The prevalence of overweight/obesity in children and teenagers in the United States has almost tripled in the last 25 years. In 2003-2006, approximately 17 percent of 6-19 year olds had a body mass index (BMI) ≥ 95th percentile of the age and sex specific 2000 Centers for Disease Control and Prevention (CDC) growth charts. Youths of all ages, both genders, and all ethnicities are affected by this public health problem. 

High BMI can affect a child’s psychosocial status and musculoskeletal development, and may increase risk of pulmonary problems, liver disorders, metabolic disorders, and cardiovascular conditions such as high blood pressure, atherosclerosis, and high cholesterol. Furthermore, excess weight in childhood often tracks to adulthood. One study showed that extremely obese youth were likely to become obese young adults, and the connection between overweight/obesity and a variety of chronic health problems (metabolic, cardiovascular, cancers, etc.) in adults is well established.
In addition to the immediate and long-term health effects, children’s weight status can affect their school life in many ways. Schoolchildren with high BMI are more likely to be depressed, teased, have poor self-esteem, and miss school—all of which can impact a student’s academic performance.8

This article provides an overview of overweight/obesity in U.S. youths. Using nationally representative data based on probability samples, the prevalence and trends are presented, and disparities are highlighted. Dietary and physical activity patterns are also described.

### Definition of overweight/obesity

Overweight/obesity in children is usually defined as excess body weight, rather than as excess body fat. While excess body fat may be a better indicator of potential health problems, it is not measured routinely in surveys, whereas height and weight are simple to measure. Therefore, to determine excess weight status of children and adolescents, BMI is often used (BMI is calculated as weight in kilograms divided by height in meters squared).9,10 Measured weight and height are more accurate than self-reported weight and height. Studies of children often include weight and height values reported by parents, but parents may not know their child’s measurements and are likely to underestimate their child’s height, which will lead to underestimated BMI.11-13

The terminology for excess weight in children is evolving. Previously, expert panels recommended that youths between the ages of 2 and 19 years be labeled ‘overweight’ if their BMI was ≥95th percentile of the sex-specific BMI for their age.14,15 A more recent American Medical Association panel10 recommended that youths at or above the 95th percentile of the sex-specific BMI for their age be termed “obese.”

To avoid confusion with this evolving terminology, we define children and teens as having “high BMI” if they are at or above the 95th percentile of the sex-specific BMI for-age 2000 CDC growth charts (a reference population of U.S. children).3,10-15 It is important to remember that BMI is a screening tool, not a diagnostic tool. The definition for high BMI in youth is statistical. While youths with high BMI may have a variety of poor health outcomes,4 excess weight in a youth—by itself—does not necessarily result in greater health risks or clinical complications.16

### Prevalence and Trends

Healthy People 2010, a national health promotion and disease prevention government initiative, contains an objective to “reduce the proportion of youth age 6-19 years who are overweight or obese to 5 percent by 2010.”22 The most recent NHANES data available suggest that the United States will fall far short of this goal. Seventeen percent of school children 6-11 years and 17.6 percent of teens ages 12-19 years had high BMI in 2003-2006 (Table 1).2

Between the early 1960s and 2006 the prevalence of high BMI in children and teens increased dramatically, as shown in Figure 1. After little change was seen in the

---

**Table 1. Prevalence of high body mass index (BMI)* in youth age 6-19 years, by age, sex, and race/ethnicity, United States, 2003-2006**

<table>
<thead>
<tr>
<th></th>
<th>Age 6-11 yrs**</th>
<th>Age 12-19 yrs***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>percent</td>
<td>percent</td>
</tr>
<tr>
<td>Total</td>
<td>17.0</td>
<td>17.6</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>15.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>21.3</td>
<td>22.9</td>
</tr>
<tr>
<td>Mexican American</td>
<td>23.8</td>
<td>21.1</td>
</tr>
</tbody>
</table>

**Boys**

<table>
<thead>
<tr>
<th></th>
<th>percent</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All race/ethnicities</td>
<td>18.0</td>
<td>18.2</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>15.5</td>
<td>17.3</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>18.6</td>
<td>18.5</td>
</tr>
<tr>
<td>Mexican American</td>
<td>27.5†</td>
<td>22.1</td>
</tr>
</tbody>
</table>

**Girls**

<table>
<thead>
<tr>
<th></th>
<th>percent</th>
<th>percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All race/ethnicities</td>
<td>15.8</td>
<td>16.8</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>14.4</td>
<td>14.5</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>24.0†</td>
<td>27.7†</td>
</tr>
<tr>
<td>Mexican American</td>
<td>19.7</td>
<td>19.9</td>
</tr>
</tbody>
</table>

*High BMI is defined as being at or above the 95th percentile of the sex-specific BMI-for-age 2000 CDC growth charts.

