OHIO DEPARTMENT OF HEALTH

A Report on the Body Mass Index of Ohio's Third Graders
2004–2010

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Governor

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Letter from the Director of Health

For the half-million children and adolescents in Ohio struggling with their weight, childhood is no longer a carefree time. These children face health issues that have, until recently, been reserved for their parents and grandparents.

Diabetes, high blood pressure and high cholesterol are now prevalent in childhood, and obese children are less likely to succeed in school and have higher rates of depression than their peers. In fact, some obese children rate their quality of life as low as children receiving chemotherapy for cancer.

Experts from both the health care and public health fields have been searching for ways to prevent more children from becoming an unhealthy weight and to help those already struggling. While there is no question that behavior changes, such as beginning a walking program or reducing the amount of soda you drink, can have a positive impact on your health, recent research has found that a significant amount of the obesity epidemic can be attributed to unhealthy environments – those places we live, learn, work and play in every day.

For example, certain neighborhoods, including some urban and rural communities in Ohio, a child's risk for being overweight or obese is almost 40 percent, almost 10 percent higher than children in other communities. Many Ohioans live far from a store that sells fruits and vegetables or low fat dairy products but instead are surrounded by corner markets and fast-food restaurants selling only inexpensive foods low in nutritional value. Schools are struggling to maintain high teaching standards with limited budgets and are challenged to find the time or resources to offer physical activity and healthy food options. Many people live outside of public transit lines and work or go to school too far from where they live to walk or bike, while others live in neighborhoods without safe streets or safe places for children to play.

The Ohio Department of Health (ODH) recognizes these barriers as opportunities to improve the health of all Ohioans through changing the policies, systems and environments in communities, schools, workplaces, and health care to better support healthy behaviors. Programs such as WIC Farmers' Markets, Child and Family Health Services grants, Ounce of Prevention is Worth a Pound, and Creating Healthy Communities grants are just a few of the ways ODH mobilizes stakeholders to come together to strengthen communities by addressing the underlying causes of illness and disease. ODH also partners with the Ohio Department of Education and schools across the state to support the work of school nurses and health practitioners and to enhance our schools' ability to address the non-academic factors that influence student success.

This report is the result of collaborations between ODH and many schools throughout Ohio. Through surveillance programs such as this one, we can make informed decisions based on important indicators of health to more effectively address the needs of the most vulnerable communities in Ohio. Working together, we can all use this opportunity to create healthy communities that empower families to make healthy decisions and give all of Ohio's children the chance to lead healthy lives.

Sincerely,

Theodore E. Wymyslo MD

Theodore E. Wymyslo, MD
Director of Health

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Letter from the Superintendent of Public Instruction

As educators, it is imperative we provide the supports necessary so that all students realize success regardless of certain nonacademic barriers. Students face a multitude of social, emotional and physical issues and the more we learn about these inhibitors, the better equipped we are to address and eliminate them.

The health and emotional consequences of obesity, for example, can greatly affect a child's ability to achieve in school. Our schools are in a unique position to make a positive impact on childhood obesity by creating environments that promote health and wellness. Policies that provide opportunities to learn and practice healthy behaviors enhance the supports currently offered at the local level. I applaud the many educators who have worked to develop strategies and implement programs that improve the health and nutrition of Ohio's students. I recognize that schools alone cannot eradicate obesity. We all share responsibility for creating programs for our children that promote health and exercise, prevent obesity, and provide intervention and support for children who come to school substantially overweight.

The Ohio Department of Education (ODE) pledges to support Ohio schools as they develop health and wellness programs. As part of this commitment, ODE offers resources and tools for food and nutrition education as well as a web-based promising practices database. ODE uses this online tool to collect and present successful nutrition and wellness activities, projects and programs around our state.

The Ohio Department of Health's 3rd grade BMI Report, used with other health information, can help schools and their county partners determine where to implement policies, guidance and programs that can combat the obesity epidemic affecting our children's physical, social, emotional and academic health.

Every student deserves an opportunity for success and the chance to fulfill his or her aspirations. It will take the collaboration of families, community partners and local health agencies to reverse the childhood obesity epidemic, and ODE is proud to support these efforts. Collectively, we can make an impact on their lives and future.

Sincerely,

Deborah S. Delisle

Deborah S. Delisle
Superintendent of Public Instruction

Introduction to Childhood Obesity

Childhood obesity is one of the most important public health issues in Ohio with more than **30 percent** of children and adolescents classified as overweight or obese.

Executive Summary

Many sources of information are used to guide and evaluate state and local efforts to safeguard and enhance the health of Ohio's communities. Much of this information is gained through the collection, analysis, and interpretation of public health data. Emerging as one of the most requested and needed types of data is body mass index (BMI). BMI data collected for surveillance purposes have been used to establish baselines, monitor trends and in some instances, evaluate the impact of interventions targeted to reduce obesity. The data collected by the Ohio Department of Health (ODH) as part of the ODH BMI surveillance program helps to inform decision makers and guides the development of public health policy. This executive summary provides an overview of the report's major findings on state and county level overweight and obesity prevalence among Ohio's 3rd graders.

In comparing the data collected in 2004-05 and 2009-10 we observed:

- No changes in overweight or obesity prevalence.
- More than 1/3 of Ohio's 3rd graders remain overweight/obese, falling short of the Healthy People 2010 national objective for obesity among children aged 6 to 11 years.
- Ten counties with significantly lower overweight/obesity prevalence between 2004-05 and 2009-10.
- Eight counties with significantly higher overweight/obesity prevalence between 2004-05 and 2009-10.

In Ohio in 2009-10:

- Non-Hispanic black and Hispanic children were significantly more overweight or obese compared to non-Hispanic white children.
- Children residing in Appalachian counties had significantly higher overweight or obesity prevalence compared to children residing in any other county type.
- Low income children were significantly more likely to be obese compared to other children.
- Overweight and obesity prevalence was greatest among children with a higher consumption of sugar-sweetened beverages, with children drinking more than one sugar-sweetened beverage per day having the highest overweight and obesity prevalence.
- Children who drank the most sugar-sweetened beverage per day in Ohio include non-Hispanic black and Hispanic children, children living in Appalachian counties, and low income children.
- Children watching three or more hours of TV per day had a higher prevalence of overweight/obesity compared to children who watched less.

This report represents a comprehensive look at the state of obesity for Ohio's 3rd grade children. Though overall rates of overweight and obesity for these children have not increased in five years, they have not decreased either. Our data highlights a number of areas requiring action. Evidence-based strategies to improve the policies, systems and environments that impact healthy behaviors should be focused on those populations at highest risk, as identified in this report. Such strategies include:

- Increasing access to fresh fruits and vegetables and limiting exposure to unhealthy options
- Improving access to safe and attractive places to play
- Reducing television and screen time use and exposure
- Reducing consumption of sugar-sweetened beverages

In communities where BMI surveillance is also a local effort, it is important to encourage collaboration with schools and local and state health departments to ensure data quality and coordination efforts with ODH's BMI surveillance program.

Introduction

Childhood obesity has become one of the most important public health issues in the United States with more than 30 percent of children and adolescents classified as overweight or obese. Ohio is not immune to this crisis with a quarter of low income preschool-aged children and more than one third of all 3rd graders identified as overweight or obese. Recognizing the severity of the problem and the need for quality data, the Ohio Department of Health (ODH) responded in 2004 by developing a state implemented surveillance program thereby directly measuring heights and weights of 3rd grade children to gain a better understanding of the magnitude of childhood obesity within Ohio and its 88 counties.

