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## Prevalence of Overweight Among Anchorage Children: A Study of Anchorage School District Data: 1998-2003

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## **Abstract**

The Anchorage School District and the Alaska Division of Public Health collaborated to assess the prevalence of overweight among children in the Anchorage School District. We analyzed routinely collected height and weight measurements for students in grades K-12. Data collected by school nurses from 41,261 students spanning five school years were included in the analysis. A total of 78,303 individual height and weight values were used. We assessed and classified student weight status using BMI-for-age values and the categories defined by the National Center for Health Statistics. Over the five-year time period, 2% of students were underweight, 62% were at a normal weight, 18% were at-risk for becoming overweight, and 18% were overweight. Of students entering kindergarten or first grade, 32% were overweight or at-risk for becoming overweight. Students of a racial or ethnic background other than White were more likely to be overweight or at-risk for becoming overweight than White students. Schools can play a role in helping to address childhood overweight. However, educators cannot solve this problem alone. Parents and community partners must take an active role in preventing and addressing childhood obesity.

## **Introduction**

In the United States, the increase in overweight and obesity has been so substantial and dramatic that it is commonly described as epidemic.<sup>1</sup> The epidemic has spread through all 50 states, within all racial and ethnic subgroups, and among all socioeconomic and age groups. According to the Institute of Medicine, "...we have learned that excess weight has significant and troublesome health consequences", yet "we nevertheless see our population, in general, and our children, in particular, gaining weight to a dangerous degree and at an alarming rate."<sup>2</sup>

The spread of the obesity epidemic among children is especially worrisome, as it threatens to negate many of the gains in children's health that have been made in the past century. Among children, excess weight is associated with numerous health problems. High

blood pressure, high cholesterol, orthopedic disorders, type II diabetes, and psychosocial disorders are more common among overweight youth than among those with a healthy body weight.<sup>3</sup> In addition, children and adolescents who are overweight have an increased risk of being overweight or obese as adults. Overweight and obese adults, in turn, have a higher risk of premature death than adults with normal weights. Obesity and overweight among adults are also associated with an increased risk of coronary heart disease, type II diabetes, musculoskeletal disorders, sleep apnea, asthma, and psychological disorders, as well as cancer of the endometrium, colon, kidney, gallbladder, and breast (postmenopausal).<sup>4</sup>

To assess the scope of the obesity epidemic among children and adolescents in Anchorage, the Anchorage School District and the Alaska Division of Public Health collaborated to analyze existing data on the height and weight of students enrolled in the Anchorage School District. Working together, we can begin to explore steps that our community can take to respond to this growing problem that threatens the health and well being of our children.

## **Background**

Over the past several decades, overweight and obesity have become increasingly prevalent among adults and children in the United States. Self-reported national survey data from the Behavioral Risk Factor Surveillance System (BRFSS) indicate that in the United States the percentage of adults who are obese, defined as having a body mass index (BMI) of 30 or higher, rose from 13% in 1991 to 22% in 2002. The dramatic increase in obesity has been observed in all states. In 1991 nearly every state in the nation reported that less than 15% of their adult population was obese, while no state reported obesity rates higher than 20%. By 2002, however, a majority of states reported that 20% or more of the population could be classified as obese, with no states reporting obesity rates below 15%.<sup>5</sup> (Figure 1)

In addition to the increasing percentage of adults classified as obese, 37% of adults in the United States

were classified as overweight in 2002, having BMI values between 25-29.9. When the percentages of obese and overweight individuals were combined, they totaled 59%, nearly two-thirds of the U.S. population.<sup>6</sup>

Trends in obesity and overweight among Alaskan adults parallel those found nationally. Since 1991, the percentage of Alaskan adults who are overweight or obese has increased steadily. Three-year moving averages show that 39% of Alaskan adults are classified as overweight, and an additional 23% are considered obese. When combined, these numbers indicate that 62% of Alaskan adults are above a normal weight (Figure 2).

The spread of the obesity epidemic has been equally, if not more, severe among children and adolescents. According to the Institute of Medicine, during the past three decades the rate of childhood obesity in the United States has more than doubled for children and adolescents in the 2-5 and 12-19 age groups, and has more than tripled among children aged 6-11.<sup>7</sup>

In Alaska, data from the 2003 Youth Risk Behavior Survey (YRBS) indicated that 14% of Alaskan high school boys and 8% of Alaskan high school girls were overweight, with BMI values at or above the 95th percentile for their age. An additional 15% of Alaskan high school boys and 14% of Alaskan high school girls were at-risk for becoming overweight, with BMI-for-age values between the 85th and 95th percentiles. When these numbers are combined nearly one-third of high school males and more than one-fifth of high school females were above a normal weight (Figure 3).

Although the BRFSS provides height and weight data for Alaskan adults and the YRBS provides data for high school students, less is known about the prevalence of overweight among younger children. The Anchorage School District has collected student height and weight measurements for many years. Analyzing these existing height and weight data provides an indication of the extent of childhood overweight among students in the district.

## **Methods**

Overweight and obesity are defined using BMI, an index that is calculated using height and weight measurements and is significantly correlated with levels of body fat.<sup>8</sup> The BMI does have limitations; a true measure of body fat can only be obtained through a detailed laboratory assessment of body composition. In public health settings, however, BMI is widely accepted and utilized as an indicator of body weight and adiposity.<sup>9</sup> Adults with BMI values of less than 18.5 are classified as underweight, while BMI values of 18.5 to 24.9 indicate a normal weight. Adults with BMI values from 25.0 to 29.9 are classified as overweight, while those with BMI values above 30 are considered obese.<sup>10</sup>

Among children and adolescents, different language is used to describe body weight and adiposity. BMI is the recommended indicator of weight status and body fat among children and adolescents.<sup>11</sup> However, because BMI varies by height and height changes with age, a consistent numeric cut-off point cannot be used across age groups. As a result, BMI-for-age percentiles are used to identify children and adolescents at risk for weight-related health problems.<sup>12</sup> Children and adolescents aged 2-18 with BMI-for-age percentiles at or above the 95th percentile for their age are classified as overweight. Children and adolescents with BMI values between the 85th and 95th percentiles for their age are considered at-risk for overweight. The Centers for Disease Control and Prevention (CDC) recommends that the term overweight, rather than obese, be used to describe child and adolescent weight status.<sup>13</sup>

The Anchorage School District is the largest district in the state, enrolling approximately 40% of the state's student population. School nursing staff routinely record height and weight measurements during school health screenings, the majority of which are conducted in kindergarten and 1st, 3rd, 5th, and 7th grade. Health information, including height and weight measurements, is recorded in student files and is entered into an electronic database.

