

**Prevalence of Overweight among Children and Youth in
Mississippi: A Comparison between 2003 and 2005**

Prepared for:

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INTRODUCTION

Obesity among children and youth has become a primary focus of attention among public health officials in Mississippi, particularly in light of the associated risks between overweight and chronic disease. Many studies have suggested that childhood overweight will offset recent strides made in public health and raise a generation of Americans with chronic diseases (1-4).

In 2003, the Child and Youth Prevalence of Overweight Survey (CAYPOS) found 24.0% of students in grades 1 through 8 in Mississippi to be overweight, and another 14.7% at risk for becoming overweight (5). With the exception of sixth grade, there was a trend of increasing prevalence of overweight by grade (17.5% in grade 1 compared with 31.3% in grade 8). In the 2003 CAYPOS, 25.2% of students in grades 6 through 8 were found to be overweight, compared with 18.5% in the 2003 Youth Risk Behavior Survey (YRBS).

While the prevalence is not as high as in local studies, existing data on national estimates of overweight among children and adolescents appear to be increasing. The most recent National Health and Nutrition Examination Survey (NHANES) found significant increases in the prevalence of overweight among children and youth between 1999 and 2004 (6). In 2004, 17.1% of children and adolescents were overweight, compared to 13.9% in 1999.

In 2005, the national YRBS found that prevalence for overweight among U.S. high school students had increased from 10.7% in 1999 to 13.1% in 2005 (7). To date, local estimates of the prevalence of overweight, which appear higher than national estimates, have not been compared over time to determine whether they are also

increasing. Further, while nationally the prevalence appears to be increasing over previous decades, one might question whether the lack of significant difference in the YRBS study of children and adolescents (between 2003 and 2005) suggests that the prevalence is leveling off. To address both concerns, the purpose of the 2005 CAYPOS was to estimate the prevalence of overweight among children and youth in Mississippi and compare these findings to those from the 2003 CAYPOS (5).

METHODS

The sampling frame for the 2005 CAYPOS consisted of 490,000 students in 882 public schools offering kindergarten and/or any of grades 1 through 12 in Mississippi. As with the 2003 study, a two-stage stratified probability sampling design was employed so that every student had an equal chance of selection, thereby, improving the precision of the estimates (refer to #5 for more detail).

The 2005 CAYPOS was conducted in March and April of that year in Mississippi. The study received continued institutional review board approval through the Human Subjects Committee at The University of Southern Mississippi, as the study protocol matched the 2003 CAYPOS (5). Once selected schools agreed to participate and classes were chosen, measuring equipment (i.e., digital scales and stadiometers), forms for gathering data, and passive consent forms were delivered to the schools. Each school had a designated school nurse who was responsible for conducting data and who was trained on the use of equipment. Two or three days prior to data collection, students in the selected classes were read a prepared paragraph containing information about the study. Each student was given a passive consent form to take home to parents or guardians; any student returning a signed passive consent form did not participate in the study. There

were no consequences for nonparticipation, nor was there a reward for participation (see #5 for more detail).

DATA ANALYSIS

As in the 2003 CAYPOS, Body Mass Index (BMI) was computed for each responding student based on height (in meters) and weight (in kilograms). Three students were excluded from BMI analysis because of missing weight or height. For the remaining 3,308 records, BMI was calculated using the SAS program, gc-calculate-BIV.sas as follows: $BMI = \text{Weight (in kg)} / [\text{Height (in m)}]^2$ (8,9). BMI values were checked to ensure that the results were biologically plausible, using the limits developed by the Division of Nutrition and Physical Activity, Centers for Disease Control and Prevention (CDC). BMI percentiles were also computed using the SAS program, gc-calculate-BIV.sas (8).

Data from the 2000 CDC gender-specific, BMI-for-age growth charts were used to determine BMI percentiles for individuals. Children were classified into four categories: (1) underweight (BMI is less than or equal to 5th percentile), (2) normal weight (BMI is greater than 5th- but less than 85th percentile), (3) at risk for being overweight (BMI is equal to or greater than 85th- but less than 95th percentile) and (4) overweight (BMI is equal to or greater than 95th percentile) (10).

The analysis used SUDAAN 9.01 (RTI, Research Triangle Park, NC, 2004) to calculate weighted estimates and standard errors. Proc Crosstab Procedure was used to compare prevalence of child overweight among different subgroups. Differences between summary statistics were considered statistically significant if the associated 95% confidence intervals (CIs) did not overlap.

RESULTS

Characteristics of Participants from the 2005 CAYPOS

Seventy of the 95 schools sampled participated in the study (74%). The student response rate was 94% (3,308 usable records/3,537 eligible sampled students). Thus, the overall response rate was 70% (product of school response rate and student response rate), which was above the threshold of 60% required to obtain weighted estimates. The final sample consisted of 3,308 students in grades kindergarten through twelve, including 1,624 males (49%) and 1,678 females (51%) and 1,776 nonwhites (55%) and 1,500 (45%) whites (Table 1). For this report, the category nonwhite can be considered synonymous with African American because 95% of nonwhite students were African American. The number of students in other race categories was too small for separate analysis.