The goal of the 3rd grade Body Mass Index (BMI) surveillance program is to make comprehensive estimates on overweight/obesity prevalence at both state and county levels. Such data has been essential for making comparisons with the rest of the nation and within the state to determine those populations at highest risk. The development of Ohio's state level surveillance program enables ODH to monitor rates of obesity while ensuring the reliability of the data through a standardized data collection process. Although it would be ideal to measure all children within each school across the state, resources are not available for implementing such a comprehensive, ongoing surveillance system. ODH is committed to ensuring that elevated BMI in children, a problem of high national and state importance, continues to be monitored efficiently and effectively. However, due to financial constraints it is necessary to find the balance between the frequency of data collection and available resources for successful surveillance program implementation.

In an effort to find that balance, ODH has collected state level data annually since 2004 with county level data collected every five years. In order to generate representative estimates at the state level, only approximately 30 elementary schools are needed. Conversely, county level estimates require more than 350 schools to ensure a sample that is representative of each of Ohio's 88 counties. Larger sampling, as is needed to generate county level estimates, requires more staff time and resources than is possible on an annual basis. Alternating county and state level data collection is necessary to minimize costs, while still providing information that communities can use to inform their local policies and interventions.

Many communities have initiated BMI data collection initiatives to have data specific to their own community. Data collected at the community level is important information for local policy and health officials to use in planning, implementing, and evaluating public health interventions and programs. However, it is important to recognize that the level at which surveillance occurs will impact how the data can be interpreted. Data collected in a single school district is useful in providing information for that school district only. If local communities wish to compare data across school districts within the county, care must be taken to ensure that the data collection process is standardized with a sufficient number of school buildings and participating children. Without a rigorous data collection design, such as the one currently implemented by ODH, caution must be used when comparing information.

This report represents the second implementation of a county-wide data collection effort. As in 2004-05, in 2009-10 public elementary schools were randomly selected from across the state to participate in the 3rd grade Oral Health/BMI survey resulting in 377 participating schools and 15,362 children (see Appendix A for a more detailed description of the survey).

This report provides the following: (a) trends in 3rd grade overweight and obesity prevalence across all five years of BMI surveillance; (b) 2009-10 statewide overweight and obesity estimates overall and by sex, race/ethnicity, county type, and eligibility in the free and reduced-price meal program; (c) overweight and obesity prevalence by sugar-sweetened beverage consumption and television viewing behavior; and (d) 2009-10 county level overweight/obesity estimates for each of Ohio's 88 counties.

Surveillance versus Screening: What is the difference?

Both BMI surveillance and screening data provide valuable, but different, health information. BMI screening is used to identify children at risk for weight-related problems and includes referral for additional testing or follow-up, similar to vision and hearing screenings in schools. Many communities and school districts in Ohio have long recognized the value of individual BMI screenings and elected to add BMI screenings to existing health screenings offered to students. In an effort to promote state wide BMI screenings of school aged children Ohio adopted the Healthy Choices for Healthy Children Act (HCHC) legislation to support individual BMI screenings for school aged children.

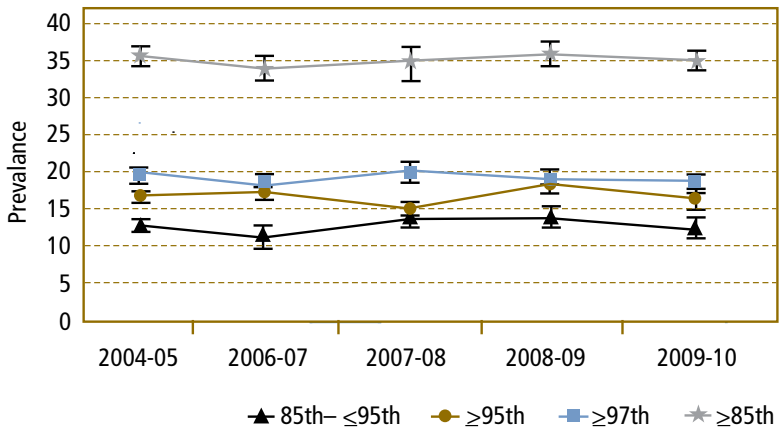
The HCHC, also known as Ohio Senate Bill 210, became law on June 18, 2010. The act contains several provisions to help schools play an active role in helping to improve childhood obesity rates over the next several years by increase physical activity, ensure access to healthy meals and beverages, and identify those students most at risk for overweight and obesity to ensure proper follow up with a health care practitioner for a complete evaluation.

ODH's 3rd grade BMI surveillance program provides data that is essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those responsible for disease prevention and control. Surveillance provides ODH and other public health professionals with data to monitor trends and changes in a population that can be used to develop and implement policies and strategies on improving child health. ODH is committed to providing ongoing BMI surveillance across the state.

Results

Figure 1

Trends in overweight and obesity among Ohio 3rd graders, 2004-2010



In Ohio, between 2004-05 and 2009-10, there were no significant changes in the prevalence of overweight, obesity, obese level 2 or combined overweight/obesity (Figure 1; Table 1). These are similar to recent national trends. Specifically, national data among children aged 2-19 years indicate no significant change in high BMI (≥97th percentile, ≥95th percentile, or ≥85th percentile) between 2003-04 and 2005-06 and no significant trends between 1999 and 2006.[1]

Notes: Standard error bars represent 95% confidence intervals; Overweight: 85th-≤95th percentile; Obese: ≥95th percentile; Obese Level 2: ≥97th percentile; Overweight/obese: ≥85th percentile

Table 1

Overweight and obesity among Ohio 3rd Graders, 2004-2010

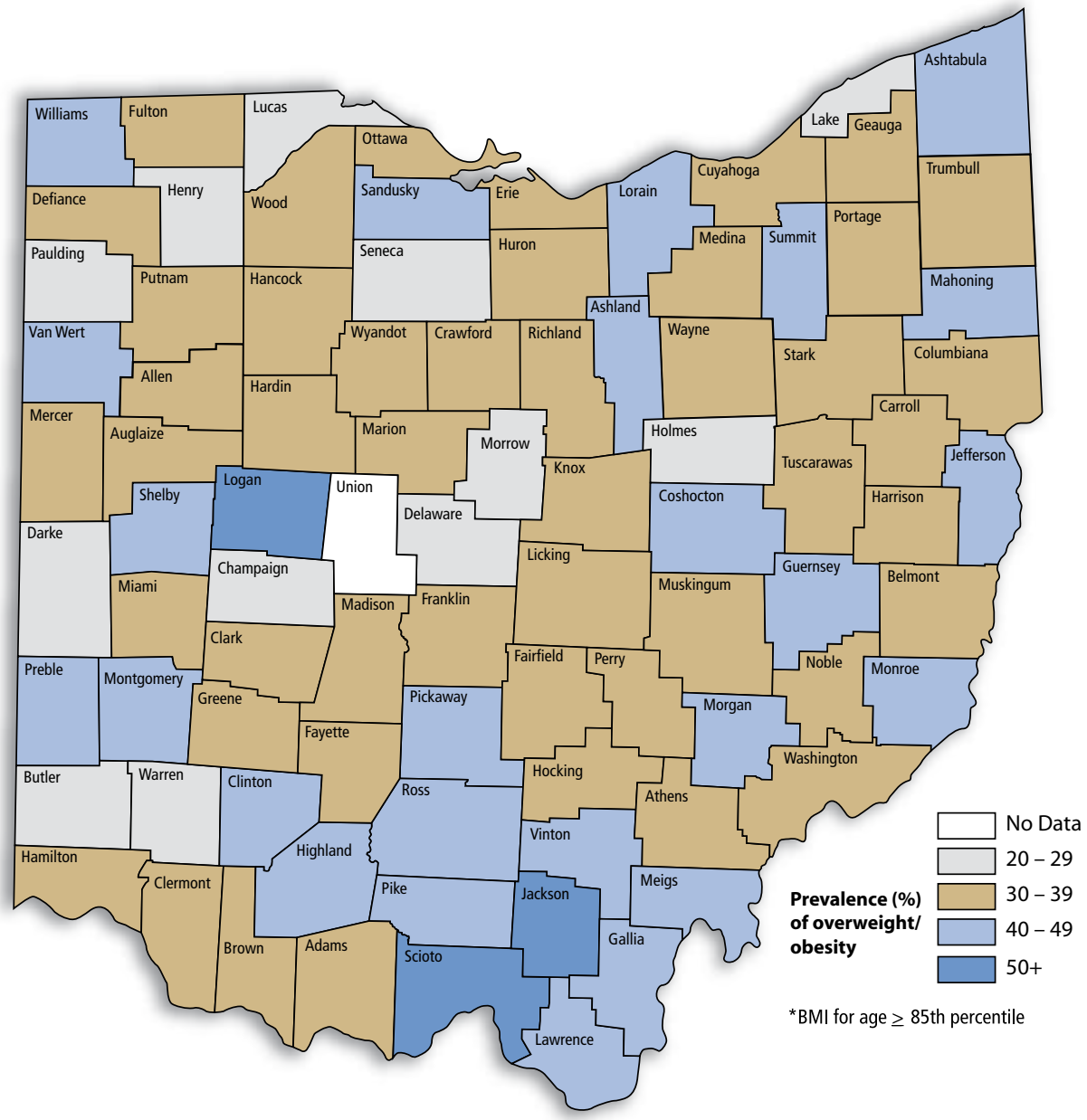
Year	85th -<95th percentile	≥95th percentile	≥97th percentile	≥85th percentile
2004-05	16.7 (15.7-17.7)	18.9 (17.5-20.3)	13.4 (12.3-14.6)	35.6 (33.9-37.3)
2006-07	17.7 (15.1-20.6)	16.6 (14.2-19.4)	11.5 (9.5-13.7)	34.3 31.4-37.4)
2007-08	14.9 (12.9-16.9)	19.7 (16.7-22.7)	13.4 (10.7-16.7)	34.6 (30.4-39.1)
2008-09	17.4 (15.1-19.8)	18.5 (15.5-21.5)	13.6 (11.3-16.2)	35.9 (32.5-39.5)
2009-10	16.3 (15.4-17.4)	18.3 (16.7-20.2)	12.5 (11.2-13.8)	34.7 (32.9-36.5)