Height and weight measurements for students in grades K-12 were extracted from the database and imported into SPSS. All personal identifiers were removed, and students were assigned an identification number. BMI values were computed for all students and BMI-for-age percentile values were calculated based on the reference percentiles provided by the Center for Health Statistics of the Centers for Disease Control and Prevention (Tables 1 and 2; complete growth charts available at <http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/charts.htm>). Height, weight, and BMI percentile values for five school years (1998-1999 to 2002-2003) were analyzed, along with demographic information on the age, sex, grade, and race/ethnicity of the students. Height and weight values were screened for accuracy, and values that were not biologically plausible were removed. A total of 82,839 values were reported, representing 41,261 students. Of the total 82,839 values reported, 78,303 (94%) were biologically plausible and were included in the final analysis (Table 3). The height and weight values represented 29% of total student enrollment over the five-year time period, with higher percentages for students in kindergarten and grades 1, 3, 5, and 7 (Table 4).

## **Results**

During the 1998-1999 to 2002-2003 school years, 2% of all Anchorage School District male and female students were underweight, 62% were at a normal weight, 18% were at-risk for becoming overweight, and 18% were overweight (Figure 4).

The prevalence of overweight and risk for overweight was similar among male and female students (Figure 5).

Students of a Non-White racial or ethnic background were slightly more likely to be overweight or at-risk for becoming overweight than White students (Figure 6). Slight gender variations in weight status among students of different racial and ethnic backgrounds were also evident. Among female students, White students were the least likely to be overweight or at-risk for becoming overweight, with higher rates of overweight and risk for overweight among Alaska Native and

Black students (Figure 7). A slightly different pattern was observed among male students, where the lowest prevalence of overweight and risk for overweight was found among Black males and White males (Figure 8).

The percentage of students who were overweight or at-risk for becoming overweight was high among young children and persisted with age among both male and female students (Figure 9). A similar pattern was evident when overweight and at-risk for overweight were examined separately (Figure 10). Of children entering kindergarten and 1st grade from 1998-2002, 14% were overweight and 18% were at-risk for overweight (Figure 11).

The mean BMI percentile values for students in all grades exceeded the 60th percentile beginning in 1998 and may have increased slightly over time (Figure 12).

The mean BMI percentile values of grade cohorts can be used to assess changes in groups of children over time. Results are shown for two grade cohorts. The mean BMI percentile values of the 1998 kindergarten grade cohort increased slightly between 1998 and 2002. A similar pattern was observed for the 1998 5th grade cohort (Figure 13).

We also looked at changes in weight status in children over time. Among students who were at a normal weight in 1998-1999, 20% were either overweight or at risk for becoming overweight by 2002-2003 (Figure 14). Of the students who were overweight in 1998-1999, 20% decreased their weight by 2002-2003 (Figure 15). Students who were at risk for being overweight in 1998-1999 were more likely to have become overweight by 2002-2003 than to have attained a normal weight (Figure 16).

## **Conclusion**

Over one-third of children in the Anchorage School District were overweight or at-risk for becoming overweight. White male and female students were less likely to be overweight or at-risk for overweight, a finding that is consistent with national results.<sup>14</sup> The percentage of students aged 3-5 years who were

overweight or at-risk for overweight was nearly as high as the corresponding percentage of older students, indicating that weight status is already a concern for many students when they first enter school. Some students changed from one weight category to another over time, although a majority had the same weight classification in 2002-2003 as they did in 1998-1999. Students who were at-risk for overweight in 1998-1999 were more likely to gain weight by 2002-2003 than to lose weight (Table 5).

There are limitations that must be considered when interpreting these data. Height and weight measurements were not collected through a statistically valid sampling procedure but were obtained as part of the routine school health screening process. The available measurements for the 5-year time period, however, represented 29% of students enrolled in all grades. Because health examinations are conducted primarily in kindergarten, first, third, fifth, and seventh grade, height and weight measurements were available for a higher percentage of students in those grades. Measurements were available for over half of the students enrolled in kindergarten, first, third, fifth, and seventh grades for the five-year time frame, with recorded data for up to 90% of students in some grades during an individual year. Because efforts were made to screen all students in the district, it is unlikely that the high prevalence of overweight and risk of overweight is due to a selection bias that resulted in the disproportionate selection of students from groups at high risk for being overweight or at-risk for overweight.

Variations in height and weight measurement may have occurred. The school district has a written protocol for height and weight measurement, and it is made available to school health staff. However, the district did not have the staff or financial resources to guarantee that the measurement procedures were followed at each school. Currently, schools use different types of measurement equipment, and multiple staff members are involved in the measurement process. While the variations in procedure and equipment could result in measurement error, it is unlikely that they could be responsible for systematic over-estimation of weight status.

In spite of the study limitations, the results of this analysis indicate that there is reason to be concerned about the weight status of children in the Anchorage School District and to develop strategies to address this problem. Because a majority of students remained in the same weight category over time, efforts should be made to prevent students from becoming overweight or at-risk for overweight.

To address the high prevalence of overweight and risk for overweight among students, the Anchorage School District is enhancing its capacity for height and weight surveillance. Standardized equipment will be installed in each school, and school nurses will be trained in its use. Training will emphasize the importance of obtaining and recording valid, reliable height and weight measurements. Data analysis will be continued so that trends can be monitored over time.

Schools can also play an important role in supporting physical activity and healthy nutrition among students. As the Institute of Medicine notes, “Both inside and outside of the classroom, schools present opportunities for students to learn about healthful eating habits and regular physical activity; engage in physical education; and make food and physical activity choices during school meal times and through school-related activities.”<sup>15</sup>

The fact that a high percentage of students are overweight or at-risk for overweight when they enter school, however, indicates that prevention efforts cannot wait until children enter the school system. Rather, they need to involve the families, health care providers, and community members that interact with children at a young age. The individuals and groups who are involved in efforts to prevent childhood overweight will also play an important role in implementing strategies to treat students who are already overweight or at risk. The observed racial and ethnic disparities in prevalence should be considered when designing interventions, and strategies should be culturally appropriate.

Prevention and treatment strategies will need to target a variety of audiences and should complement efforts

to address obesity and overweight among adults. Overweight and obesity are already taking a substantial toll on the health and economy of Alaska. Based on current national estimates, obesity kills nearly 500 Alaskans each year.<sup>16</sup> In addition, direct medical expenditures for obesity alone are estimated to total \$195 million each year in Alaska.<sup>17</sup> It is imperative that action be taken now to keep these costs from growing.