**Total sample size was 2095.

***Total sample size was 4300.

†Significantly greater prevalence of high BMI, compared to non-Hispanic whites of the same sex and age group.

The CDC conducts a variety of nationally representative surveys of children and schools that include measurements or questions related to childhood height and weight. Data from these surveys give us information on prevalence, disparities, diet, and physical activity in the United States.

For example, the National Health and Nutrition Examination Survey (NHANES) is a series of nationally representative surveys conducted by the National Center for Health Statistics, CDC. NHANES and its precursor, the National Health Examination Survey, have been monitoring the health of the U.S. civilian non-institutionalized population since 1960. Approximately 5,000 people of all ages participate in the NHANES interview and comprehensive medical exam each year. All NHANES examinations include standardized measurement of height (or length) and weight in survey participants.\textsuperscript{17-19} NHANES 2003-2006 include an in-person 24-hour dietary recall, which is used to estimate nutrients and types and amounts of foods and beverages consumed during the 24-hour period prior to examination, as well as a second 24-hour dietary recall collected via telephone three to 10 days after the first recall. (However, all of the data presented in this chapter were collected in the first, in-person dietary recall.)

In 2003-2006, NHANES directly measured physical activity using physical activity monitors, small devices worn by the participant which collect the intensity and duration of common locomotion activities such as walking and jogging. NHANES provides population estimates of trends and prevalence of high BMI, dietary intake, and directly measured physical activity for children age 6-19 years.

The Youth Risk Behavior Surveillance System (YRBS) includes national and state school-based surveys of representative samples of students in grades 9-12. Students complete the YRBS self-administered questionnaire at school. In 2007, the national YRBS used a three-stage cluster sample design to produce a nationally representative sample of students in grades 9-12 who attend public and private schools. More than 14,000 students completed the 2007 national YRBS questionnaire, for an overall response rate of 68 percent.

In 2007, data were available for analysis from 39 state surveys. Each state survey used a two-stage cluster sample design to produce a representative sample of public school students in grades 9-12 in their jurisdiction. Sample sizes ranged from 1,191 to 13,439 students. The response rate for these surveys ranged from 60 percent to 82 percent.\textsuperscript{20} The national and state YRBS surveys provide information on reported diet and physical activity patterns of high school students.

The Schools Health Policies and Programs Study 2006 (SHPPS) is a national survey of state, district, and school education administrators and teachers, conducted by the CDC to assess school health policies and practices at the state, district, school, and classroom levels. SHPPS 2006 was conducted in all 50 states and the District of Columbia, and is nationally representative of school districts. SHPPS data are collected from state education agency personnel and teachers via computer assisted telephone and personal interviews, and self-completed mailed questionnaires. The SHPPS 2006 provides information on nutrition and physical activity opportunities offered in elementary, middle, and high schools in the United States.
1960s and 1970s, the prevalence of high BMI in children ages 6-11 years increased from around 6 percent in 1976-1980, to around 17 percent in 2003-2006. Likewise, the prevalence of high BMI in teens ages 12-19 years increased from around 5 percent in 1976-1980 to approximately 17 percent in 2003-2006.\textsuperscript{1,2,23,24} Figure 1 also shows that there was very little difference between genders or age groups in the upward trend of high BMI prevalence.

**Disparities**

An increase in the prevalence of high BMI has been observed in youth of all ages, both genders, and all three major ethnic groups in the U.S. (non-Hispanic white, non-Hispanic black, and Mexican American).\textsuperscript{1,24,25} However, some demographic groups are disproportionally affected. Among Mexican Americans, greater than 27 percent of boys ages 6-11 years and more than 22 percent of boys ages 12-19 years had a high BMI in 2003-2006. Mexican American boys ages 6-11 were significantly more likely to have high BMI than their non-Hispanic white counterparts.

Among non-Hispanic black girls, 24 percent of those ages 6-11 had high BMI, and almost 28 percent of those ages 12-19 years had high BMI. Non-Hispanic black girls ages 6-11 years and ages 12-19 years were significantly more likely to have high BMI compared to their non-Hispanic white counterparts (Table 1).