The most recent national data from 2007-08 indicate that among children aged 6-11 years, 35.5 percent (95% CI: 32.4-38.7) were overweight/obese, with 19.6 percent (95% CI: 17.1-22.2) of those children being obese.[2] Comparatively, in 2009-10 Ohio had a lower proportion of overweight/obesity (34.7 percent (95% CI: 32.9-36.5)) and a lower proportion of obesity (18.3 percent (95% CI: 16.6-20.2)) (Table 1). Despite being lower than the national prevalence, Ohio 3rd graders are still above the Healthy People 2020 national objective for obesity among children aged 6 to 11 years (15.7 percent).[3]

Note: Prevalence estimate (95% confidence interval)

Figure 2

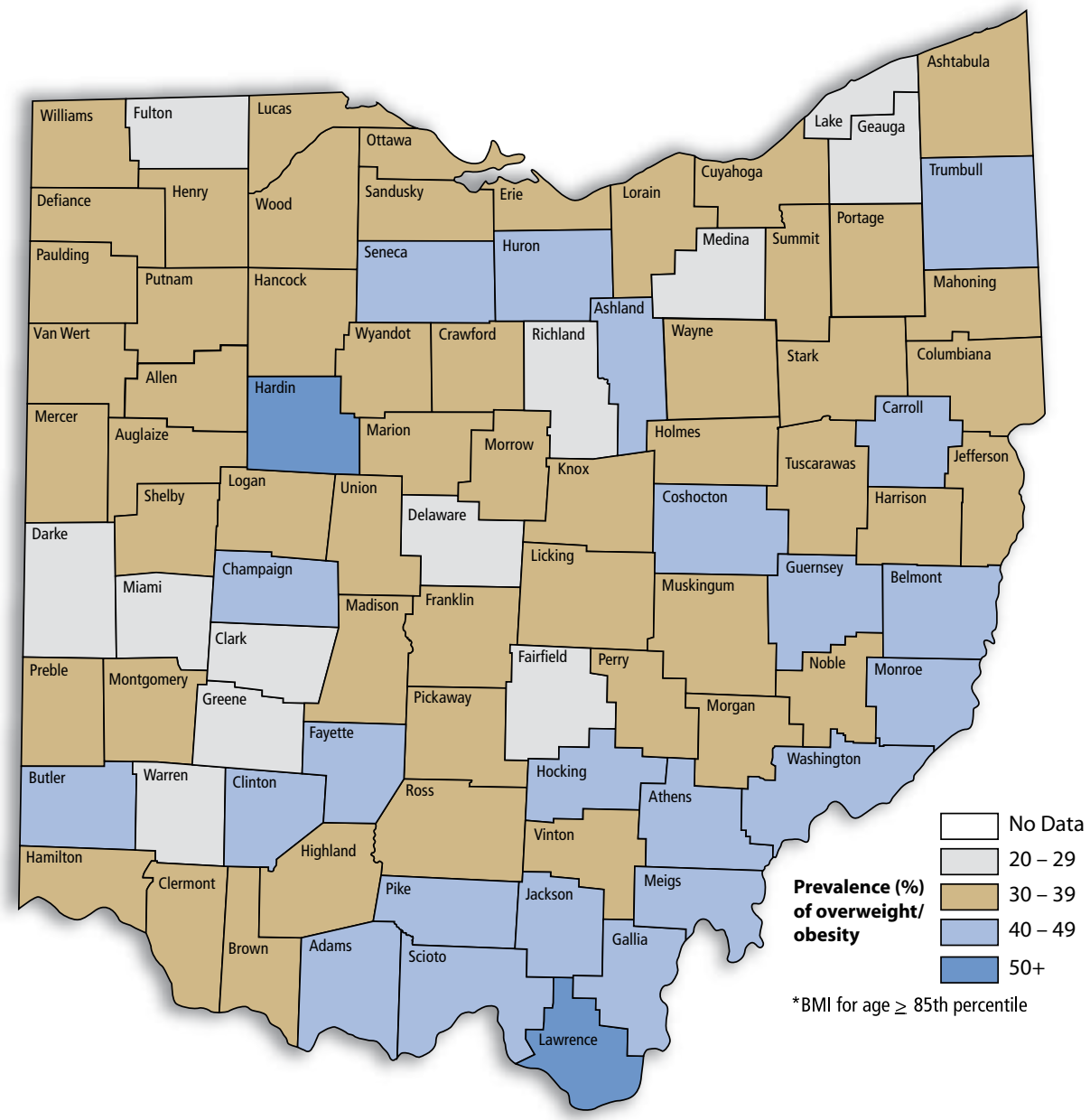
Overweight and obesity among Ohio 3rd graders by county, 2004-05



Note: Prevalence 2004-05 = 35.6%

Figure 2B

Overweight and obesity among Ohio 3rd graders by county, 2009-10

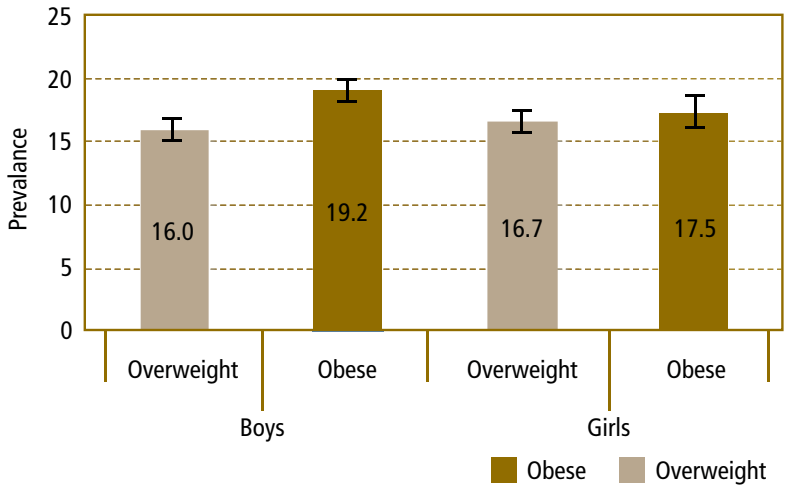


In Ohio between 2004-05 and 2009-10 we observed 10 counties with significantly lower overweight/obesity prevalence between 2004-05 and 2009-10, and eight counties with significantly higher overweight/obesity prevalence (For specific county estimates, see Appendix B).