Table 1. Classification of Adult and Youth Weight Status

| <u>Adults (BMI Values)</u>  | <u>Youth (BMI-for-age percentiles)</u>   |
|---|--|
| <ul style="list-style-type: none"> <li>• Underweight<br/>    &lt;18.5</li> <li>• Normal Weight<br/>    18.5-24.9</li> <li>• Overweight<br/>    25.0-29.9</li> <li>• Obese<br/>    ≥ 30</li> </ul> | <ul style="list-style-type: none"> <li>• Underweight<br/>    ≤ 5<sup>th</sup> percentile</li> <li>• Normal Weight<br/>    5<sup>th</sup>-85<sup>th</sup> percentile</li> <li>• At-risk for Overweight<br/>    85<sup>th</sup>-95<sup>th</sup> percentile</li> <li>• Overweight<br/>    ≥ 95<sup>th</sup> percentile</li> </ul> |

Table 2. Body Mass Index Reference Data

| Age* | Males            |                  | Females          |                  |
|------|------------------|------------------|------------------|------------------|
|      | 85 <sup>th</sup> | 95 <sup>th</sup> | 85 <sup>th</sup> | 95 <sup>th</sup> |
| 3    | 17.10            | 17.98            | 16.95            | 18.09            |
| 4    | 16.85            | 17.83            | 16.76            | 18.08            |
| 5    | 16.89            | 18.12            | 16.91            | 18.49            |
| 6    | 17.17            | 18.73            | 17.32            | 19.20            |
| 7    | 17.64            | 19.55            | 17.93            | 20.13            |
| 8    | 18.25            | 20.53            | 18.67            | 21.20            |
| 9    | 18.97            | 21.57            | 19.51            | 22.35            |
| 10   | 19.76            | 22.64            | 20.39            | 23.52            |
| 11   | 20.57            | 23.69            | 21.27            | 24.66            |
| 12   | 21.4             | 24.67            | 22.13            | 25.74            |
| 13   | 22.23            | 25.59            | 22.94            | 26.75            |
| 14   | 23.03            | 26.42            | 23.68            | 27.66            |
| 15   | 23.8             | 27.18            | 24.34            | 28.49            |
| 16   | 24.55            | 27.88            | 24.92            | 29.25            |
| 17   | 25.27            | 28.57            | 25.43            | 29.95            |
| >18  | 25.98            | 29.3             | 25.87            | 30.64            |

Source: Kuczmarski RJ, Ogden CL, Gummer-Strawn LM, et al. CDC Growth Charts: United States. Advance data from Vital and Health Statistics; no. 314, Hyattsville, Maryland: National Center for Health Statistics. 2000.

\*Percentiles evaluated at mid-point for age.

Table 3. Initial and Final Sample Composition:  
Anchorage School District Students 1998-2003

| Academic Year           | Missing Component | <3 or >19 years old | Biologically Implausible | Age/Grade Inconsistency | Height Reversal | Full and Acceptable Values | Total        |
|-------------------------|-------------------|---------------------|--------------------------|-------------------------|-----------------|----------------------------|--------------|
| 1987-1988/<br>1995-1996 | 0                 | 0                   | 25                       | 21                      | 1               | 133                        | 178          |
| 1996-1997               | 1                 | 0                   | 9                        | 4                       | 0               | 275                        | 289          |
| 1997-1998               | 7                 | 1                   | 26                       | 12                      | 3               | 1111                       | 1160         |
| <b>1998-1999</b>        | <b>59</b>         | <b>4</b>            | <b>92</b>                | <b>52</b>               | <b>85</b>       | <b>7725</b>                | <b>8017</b>  |
| <b>1999-2000</b>        | <b>59</b>         | <b>35</b>           | <b>200</b>               | <b>91</b>               | <b>196</b>      | <b>13437</b>               | <b>14018</b> |
| <b>2000-2001</b>        | <b>60</b>         | <b>218</b>          | <b>245</b>               | <b>311</b>              | <b>111</b>      | <b>14315</b>               | <b>15260</b> |
| <b>2001-2002</b>        | <b>68</b>         | <b>297</b>          | <b>322</b>               | <b>310</b>              | <b>227</b>      | <b>17451</b>               | <b>18675</b> |
| <b>2002-2003</b>        | <b>62</b>         | <b>385</b>          | <b>386</b>               | <b>244</b>              | <b>208</b>      | <b>20708</b>               | <b>21993</b> |
| 2003-2004               | 6                 | 15                  | 44                       | 31                      | 3               | 3148                       | 3247         |
| 2029                    | 0                 | 0                   | 0                        | 1                       | 0               | 0                          | 1            |
| 2033                    | 0                 | 0                   | 0                        | 1                       | 0               | 0                          | 1            |
| Total                   | 322               | 955                 | 1349                     | 1076                    | 834             | <b>78303</b>               | 82839        |
| Study %                 | 0.4%              | 1.2%                | 1.6%                     | 1.3%                    | 1.1%            | 94.4%                      | 94.1%        |

Table 4. Proportion of Students Sampled by Grade:  
Anchorage School District Students 1998-2003

|               | PE  | KG  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9  | 10  | 11  | 12 | Total |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|----|-------|
| 1998/<br>1999 | 5%  | 13% | 40% | 2%  | 50% | 2%  | 42% | 2%  | 32% | 1%  | 0% | 0%  | 0%  | 0% | 15%   |
| 1999/<br>2000 | 35% | 65% | 49% | 13% | 64% | 10% | 61% | 12% | 44% | 13% | 1% | 1%  | 0%  | 0% | 26%   |
| 2000/<br>2001 | 23% | 72% | 50% | 10% | 68% | 10% | 65% | 9%  | 51% | 8%  | 6% | 5%  | 0%  | 0% | 28%   |
| 2001/<br>2002 | 21% | 80% | 56% | 13% | 75% | 11% | 71% | 12% | 62% | 16% | 5% | 34% | 1%  | 0% | 34%   |
| 2002/<br>2003 | 46% | 90% | 57% | 15% | 83% | 12% | 81% | 14% | 72% | 12% | 6% | 54% | 17% | 0% | 40%   |
| Total         | 26% | 64% | 50% | 11% | 68% | 9%  | 64% | 10% | 52% | 10% | 4% | 19% | 4%  | 0% | 29%   |

## Table 5. Anchorage School District Data Conclusions

- 32% of students were overweight or at-risk for becoming overweight when they enter kindergarten and/or first grade
- 36% of students were overweight or at-risk of overweight
- Percentage of students who were overweight or at-risk for overweight appears to have increased slightly over time
- Over time, students who were at-risk for overweight were more likely to become overweight than to attain a normal weight