Overweight by Subgroups from the 2005 CAYPOS

Among students in grades K through 12, 25.5% were overweight (Table 2). Another 18.4% were at risk for becoming overweight, giving a combined total of 43.9% of students at or above the 85th percentile of BMI-for-age. The proportion of overweight students was similar among female (25.9%) and male (25.2%) students.

One-quarter (25.0%) of students in grades K - 5 (elementary) schools were overweight, with another 18.0% at risk of becoming overweight. The combined total of 43.0% was slightly higher than high school students (41.6%), where 23.5% were overweight and 18.1% were at risk of becoming overweight. Middle school students had the highest prevalence of overweight (28.9%) and at risk for becoming overweight (19.4%), with a combined prevalence of 48.3%.

Comparison of 2005 and 2003 CAYPOS

In 2005, prevalence for all students in grades 1-8 that were at risk for becoming overweight was 18.7%, compared to 14.7% in 2003. The prevalence of overweight increased from 24.0% in 2003 to 27.1% in 2005. When examined separately by school level, prevalence for at risk of overweight and overweight increased in both elementary and middle school groups between 2003 and 2005. In grades 1-5, prevalence of at risk of overweight increased from 14.4% to 18.3%, while the prevalence of overweight increased from 23.3% to 26.1% (these results are not shown in table). Similar increases were observed in grades 6-8, with the prevalence of at risk of overweight increasing from 15.2% to 19.4% and the prevalence of overweight increasing from 25.2% to 28.9%. Despite the apparent increases, these differences were not statistically significant. Table 3 presents a comparison of the percentages of overweight and at risk for overweight among students in grades 1 – 8.

Between 2003 and 2005, except for students in third grade, the percent of students at risk for becoming overweight increased in each grade. The prevalence decrease in third grade was not statistically significant. Except for students in fifth and eighth grade, the percent of overweight have increased. The prevalence increase on overweight for sixth grade was statistically significant.

DISCUSSION

Data from the 2005 CAYPOS suggest that the prevalence of overweight (25.5%) and at-risk for overweight (18.4%) among students in grade K – 12 are higher than other local prevalence reported in Arkansas, Texas, and New York (11-13). In addition, the percent of overweight in Mississippi school children in grades 1-8 has increased from

24.0% in 2003 to 27.1% in 2005. The percent for at risk of becoming overweight increased from 14.7% to 18.7% during the same period. Unlike local estimates in Arkansas, these data suggest that the prevalence of overweight and at-risk for overweight are not declining or leveling off in Mississippi.

Although discouraging, it is not surprising to see a percentage of overweight and at risk of overweight of 37.0% in Kindergarten students. Previous research in a New York City WIC population found a combined percent of 45.2% in 4 year olds (14). When comparing overweight and at risk of overweight within the current study, percentages gradually increased from Kindergarten, with the peak in 7th grade (54.9%). Grades 4, 5, and 6 had combined prevalence of overweight and at risk of overweight of approximately 50%.

In addition to finding differences between grade levels, our 2005 study found differences in weight status based on race and gender. Similar to our 2003 results, nonwhite students had a higher prevalence of overweight (27.4%) than the white students (22.9%) in both gender groups. These results are also similar to findings in Arkansas and Texas, where nonwhites and females had higher percentages of overweight (11,12).

The American Academy of Pediatrics recommends calculating and plotting BMI once a year in all children and adolescents to identify rate of excessive weight gain relative to linear growth (15). In 2004, this policy was adopted for the entire state of Arkansas, where all public school students were measured and BMI was calculated. In the first two years of the program, no increases were seen in the prevalence of overweight and at risk of overweight. Although it cannot be concluded that the mandatory BMI screening was the reason for the stabilized weights of the children, such findings are very

encouraging (11). It would be interesting to note if similar results would be seen if Mississippi were to adopt the same policy.

It must be noted that the current research included only public school students in grades K-12. It may be valuable to extend the research into private schools. Also, since it appears that weight issues begin at a very early age, research is needed to establish the prevalence among pre-school students. With all of these recommendations in mind, it is important to note that this research achieved its initial objective of obtaining and comparing BMI data on public school students in the state of Mississippi. Without this information, it will be impossible to determine if future interventions will be effective in halting the problem of childhood overweight.