Note: Prevalence 2009-10 = 34.7%

Figure 3

Overweight and obesity among Ohio 3rd graders by sex, 2009-10

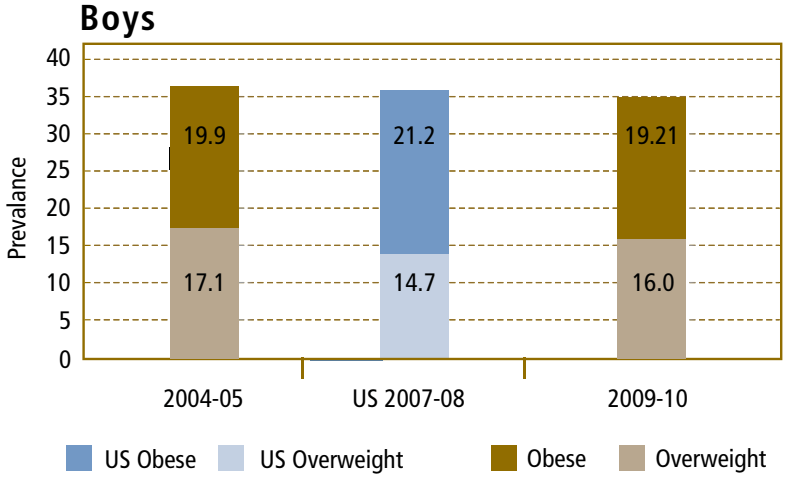


In Ohio in 2009-10, there were no significant differences in overweight or obesity prevalence by sex (Figure 3).

Note: Standard error bars represent 95% confidence intervals

Figure 4

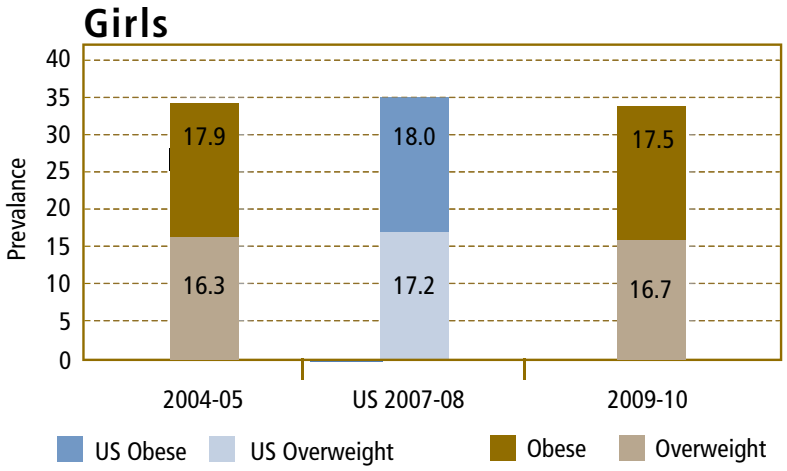
Overweight and obesity among Ohio 3rd grade boys, 2004-05 vs. 2009-10



Between 2004-05 and 2009-10, there were no differences in overweight or obesity prevalence among Ohio 3rd grade boys (Figure 4). Nationally in 2007-08 among boys aged 6-11 years, 35.9 percent (95% CI: 30.1-41.6) were overweight/obese, with 21.2 percent (95% CI: 17.9-24.6) being obese.[2] In 2009-10, Ohio boys had an approximately similar proportion of overweight/obesity (35.2 percent (95% CI: 33.1-37.4)), and a lower proportion of obesity (19.2 percent (95% CI: 17.4-21.0)).

Figure 5

Overweight and obesity among Ohio 3rd grade girls, 2004-05 vs. 2009-10

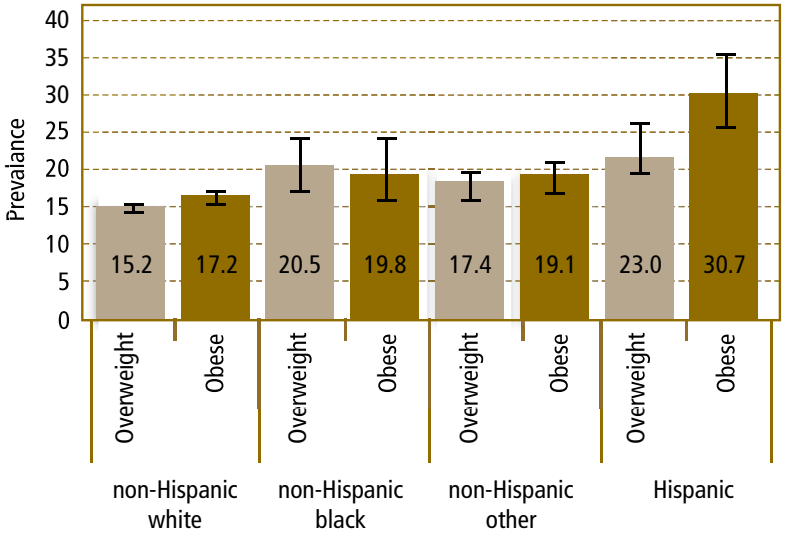


Between 2004-05 and 2009-10, there were no changes in overweight or obesity prevalence among Ohio 3rd grade girls (Figure 5). Nationally in 2007-08 among girls aged 6-11 years, 35.2 percent (95% CI: 29.5-40.8) were overweight/obese, with 18.0 percent (95% CI: 13.6-22.4) being obese.[2] In 2009-10, Ohio girls had a lower proportions of overweight/obesity (34.1 percent (95% CI: 31.8-36.5)) and obesity (17.5 percent (95% CI: 15.3-19.9)).

Substantial racial/ethnic disparities exist in obesity nationally. Specifically, Hispanic boys and non-Hispanic black girls are disproportionately affected by overweight and obesity.[2] Since the 1970s, among 6-11 year old children, black children have experienced the greatest increases in overweight and obesity.[4]

Figure 6

Overweight and obesity among Ohio 3rd graders by race/ethnicity, 2009-10

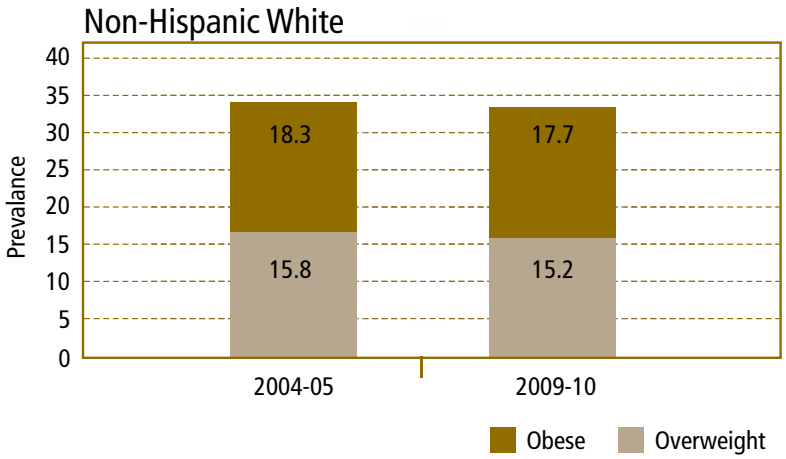


In Ohio in 2009-10, there were significant differences overall by race/ethnicity ($p<0.01$). Non-Hispanic black and Hispanic children were significantly more overweight or obese compared to non-Hispanic white children (Figure 6). National data indicate that substantial racial/ethnic disparities exist in obesity. Specifically, Hispanic boys and non-Hispanic black girls are disproportionately affected by obesity.[2]

Notes: Standard error bars represent 95% confidence intervals; Non-Hispanic other includes the following: Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native

Figure 7

Overweight and obesity among Ohio 3rd grade non-Hispanic white students, 2004-05 vs. 2009-10



Data from 2004-05 and 2009-10 by race/ethnic group show no significant changes in overweight or obesity were observed (Figures 7-10).