Figure 1. Obesity Trends Among US Adults

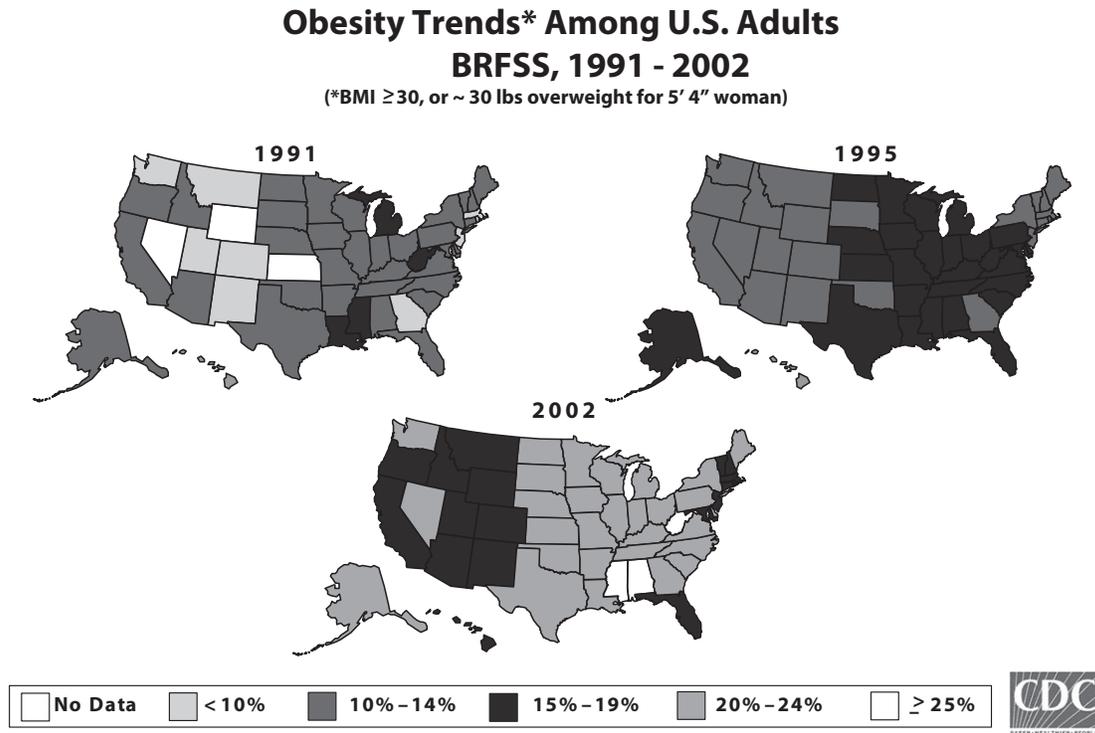


Figure 2. Trend in Percentage of Adults Who Are Overweight (BMI 25-29.9), Obese (BMI 30+) Alaska BRFSS, 1991-2003 (3-Year Moving Averages)

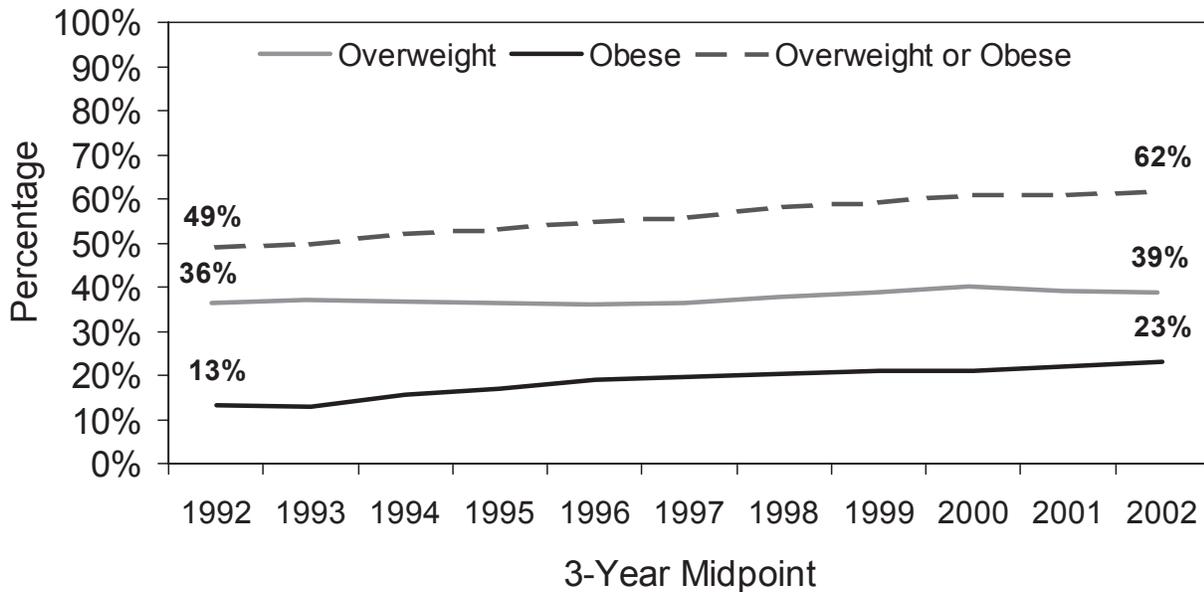


Figure 3. Alaskan High School Students Who Are Overweight or At-Risk for Becoming Overweight  
YRBS 2003

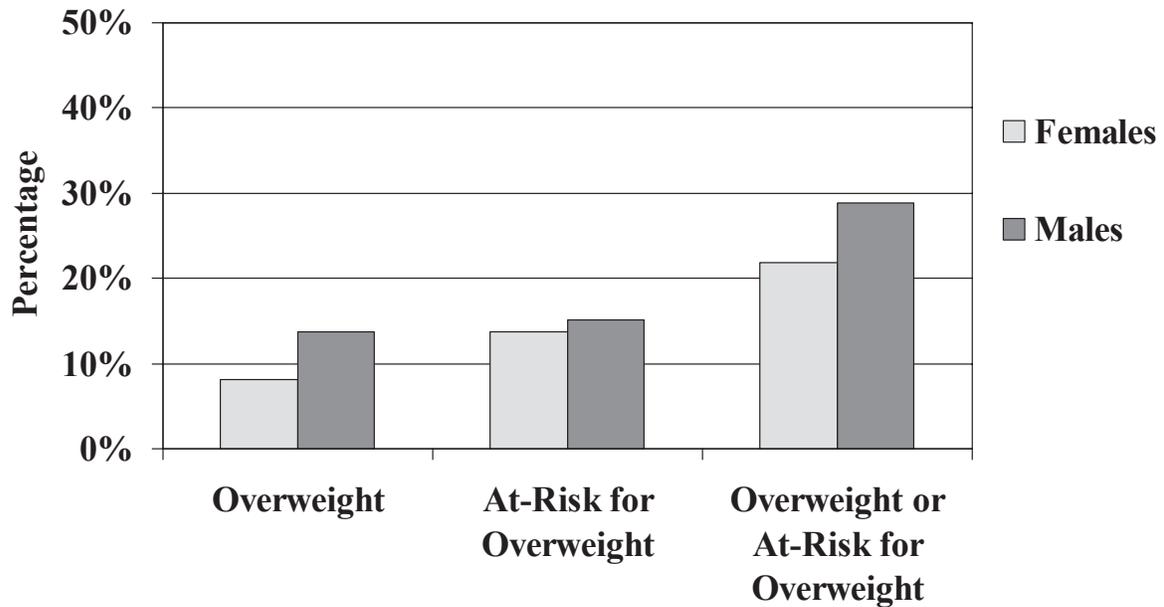


Figure 4. BMI Status for Anchorage School District Students, 1998-1999 – 2002-2003