Disparities in prevalence of high BMI by socioeconomic status have also been reported.\textsuperscript{26,27} NHANES contains poverty-income ratio, or the ratio of household income to the poverty threshold after accounting for inflation and family size. Using data from 2001-2006, we examined trends in high BMI by household income quintile, gender, and ethnicity. A significant inverse linear trend was observed for non-Hispanic white boys age 6-19 years, meaning that non-Hispanic white boys from lower income households are more likely to have high BMI than non-Hispanic white boys from higher income households. Trends were not observed for non-Hispanic black or Mexican American boys. (Figure 2). Among girls age 6-19 years, no significant trends were observed by income level for any of the three racial/ethnic groups examined (Figure 3).

Differences in the prevalence of high BMI by education level attained by the household head within ethnic group can also be estimated using NHANES 2001-2006 data.

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**Table 2. Mean daily caloric intake in youth age 6-19 years, by age, sex, and race/ethnicity, United States, 1988-1994 and 2003-2006**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children age 6-11 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities*</td>
<td>1974</td>
<td>2051</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>1987</td>
<td>2089</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>1954</td>
<td>1967</td>
</tr>
<tr>
<td>Mexican American</td>
<td>1934</td>
<td>2083</td>
</tr>
<tr>
<td><strong>Boys age 6-11 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities</td>
<td>2147</td>
<td>2176</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>2200</td>
<td>2224</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>2034</td>
<td>2049</td>
</tr>
<tr>
<td>Mexican American</td>
<td>2008</td>
<td>2198</td>
</tr>
<tr>
<td><strong>Girls age 6-11 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities†</td>
<td>1794</td>
<td>1921</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>1765</td>
<td>1944</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>1873</td>
<td>1884</td>
</tr>
<tr>
<td>Mexican American</td>
<td>1863</td>
<td>1968</td>
</tr>
<tr>
<td><strong>Teens age 12-19 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities**</td>
<td>2415</td>
<td>2333</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>2438</td>
<td>2375</td>
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<td>Non-Hispanic black</td>
<td>2369</td>
<td>2293</td>
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<tr>
<td>Mexican American</td>
<td>2205‡</td>
<td>2261</td>
</tr>
<tr>
<td><strong>Boys age 12-19 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities</td>
<td>2845</td>
<td>2680</td>
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<tr>
<td>Non-Hispanic white</td>
<td>2899</td>
<td>2765</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>2685</td>
<td>2601</td>
</tr>
<tr>
<td>Mexican American</td>
<td>2504§</td>
<td>2531</td>
</tr>
<tr>
<td><strong>Girls age 12-19 years</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All race/ethnicities†</td>
<td>1978</td>
<td>1957</td>
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<td>Non-Hispanic white</td>
<td>1951</td>
<td>1940</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>2060</td>
<td>1991</td>
</tr>
<tr>
<td>Mexican American</td>
<td>1902</td>
<td>1960</td>
</tr>
</tbody>
</table>

†Significantly less mean daily calories consumed than boys of the same age in 1988-1994 and in 2003-2006.
‡Significantly less mean daily calories consumed than non-Hispanic whites and non-Hispanic blacks of the same age in 1988-1994.
§Significantly less mean daily calories consumed than non-Hispanic white boys of the same age in 1988-1994.

Figure 4 shows the prevalence of high BMI among boys ages 6-19 years, by ethnicity and education level of household head. There was a significant inverse linear trend for non-Hispanic white boys (p < 0.01), meaning non-Hispanic white boys were more likely to have a high BMI if they came from a household headed by a person with a lower educational level. Trends were not observed for non-Hispanic black or Mexican American boys. Among girls ages 6-19, there was a significant inverse linear trend for non-Hispanic black girls, but not for non-Hispanic whites or Mexican Americans (Figure 5).

In summary, a child’s risk of high BMI differs by race/ethnicity. The relationship between high BMI and indicators of socioeconomic status (household income, household head education level), however, is not consistent, and differs by gender and race/ethnicity.

Trends in Diet and Physical Activity

High BMI is a complex condition ultimately related to one’s diet and physical activity. Genetics, individual behaviors, social, cultural, and environmental factors all play a role in the development of the condition. It is likely that genetically susceptible individuals are responding to a changing environment in which energy-dense foods are increasingly available and opportunities for physical activity are more and more difficult to find.