Figure 8

Overweight and obesity among Ohio 3rd grade non-Hispanic black students, 2004-05 vs. 2009-10

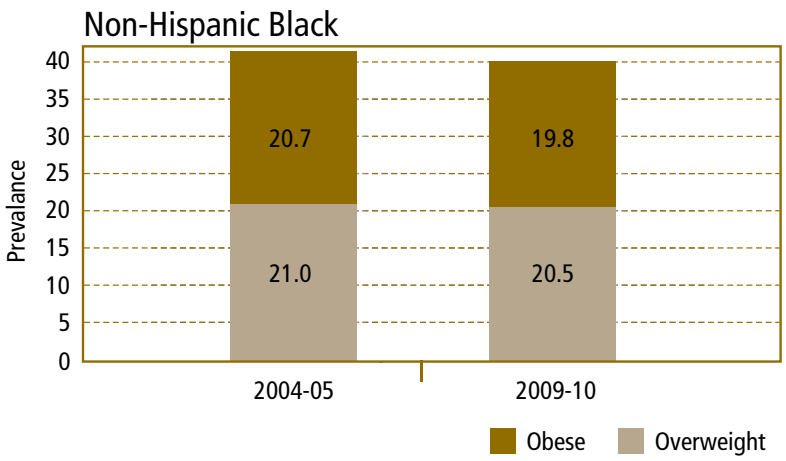


Figure 9

Overweight and obesity among Ohio 3rd grade non-Hispanic other students, 2004-05 vs. 2009-10

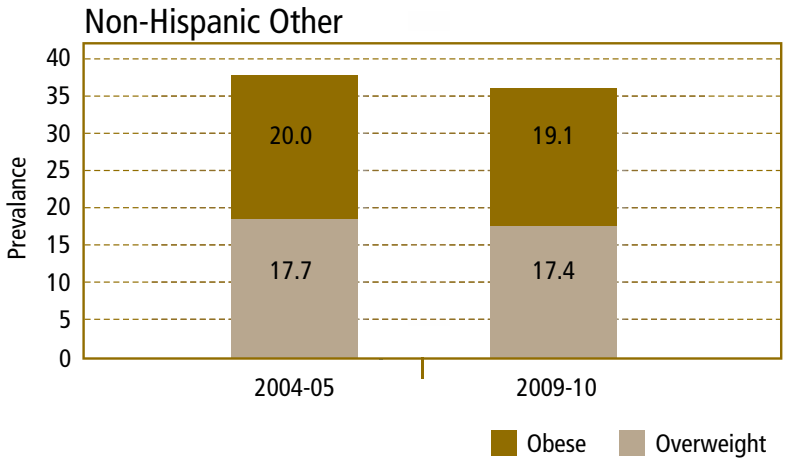
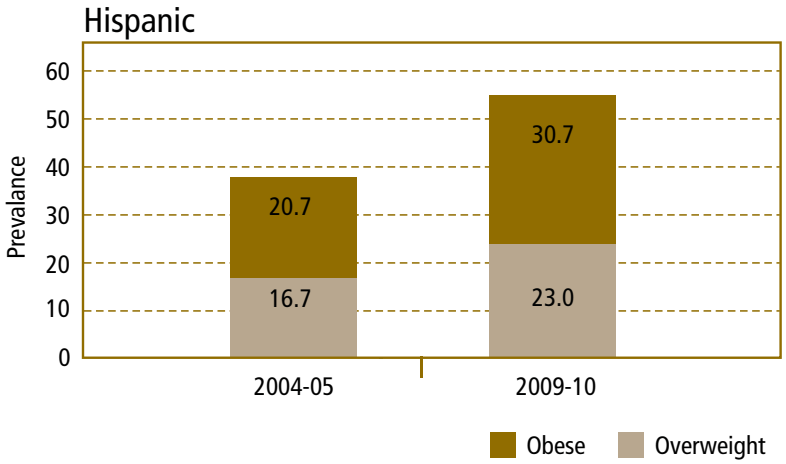


Figure 10

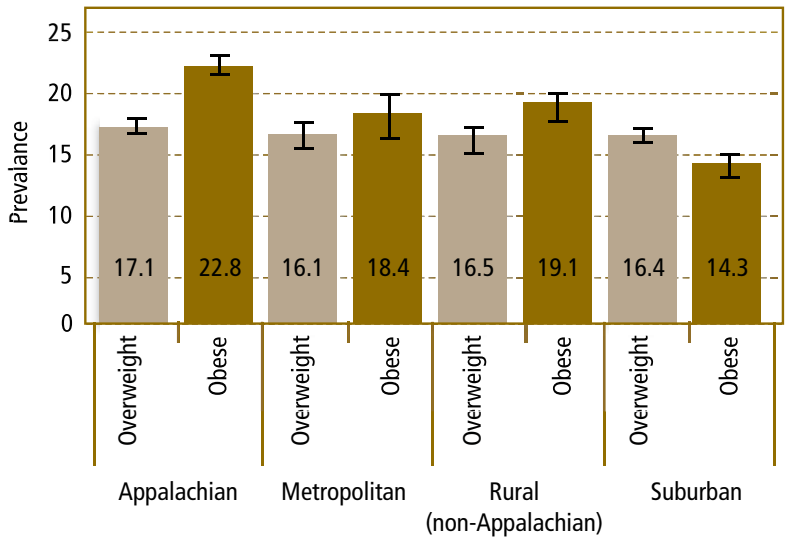
Overweight and obesity among Ohio 3rd grade Hispanic students, 2004-05 vs. 2009-10



Note: Due to small sample sizes of Hispanic students, we could not detect statistical differences between years.

Figure 11

Overweight and obesity among Ohio 3rd graders by county type, 2009-10



In Ohio in 2009-10, there were significant differences overall by county type (p<0.01). Children residing in Appalachian counties had significantly higher overweight or obesity prevalence compared to children residing in any other county type.