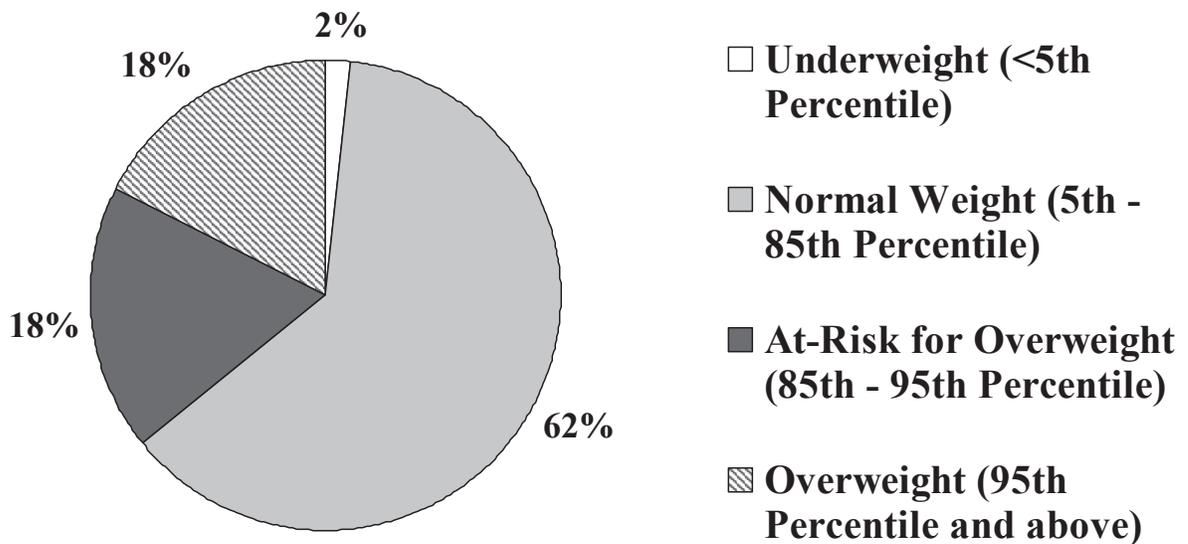


Figure 5. BMI Status for Female and Male Students, Anchorage School District 1998-2003

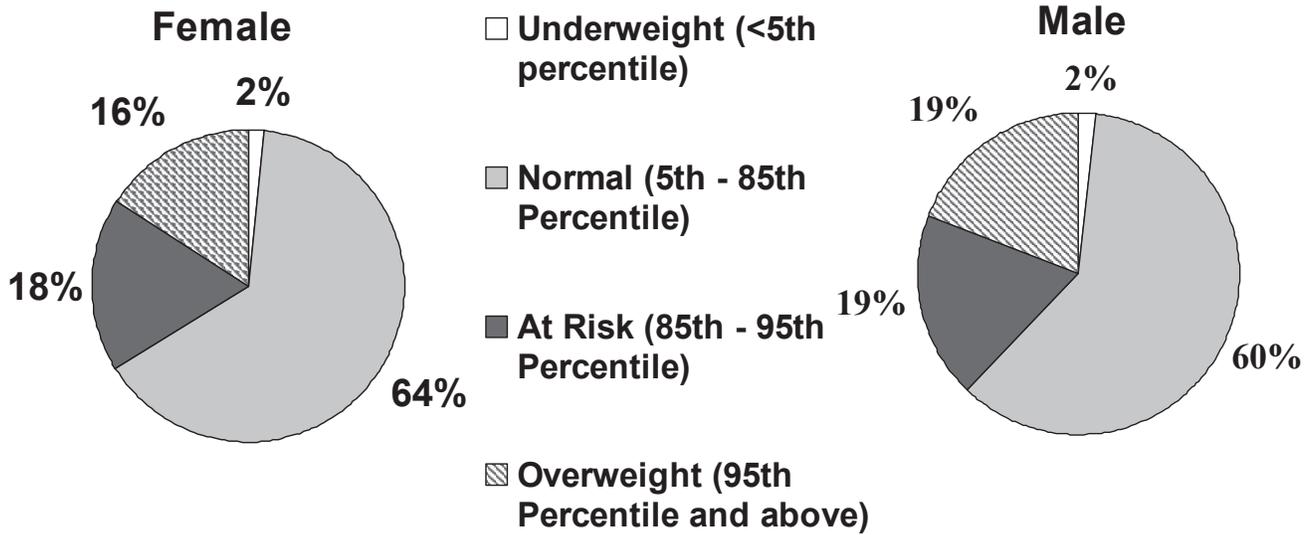


Figure 6. Percentage of Students Overweight/At-Risk of Overweight, By Race/Ethnicity and Sex Anchorage School District Students, 1998-2003

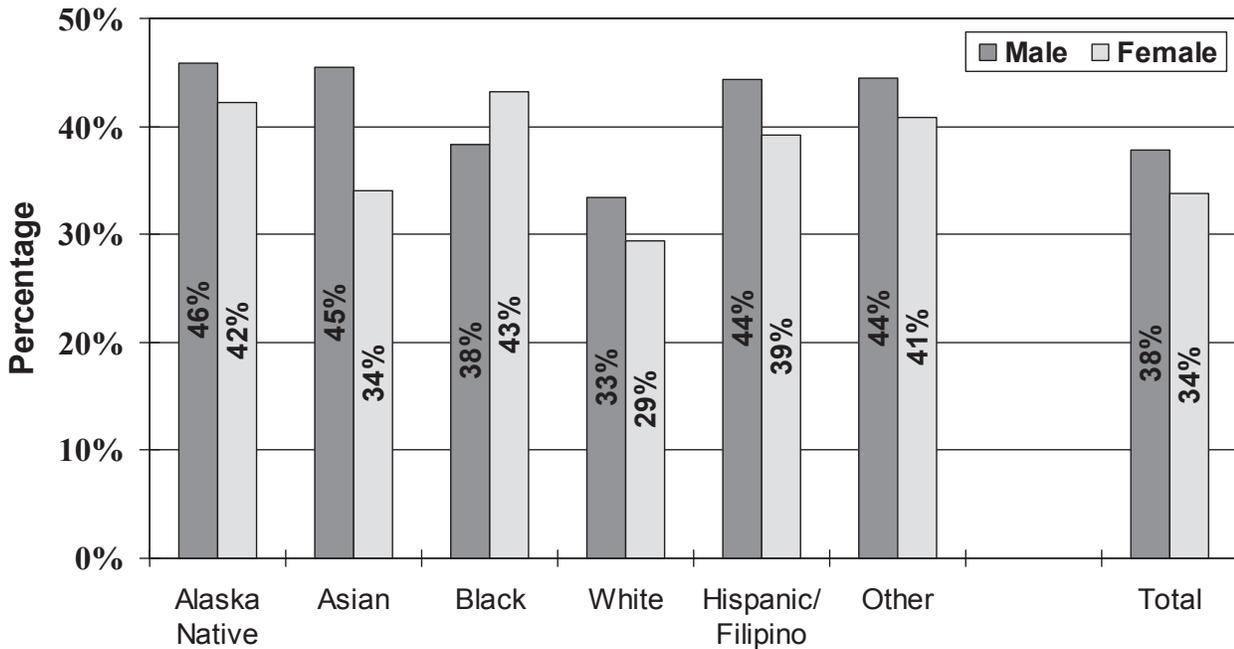


Figure 7. Anchorage School District Female Students At-Risk for Overweight and Overweight: 1998-2003