Diet

Through the past 15 years, mean daily caloric intake has not increased in adolescents and teens aged 12-19 years. Furthermore, NHANES dietary data from 2003-2006 do not show any increase in mean caloric intake by any of the three racial/ethnic groups for youth ages 12-19 years, when compared to NHANES data from 1988-1994. Mean daily caloric intake has increased slightly in Mexican Americans ages 6-11 years, but has not significantly increased in non-Hispanic white or non-Hispanic black youth ages 6-11 years (Table 2). Although consumption of calories is consistently higher in boys than girls, patterns of caloric intake by race/ethnicity and age group are similar across genders (Table 2).

While changes in total calories consumed have not been observed during the past 15 years, the composition of children’s diets is changing. Research suggests that consuming sugar-sweetened beverages may contribute to weight gain in children and teens. Beverage consumption among children and teens ages 6-19 appears to have shifted between 1977 and 2002. In children ages 6-11 years and teens ages 12-19 years, NHANES data show that the consumption of milk has decreased, while consumption of fruit drinks, fruit juice, and sodas have all increased, especially in teens. According to the 2007 YRBS, 33.8 percent of high school students reported drinking a soda at least once a day in the previous week.

Although fruit and vegetable consumption alone have not been consistently related to high BMI, reported fruit and vegetable consumption provides another way to look at what young people are (and are not) eating. NHANES data show that there was a large increase in the intake of savory grain snacks, pizza, and candy, while vegetable consumption decreased during this time period despite a large increase in the consumption of fried potatoes. National YRBS data also suggest that most high school students consume fruits and vegetables less than five times per day. In 2007, only 21.4 percent of high school students reported that they ate fruits and vegetables five or more times per day. Boys were more likely to consume five or more times per day compared to girls.

While the recommended fruit and vegetable intake varies by age, gender, and activity level, these data suggest that the majority of youth are not eating enough fruits and vegetables. Furthermore, in 2003-2004, less than 10 percent of vegetables consumed by children ages 2-19 years were dark green or orange, far short of the Healthy People 2010 Objective that at least one third of vegetables consumed be dark green or orange.

Frequent snacking on energy-dense foods may contribute to excess energy intake among children and teens. In 2006, the majority of schools still did not prohibit the offering of “junk foods” (foods or beverages with low nutrient density) in concession stands, school stores, vending machines, student parties, or à la carte during meal times. Soda was available to students in 77 percent of high schools, and chocolate candy was available in 50 percent of high schools. In direct competition with the school lunch, 12 percent of elementary schools, 19 percent of middle schools, and 24 percent of high schools offered brand-name fast foods from companies such as Pizza Hut, Taco Bell, or Subway.
Figure 1. Trends in high BMI* in youth ages 6–19 years, by sex, United States, 1963–2006

*High BMI is defined as being at or above the 95th percentile of sex-specific BMI for age 2000 CDC growth charts.

Figure 2. Prevalence of high BMI* among boys ages 6–19 years, by race/ethnicity and household income quintile, United States, 2001–2006

*High BMI is defined as being at or above the 95th percentile of sex-specific BMI for age 2000 CDC growth charts.
†Significant inverse linear trend for non-Hispanic whites.
Figure 3. Prevalence of high BMI* among girls ages 6–19 years, by race/ethnicity and household income quintile, United States, 2001–2006

*High BMI is defined as being at or above the 95th percentile of sex-specific BMI for age 2000 CDC growth charts.

Figure 4. Prevalence of high BMI* among boys ages 6–19 years, by race/ethnicity and education level of household head, United States, 2001–2006

*High BMI is defined as being at or above the 95th percentile of sex-specific BMI for age 2000 CDC growth charts.
†Significant inverse linear trend for non-Hispanic whites.
Figure 5. Prevalence of high BMI* among girls ages 6–19 years, by race/ethnicity and education level of household head, United States, 2001–2006

*High BMI is defined as being at or above the 95th percentile of sex-specific BMI for age 2000 CDC growth charts.
†Significant inverse linear trend for non-Hispanic whites.