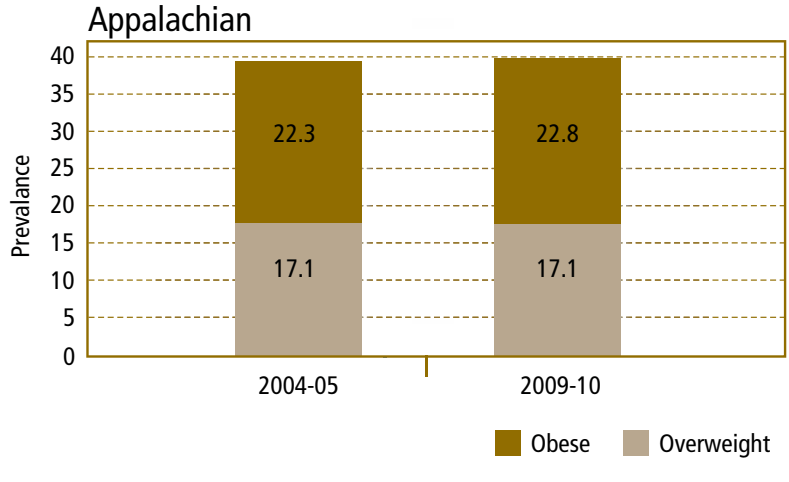
Notes: Standard error bars represent 95% confidence intervals;

Definitions for county type: a term that classifies each Ohio county into one of four categories; Appalachian as designated by the Appalachian Regional Commission; metropolitan: a non-Appalachian county that contains at least one city with 50,000 or more inhabitants; suburban: a non-metropolitan, non-Appalachian county that meets the U.S. Census definition of an urbanized area); and rural/non-Appalachia: all other counties not classified as Appalachian, metropolitan or suburban

Nationally, there are geographic differences in childhood overweight and obesity, with high rates in southeastern United States and parts of Appalachia.[5] While individual demographics and area poverty rates may account for some regional differences in weight status, geography remains important.[6]

Figure 12

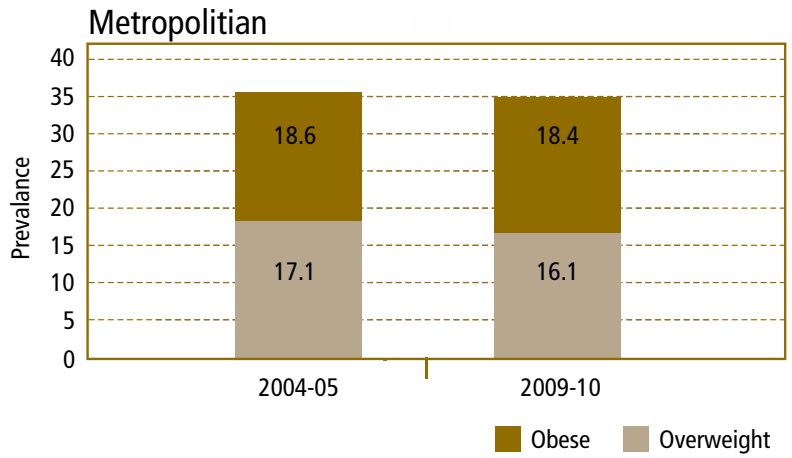
Overweight and obesity among Ohio 3rd graders in Appalachian counties, 2004-05 vs. 2009-10



When comparing data from 2004-05 and 2009-10 by county type, no significant changes in overweight or obesity prevalence were observed.

Figure 13

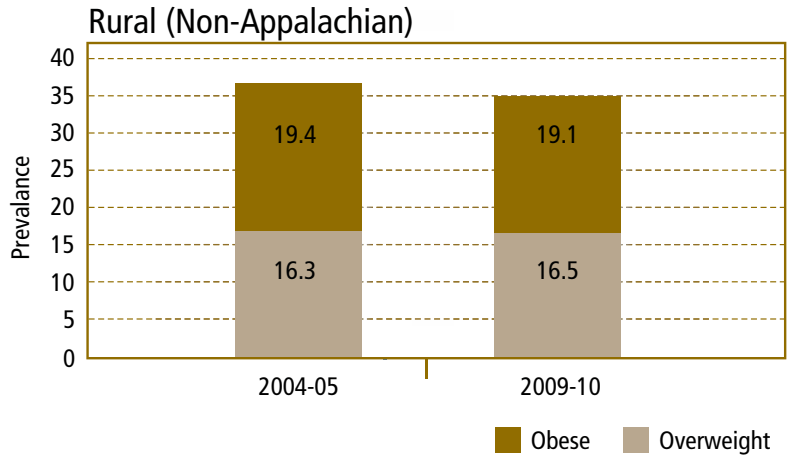
Overweight and obesity among Ohio 3rd graders in Metropolitan counties, 2004-05 vs. 2009-10



When comparing data from 2004-05 and 2009-10 by county type, no significant changes in overweight or obesity prevalence were observed.

Figure 14

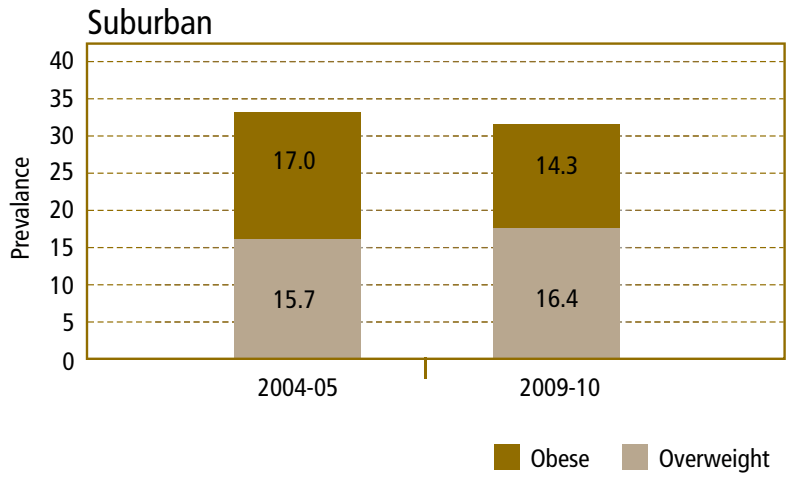
Overweight and obesity among Ohio 3rd graders in Rural (non-Appalachian) counties, 2004-05 vs. 2009-10



When comparing data from 2004-05 and 2009-10 by county type, no significant changes in overweight or obesity prevalence were observed.

Figure 15

Overweight and obesity among Ohio 3rd graders in Suburban counties, 2004-05 vs. 2009-10

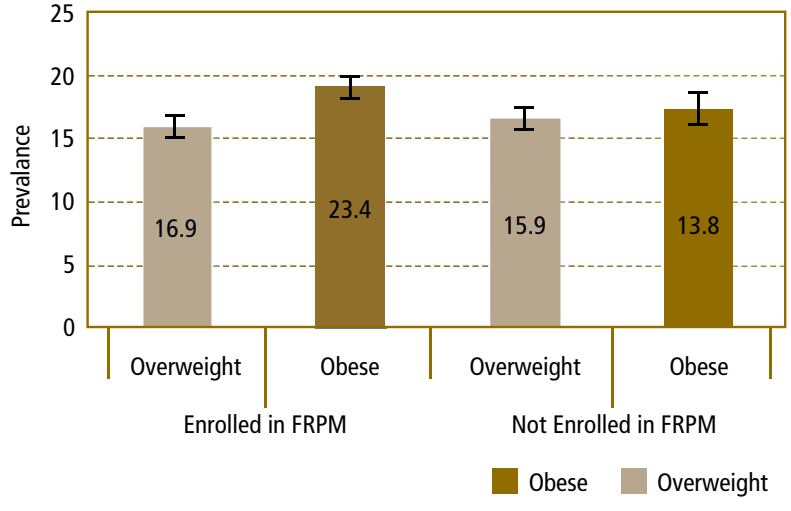


When comparing data from 2004-05 and 2009-10 by county type, no significant changes in overweight or obesity prevalence were observed.

Free or Reduced-Price Meals (FRPM) are available to families below 130 percent and 185 percent of the poverty level, respectively, through the National School Lunch Program.[7, 8] In Ohio in 2009-10, 43% of 3rd graders were FRPM enrolled. In this report, FRPM participation is considered a marker of socioeconomic status (SES). Low SES is a risk factor for childhood obesity nationally.[9] Other states have also found that children participating in FRPM have a higher rate of childhood obesity.