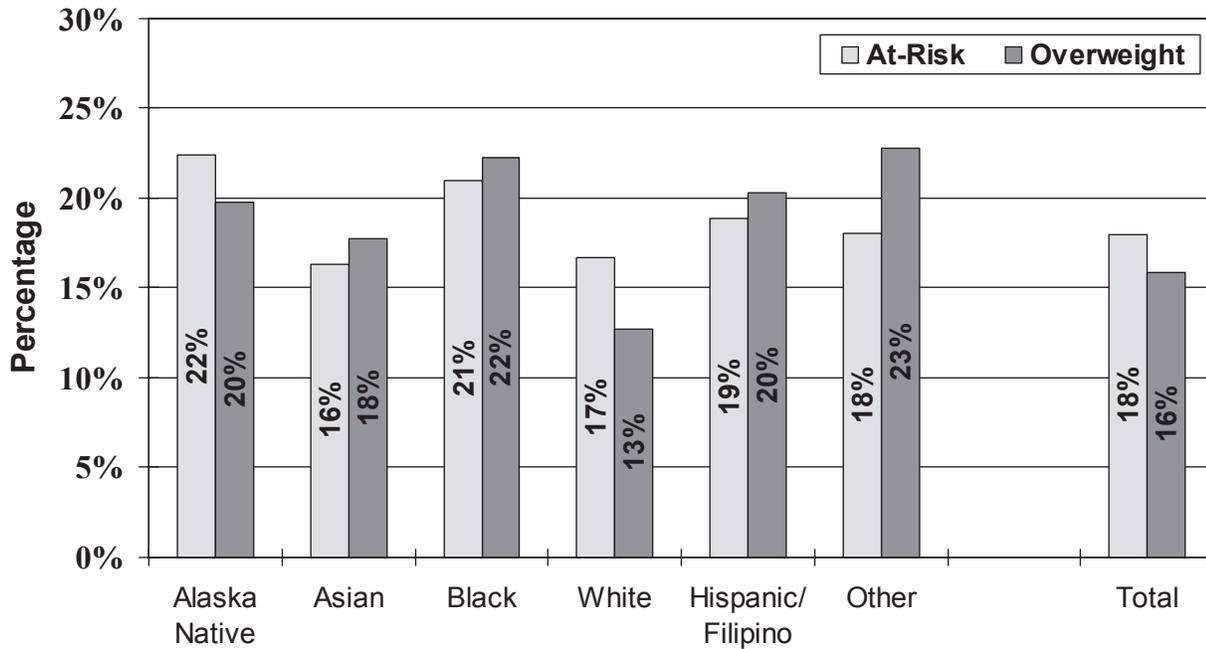


Figure 8. Anchorage School District Male Students At-Risk for Overweight and Overweight: 1998-2003

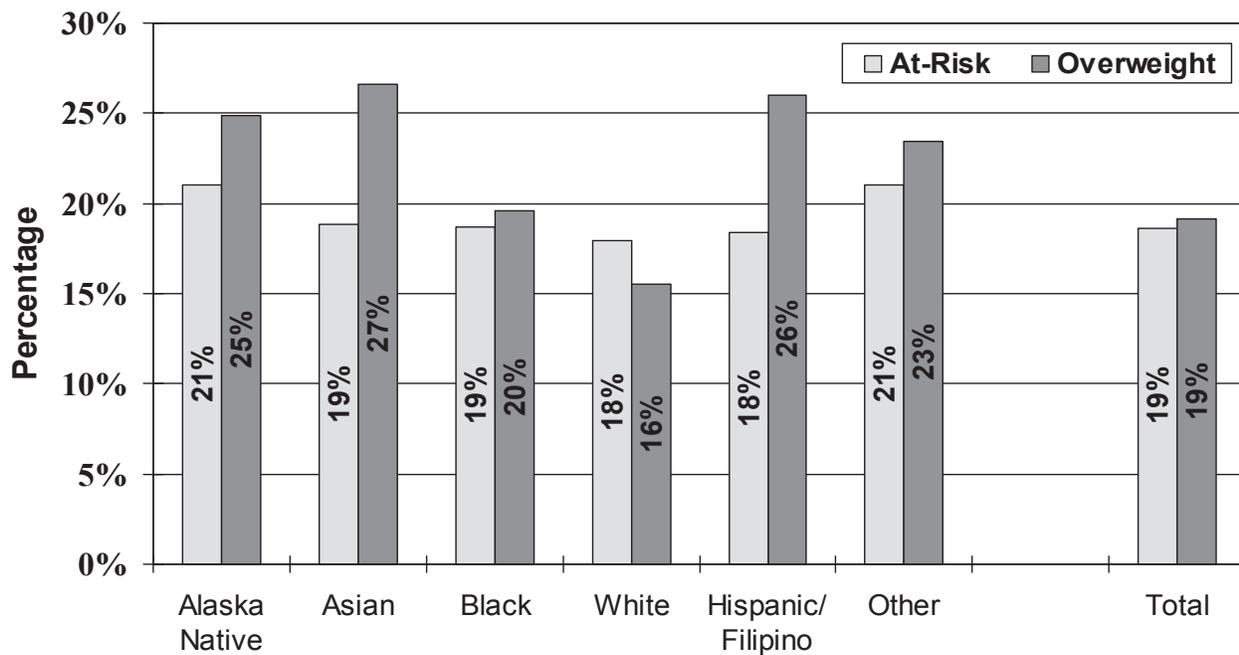


Figure 9. Percentage of Students Overweight/At-Risk of Overweight, By Age and Sex Anchorage School District Students, 1998-2003

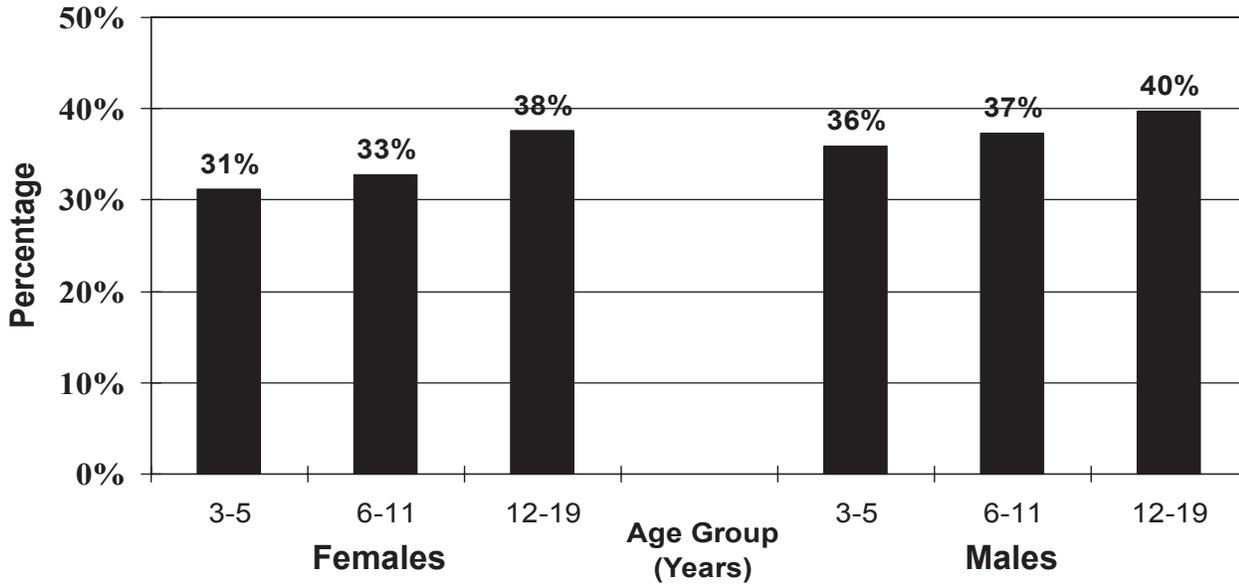


Figure 10. BMI Status By Age and Sex Anchorage School District Students, 1998-2003