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Table 1. Characteristic of Participants, CAYPOS, Grades K-12, Mississippi, 2005

| Characteristic | Unweighted count | Weighted percent |
|-----------------------|-------------------------|-------------------------|
| Gender ^a | | |
| Male | 1,624 | 49.0 |
| Female | 1,678 | 51.0 |
| Race ^b | | |
| White | 1,500 | 44.9 |
| Nonwhite | 1,776 | 55.1 |
| Grade ^a | | |
| Elementary | 1,743 | 52.4 |
| K | 313 | 9.7 |
| 1st | 331 | 9.6 |
| 2nd | 194 | 5.5 |
| 3rd | 326 | 10.1 |
| 4th | 355 | 10.6 |
| 5th | 224 | 7.0 |
| Middle school | 771 | 22.0 |
| 6th | 310 | 9.1 |
| 7th | 137 | 4.1 |
| 8th | 324 | 8.8 |
| High school | 788 | 25.6 |
| 9th | 262 | 8.3 |
| 10th | 218 | 6.8 |
| 11th | 209 | 7.1 |
| 12th | 99 | 3.3 |

^aData on gender and grades were missing for 9 of the 3,311 students in grades K-12.

^bData on race were missing for 35 of the 3,311 students. Ninety-five percent of nonwhite students were African American.

Table 2. Percentage of Overweight and At Risk of Overweight by Selected Factors, CAYPOS, Grades K-12, Mississippi, 2005

| Characteristic | At Risk for Overweight^a (95% CI)^c | Overweight^b (95% CI) |
|-----------------------|--|--|
| Gender | | |
| Male | 18.6 (16.8 - 20.4) | 25.2 (23.0 - 27.4) |
| Female | 18.1 (15.7-20.5) | 25.9 (22.6 - 29.2) |
| Race | | |
| White | 17.7 (15.5-19.9) | 22.9 (20.4 - 25.4) |
| Nonwhite ^d | 18.8 (17.2 - 20.4) | 27.4 (24.5 - 30.3) |
| Grade | | |
| Elementary (K-5) | 18.0 (16.2 - 19.8) | 25.0 (22.3 – 27.7) |
| Middle school (6-8) | 19.4 (16.5-22.3) | 28.9 (24.8-33.0) |
| High school (9-12) | 18.1 (15.9-20.3) | 23.5 (20.6-26.4) |
| Total | 18.4 (17.0 - 19.8) | 25.5 (23.3 - 27.7) |

^aBody mass index (BMI) \geq 85th percentile and $<$ 95th percentile for age and gender.

^bBody mass index (BMI) \geq 95th percentile for age and gender.

^c95% confidence interval.

^dNinety-five percent of nonwhite students were African American.

Table 3. Comparison of Percentage of Overweight and At Risk for Overweight Among Students with Grades 1-8 from the CAYPOS by Gender, Race, and Grade, Mississippi, 2003 and 2005

| Characteristic | At Risk for Overweight | | Overweight | |
|-----------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| | 2003 CAYPOS % (95% CI) | 2005 CAYPOS % (95% CI) | 2003 CAYPOS % (95% CI) | 2005 CAYPOS % (95% CI) |
| Gender | | | | |
| Male | 12.2 (9.9-14.6) | 19.2 (17.1-21.4) | 26.4 (22.5-30.4) | 26.3 (23.7-29.1) |
| Female | 17.3 (14.8-19.7) | 18.3 (15.6-21.3) | 21.5 (19.0-24.0) | 27.8 (24.3-31.6) |
| Race | | | | |
| White | 15.5 (13.0-18.0) | 18.5 (15.7-21.7) | 21.9 (18.3-25.5) | 24.5 (21.2-28.1) |
| Nonwhite | 13.8 (11.0-16.7) | 18.7 (16.5-21.1) | 26.2 (22.9-29.5) | 29.1 (25.2-33.4) |
| Grade | | | | |
| 1 | 9.4 (6.1-12.6) | 21.5 (16.3-26.7) | 17.5 (12.9-22.1) | 20.6 (14.4-26.8) |
| 2 | 10.5 (7.8-13.2) | 13.3 (9.0-17.6) | 21.2 (14.7-27.8) | 21.9 (15.3-28.5) |
| 3 | 18.6 (13.7-23.5) | 15.7 (12.1-19.3) | 24.2 (18.2-30.2) | 26.2 (19.6-32.8) |
| 4 | 17.1 (12.5-21.8) | 17.9 (14.0-21.8) | 25.4 (20.6-30.2) | 32.2 (25.9-38.5) |
| 5 | 16.4 (9.7-23.1) | 23.0 (19.7-26.3) | 28.3 (21.2-35.4) | 27.5 (22.1-32.9) |
| 6 | 17.7 (11.9-23.5) | 17.8 (15.1-20.5) | 16.9 (9.7-24.0) | 32.9 (26.7-39.1) |
| 7 | 15.7 (11.9-19.6) | 20.5 (12.6-28.4) | 27.7 (24.1-31.2) | 34.4 (27.2-41.6) |
| 8 | 11.9 (6.1-17.8) | 20.6 (17.4-23.8) | 31.3 (24.4-38.2) | 22.3 (17.7-26.9) |
| Total | 14.7 (12.8-16.6) | 18.7 (17.0-20.6) | 24.0 (21.6-26.4) | 27.1 (24.4-29.9) |