Figure 16

Overweight and obesity among Ohio 3rd graders by enrollment in the free and reduced-price meal program, 2009-10

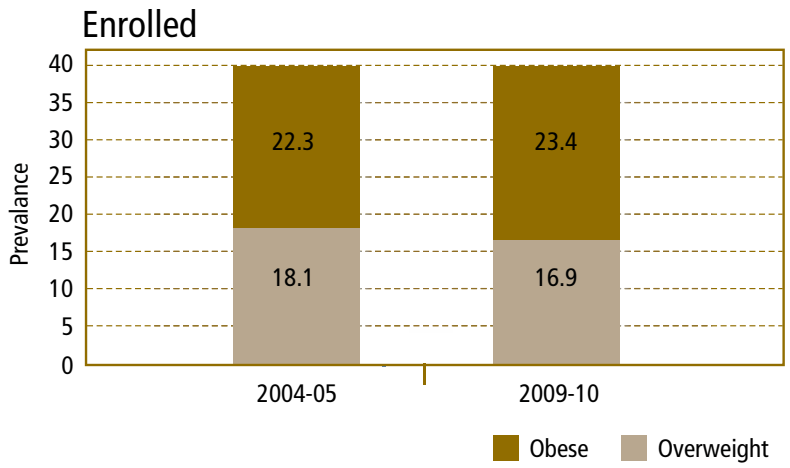


In Ohio in 2009-10, there were significant differences by enrollement in the free and reduced-price meal program (FRPM) ($p<0.01$). Ohio 3rd graders who were enrolled in FRPM were significantly more likely to be obese than children who were not enrolled in FRPM.

Note: Standard error bars represent 95% confidence intervals

Figure 17

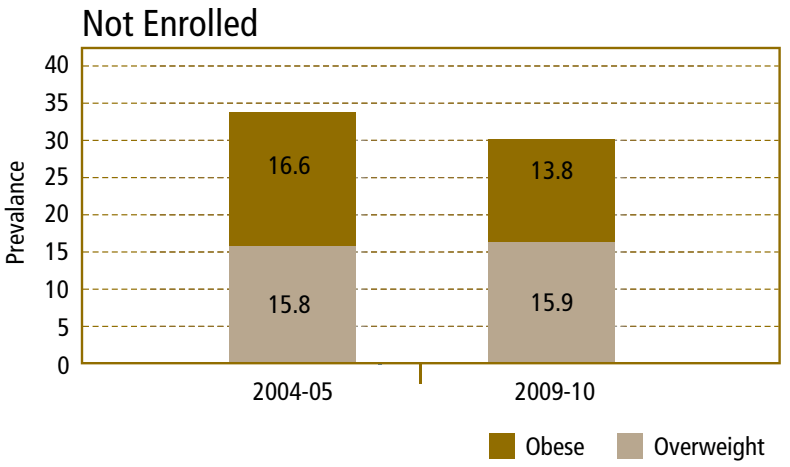
Overweight and obesity among Ohio 3rd graders enrolled in the free and reduced-price meal program, 2004-05 vs. 2009-10



When comparing data from 2004-05 and 2009-10 by FRPM enrollment, there was no significant change in overweight or obesity among those enrolled (Figure 17), however, there was a significant decrease in obesity among those 3rd graders not enrolled in FRPM ($p<0.05$) (Figures 17-18).

Figure 18

Overweight and obesity among Ohio 3rd graders not enrolled in the free and reduced-price meal program, 2004-05 vs. 2009-10



Sugar-Sweetened Beverage Consumption

Sugar-sweetened beverages have become a significant source of daily calories for children and their consumption has been linked with obesity.

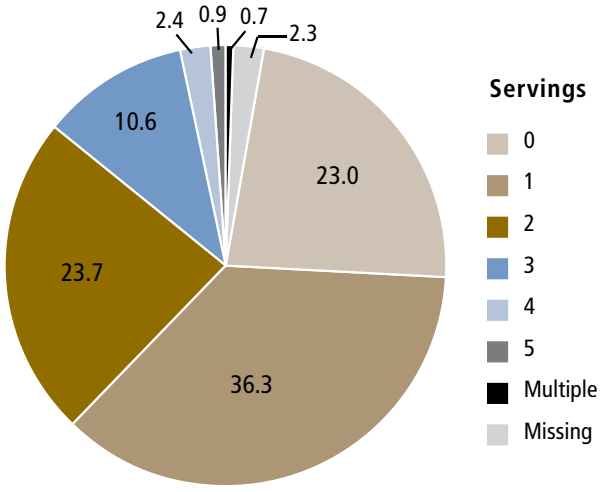
Sugar-Sweetened Beverage Consumption

The American Academy of Pediatrics recommends minimizing daily intake of any sugar-sweetened beverages, including sodas and colas, sports drinks, juice drinks, juice cocktails and other flavored drinks. Sweeteners include sugars and syrups that are added to beverages to enhance flavor. However, while they often add significant calories to those drinks, they typically have no nutritional benefit. Sugar-sweetened beverages have become a significant source of daily calories for children and their consumption has been associated with obesity. For example, one study found that overweight children consumed a higher proportion of their calories from carbonated soft drinks than their healthy weight counterparts.[10] Research suggests that when calories are consumed in these beverages, people typically do not reduce their calorie intake from other foods.[11] This causes children to take in more daily calories than recommended and over time can lead to weight gain. Strategies to reduce intake of sugar-sweetened beverages among children can be successful. For example, an interactive, school-based curriculum for 3rd grade aged children, which included a focus on water consumption, reducing intake of soft drinks, and healthy eating habits was successful in decreasing consumption of soft drinks and decreasing prevalence of overweight.[12]

Parents were asked: On an average day, about how many servings of pop, soda, or other sweetened beverages does your child drink (not counting diet beverages)? This includes those with added sugar, such as Sunny Delight, Hawaiian Punch, Gatorade and energy drinks (please check one): Zero, 1, 2, 3, 4, or 5. We then categorized the responses into the following groups: zero, one, or greater than one (multiple responses were considered greater than one).

Figure 19

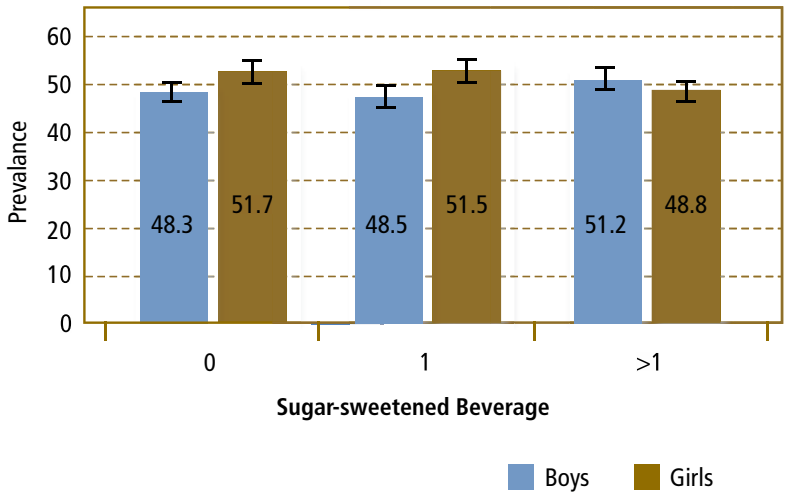
Distribution of sugar-sweetened beverage consumption among Ohio 3rd graders, 2009-10



In 2009-10, approximately 23 percent of Ohio's 3rd grade children were drinking zero sugar-sweetened beverages per day and 36 percent of Ohio 3rd graders were drinking one sugar-sweetened beverage per day. Approximately 40 percent were drinking two or more sugar-sweetened beverages per day.