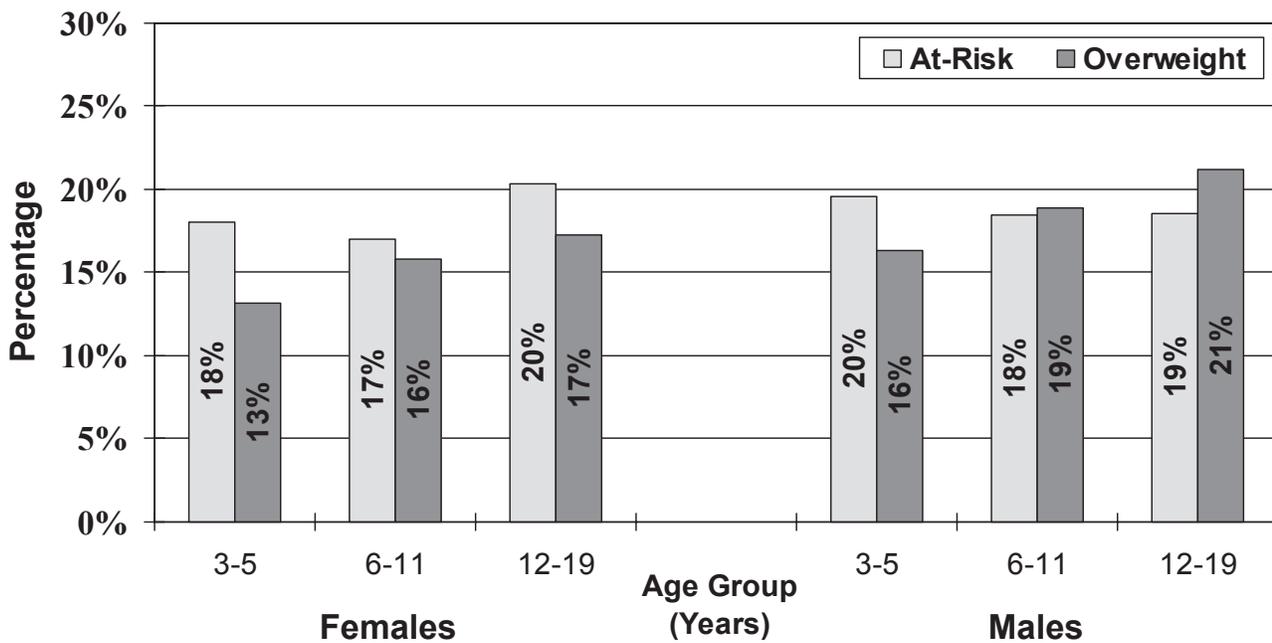


Figure 11. BMI Status of Kindergarten and First Grade Students: Anchorage School District 1998-2003

