation.[66,67]

More, More, More...

Children who eat fast food, compared with those who do not, consume more total energy (calories), more energy per gram of food, more total fat, more total carbohydrate, more added sugars, more sugar-sweetened beverages, less fiber, less milk, and fewer fruits and non-starchy vegetables.[69]

Intervention programs that involve the whole community can reduce BMI scores for those most at risk.[68]

Nutritional Challenges

- A healthy diet in childhood and adolescence is important for proper growth and development and can prevent problems, such as obesity, diabetes, hypertension, premature dental development, and dental caries. Healthful eating reduces risk for many diseases, including the three leading causes of death: heart disease, cancer, and stroke. [5,6,70,71]
- Each day, over 30 million school-aged children receive lunch and 10 million receive breakfast in the National School Lunch Program (NSLP) and the School Breakfast programs supported by the USDA.[72,73]
- School lunches significantly improve children's diets. For many students, it's the only time they receive balanced, nutritious meals.[74]
- In schools with cooperative gardening or food production projects in place, students have increased their daily intake of fruits and vegetables.[75,76]
- Children and adolescents are heavy consumers of sodas. Sixty-two percent of young women and 73% of young men consume carbonated soft drinks on any given day. The vast majority contain sugar.[77]
- The most effective way to prevent complications of obesity is to introduce, model, and reinforce healthful behaviors and lifestyles early in childhood.[78]

Physical Activity

- A 2005 national survey reported 77% of children aged 9-13 engaged in free-time physical activity during non-school hours,[79] but participation declines as children get older.[80] In high school, only 27.8% of girls and 43.8% of boys had at least 60 minutes of physical activity per day.[81] Most 6th grade girls do not meet the standard for adequate physical activity.[82] *(Continued on page 5)*

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Physical Activity *(Continued from page 4)*

- Some groups of children have less access to organized physical activity. Hispanic (25.9%) and non-Hispanic black (24.1%) children 9-13 years old were significantly less likely to participate in such activities compared with non-Hispanic white children (46.6%). Children of parents with lower incomes and educational levels were less likely to participate in organized physical activity. However, nearly three-fourths of all groups participated in some level of free-time physical activity.[79]
- The paradox in physical activity programs is that students who are self-confident, fitter, and less anxious tend to participate regularly. Those who are more likely to need and benefit from a physical activity program are less likely to participate.[83]
- Neighborhood factors influence physical activity levels. Girls who saw walkers and bikers on neighborhood streets, didn't have a lot of crime in the neighborhood, saw other children playing outdoors, had a bicycle or walking trail nearby, and had access to physical activity facilities, also had lower BMI scores. In neighborhoods with well-lit streets at night, lots of traffic, bicycle or walking trails, and access to physical activity, girls had 14% higher scores for vigorous physical activity.[84]

How Schools Help

- All schools participating in the National School Lunch Program (NSLP) must have a wellness policy, with guidelines and goals for nutrition and physical activity designed to promote student health.[85]
- A school-based fitness program showed that small increases in vigorous physical activity helped students improve their fitness, body composition, and insulin levels.[53]
- Some schools no longer involve food in school-sponsored fund-raising events.[86]
- Vending machines in some schools are now stocked with low-fat milk, fresh fruits, and vegetables, in place of soda, candy, and sweet or salty snacks.[86]
- New kinds of rewards - school supplies, coupons for movies, and the opportunity to go to the head of the lunch line - have been substituted for food prizes.[87]
- One California school district worked with school-food officials and students to develop healthier choices in the school snack bar, with excellent results. Sodas, Twinkies, Slim Jims, and giant pizzas were replaced with sushi, fresh soup, deli sandwiches, 100% fruit juice, side salads, and fresh fruit. In some schools revenues did not change, but snack bar profits increased at others.[88]
- Schools may be good locations for after-school anti-obesity programs because the children, the facilities, and the personnel are there. And running programs after school means they do not compete with classroom priorities.[89]
- Families play a key role in weight loss or healthy lifestyle programs. A British study showed that school may help promote healthy lifestyles in children, but programs require support in other social settings, including the family.[90]

A Place to Start

The following are excellent approaches to dealing with overweight and obesity. All are available online, free.

- **The Science of Energy Balance: Calorie Intake and Physical Activity** – A Lesson Plan and Activities, with Reference Manual, from the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health. This is a

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Supported by a grant from the Robert Wood Johnson Foundation.

A Place to Start *(Continued from page 5)*

complete explanation of, and clearly presented exercises for, teaching the value of portion size, the energy expenditures of typical activities, and the delicate balance of energy intake and activity. Available at http://science.education.nih.gov/Supplements/NIH4/Energy/guide/nih_energy_curr-supp.pdf.

- **Annapolis Valley Health Promoting Schools Project "Make the Healthy Choice the Easy Choice"** A program designed to help school districts change how they work, so the learning and health of their students can be improved. Program details at: http://www.hpclearinghouse.ca/features/AVHPSP.pdf.
- **Dietary Guidelines for Americans 2005 (including the new food pyramid)** Available in hard copy from the USDA and the US DHHS, or as a PDF online. Based on the latest scientific evidence, these Guidelines provide information on choosing a nutritious diet, maintaining a healthy weight, achieving adequate exercise, and avoiding foodborne illness. Available at: http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf.

More resources for schools, families and communities are available at www.healthinschools.org.

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September 2007