Figure 6. Percent of youth ages 6–19 years attaining sufficient physical activity to meet public health recommendations,* by age and sex, United States, 2003–2004

*For ages 6–19, 60 or more minutes of moderate – or greater-intensity activity on 5 of 7 days.
Differences in caloric intake can be investigated by race/ethnicity and income level using NHANES data. In 1988-1994, the mean daily caloric intake in children ages 6-11 did not differ by race/ethnicity. In teens ages 12-19 years, Mexican Americans consumed fewer calories than both non-Hispanic whites and non-Hispanic blacks (Table 2). However, by 2003-2006, no differences between race/ethnic groups were seen in either 6-11-year-old children, or in 12-19-year-old teens (Table 2). Although it is difficult to accurately measure caloric consumption, these data suggest that total caloric consumption is unlikely to fully explain the disparities in high BMI by race/ethnicity.

Mean daily caloric intake does not change as household income increases. Dietary data from NHANES 2003-2006 show no difference in average daily caloric intake in children ages 6-11 years from households with the highest income level, compared to households with lower incomes (<130 percent of poverty level mean (SE): 2093 kcal (73.1), 131-185 percent poverty level: 1977 kcal (73.3), >185 percent poverty level: 2041 kcal (31.1)). There was no significant difference in caloric intake by income level in teens ages 12-19 years [<130 percent of poverty level mean (SE): 2321 kcal (56.0), 131-185 percent poverty level: 2317 kcal (136.3), >185 percent of poverty level: 2349 kcal (35.5)].

### Physical Activity

NHANES and YRBS data suggest that children of all ages, both genders, and all races/ethnicities are not getting enough physical activity. The 2008 “Physical Activity Guidelines for Americans” recommend that children and adolescents aged 6–17 years accumulate one hour or more of physical activity daily. Figure 6 shows directly measured physical activity data from NHANES 2003–2004. We see that less than 50 percent of children ages 6-11 years (and <10 percent of teens) got 60 or more minutes of moderate- or greater-intensity activity five of every seven days. There was a dramatic difference in physical activity by age for both boys and girls, and girls consistently got less physical activity than boys.

The self-reported YRBS data are consistent with the directly measured NHANES data, as both datasets show that a very low percentage of youth are regularly active. However, the self-reported YRBS data show higher estimates than the directly measured NHANES data. According to the national YRBS (2007), 35 percent of high school students reported being physically active for at least 60 minutes a day for five or more of the last seven days.

Physical activity level varied by gender, race/ethnicity, and age. More males (43.7 percent) than females (25.6 percent) reported being physically active for 60 minutes on most days. More whites (37 percent), than blacks (31.1 percent) or Hispanics (30.2 percent) reported being physically active for 60 minutes on most days. The percent of students who reported being physically active for 60 minutes on most days declined with age (9th grade: 38.1 percent, 10th grade: 34.8 percent, 11th grade: 34.8 percent, and 12th grade: 29.5 percent). In the 39-state YRBS surveys, no state had a majority of students reporting being physically active for 60 minutes on most days in 2007.

Physical education classes and recess provide opportunities for physical activity in schools. However, according to SHPPS, in 2006, greater than 20 percent of elementary schools did not provide daily recess for all of their students. Moreover, in 2007, just more than half of all high school students (53.6 percent) reported attending physical education classes at least one day per week, and 30.3 percent attended physical education class daily, according to the national YRBS. Reported physical education class attendance in 2007 was practically unchanged from 1993, when 52.1 percent of high school students attended physical education class at least one day per week and 34.3 percent attended physical education class daily. Finally, SHPPS reports that in 2006 only 2 percent of high schools require daily physical education or its equivalent for students in all grades in the school for the entire year.

In conclusion, high BMI has increased dramatically in U.S. youth through the past 25 years, and now affects approximately 17 percent of school-age children and teens in the country. Non-Hispanic black girls and young Mexican American boys appear to be disproportionately affected. The relationship between socioeconomic factors and high BMI is complex, and differs by race/ethnicity and gender. Caloric consumption has not increased among U.S. youth, but the composition of the diet has changed. National data show that U.S. youth are drinking more sugar-sweetened beverages, eating very few fruits and vegetables, and are not getting enough physical activity. Schools are in a position to create a culture of nutritious eating and encourage a lifestyle of physical activity, which could reduce students’ risk of high BMI.

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Endnotes


How Schools Work & How to Work with Schools explains the inner workings of schools and school systems in a format that is especially geared toward non-educators who seek to work with children and youth in school settings. It includes a summary of the benefits for students when health professionals and educators work together; an overview of the core mission of education; a background chapter on how education works at the school, district, state, and national levels; as well as many practical tips for how to work effectively with educators, school administrators, and policymakers. (48 pp., $14.00)

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