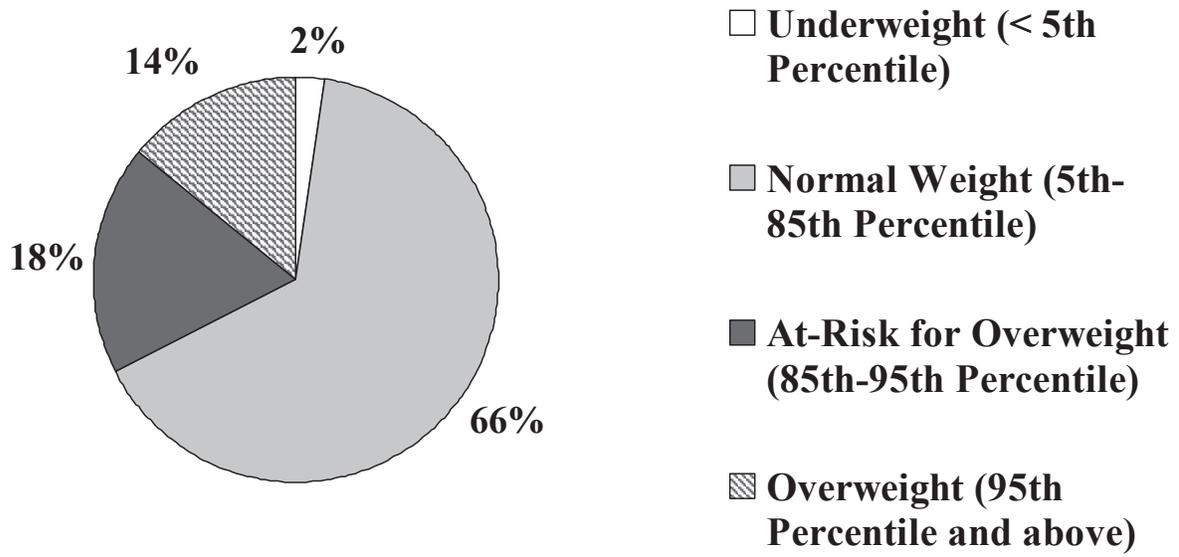


Figure 12. Mean BMI Percentile by Grade 1998/1999 – 2002/2003

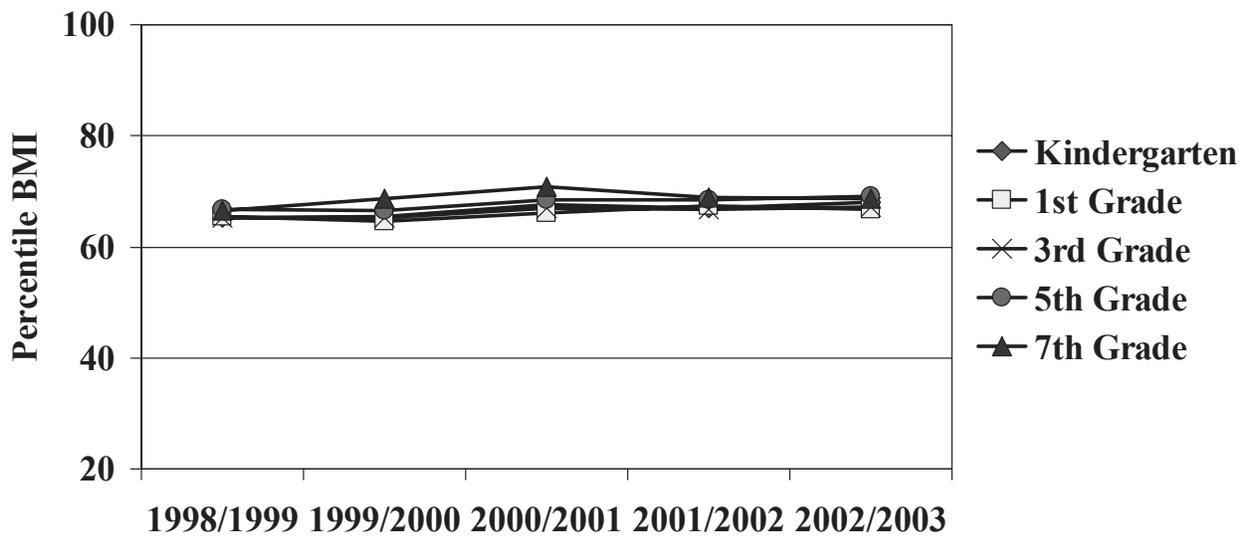


Figure 13. Mean BMI Percentile for 2 Grade Cohorts  
1998-2003

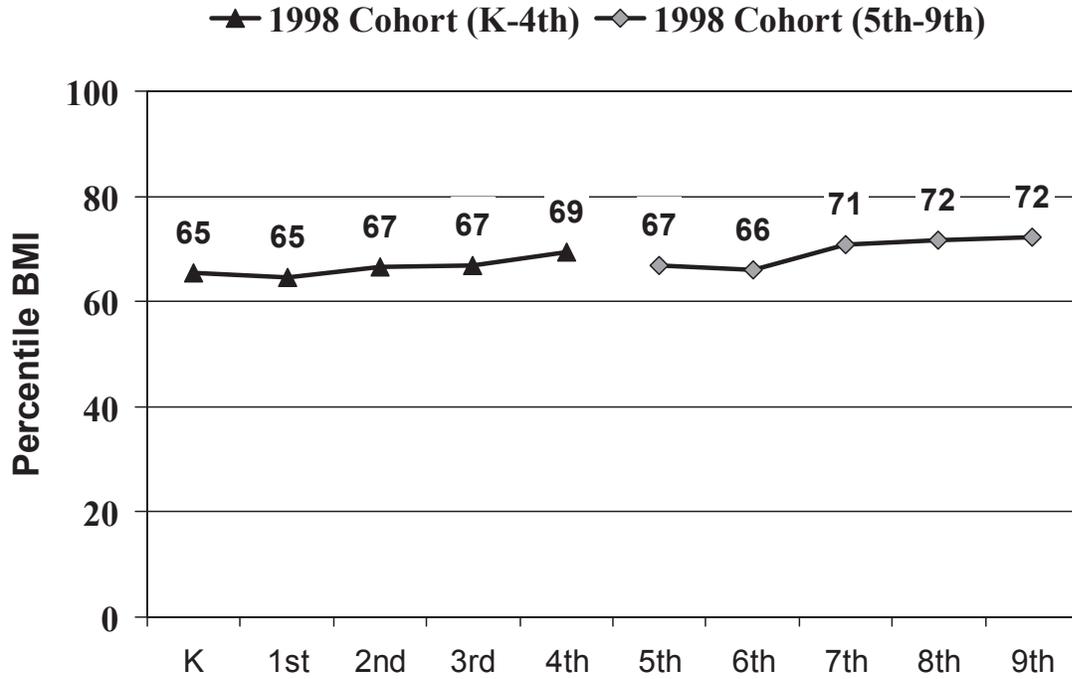
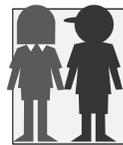


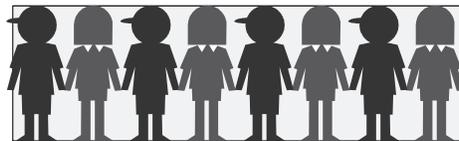
Figure 14. Change in Weight Status Among Normal Weight Students 1998-1999 – 2002-2003, Male and Female Students of All Ages

**Normal Weight  
in 1998-1999**

**Change in Weight Status  
by 2002-2003**



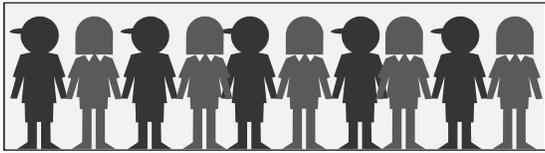
**20% Increased**



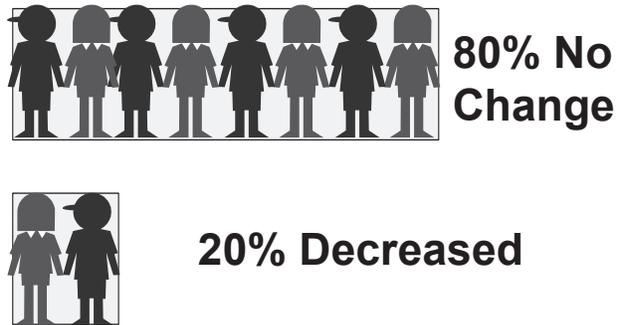
**80% No  
Change**

Figure 15. Change in Weight Status Among Overweight Students 1998-1999 – 2002-2003, Male and Female Students of All Ages

**Overweight in 1998-1999**



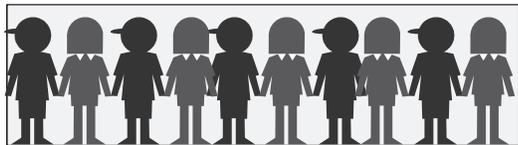
**Change in Weight Status by 2002-2003**



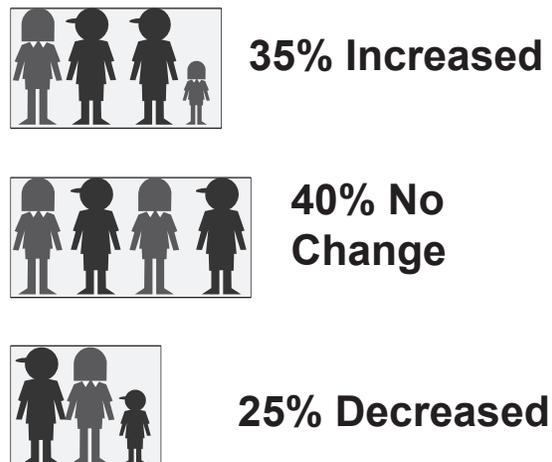
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Figure 16. Change in Weight Status Among Students At-Risk for Overweight, 1998-1999 – 2002-2003, Male and Female Students of All Ages

**At-Risk for Overweight in 1998/1999**



**Change in Weight Status by 2002/2003**



## References (Endnotes)

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