Figure 20

Sugar-sweetened beverage consumption by sex among Ohio 3rd graders, 2009-10

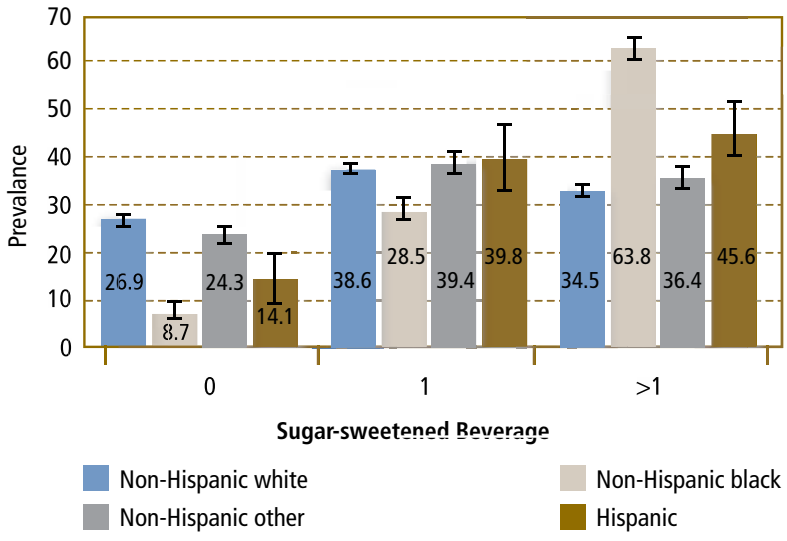


There were no significant differences in sugar-sweetened beverage intake by sex.

Note: Standard error bars represent 95% confidence intervals

Figure 21

Sugar-sweetened beverage consumption by race/ethnicity among Ohio 3rd graders, 2009-10

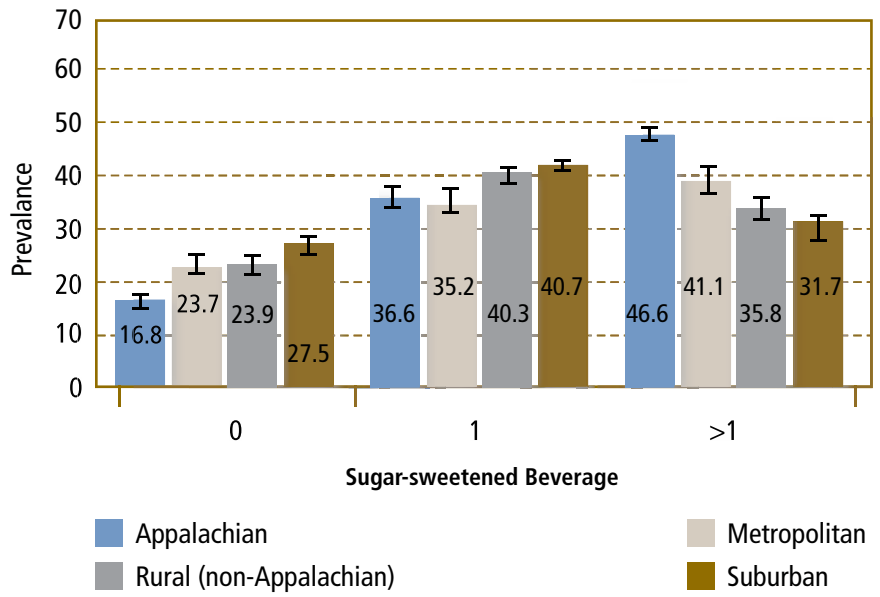


There were significant differences in sugar-sweetened beverage consumption by race/ethnicity ($p<0.0001$). Significantly more non-Hispanic black and Hispanic children drank more than one serving of sugar-sweetened beverage per day compared to non-Hispanic white children.

Notes: Standard error bars represent 95% confidence intervals; Estimate for Hispanic children drinking zero sguar-sweetened beverage (14.1±6.0) has a relative standard error >30% and should be interpreted with caution.

Figure 22

Sugar-sweetened beverage consumption by county type among Ohio 3rd graders, 2009-10

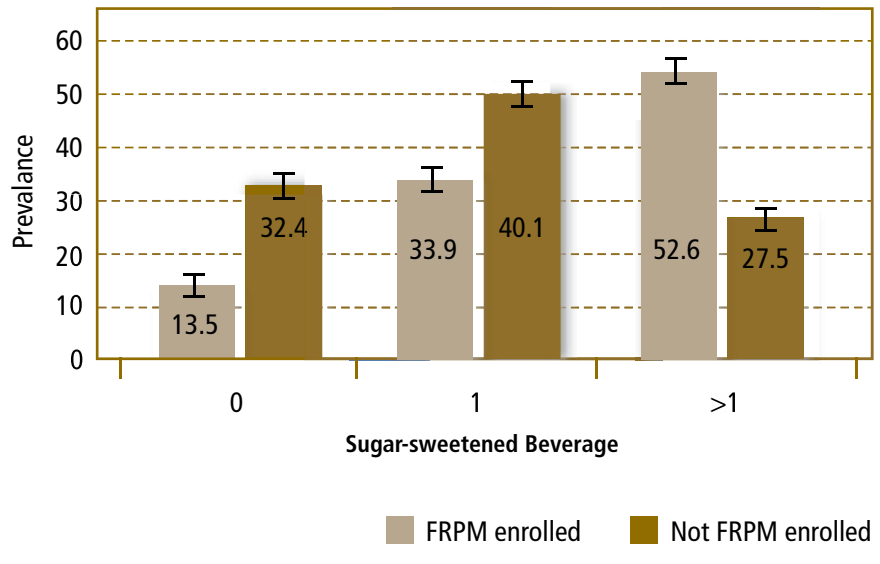


There were significant differences in sugar-sweetened beverage consumption by county type ($p<0.0001$). Significantly more children living in Appalachian counties drank more than one serving of sugar-sweetened beverage per day compared to children in metropolitan, rural (non-Appalachian), or suburban counties (Figure 22).

Note: Standard error bars represent 95% confidence intervals

Figure 23

Sugar-sweetened beverage consumption by enrollment in the free and reduced-price meal program among Ohio 3rd graders, 2009-10

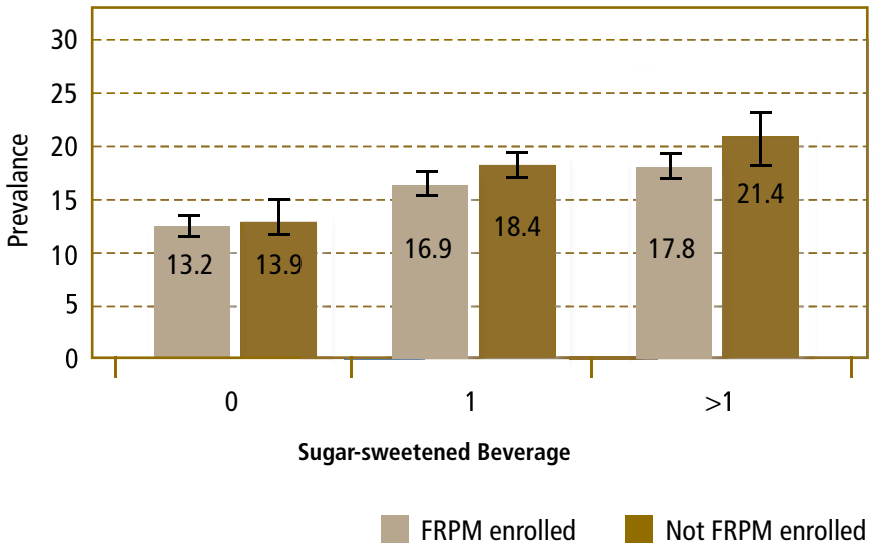


There were significant differences in sugar-sweetened beverage consumption by enrollment in the free and reduced-price meal program ($p<0.0001$). Significantly more children who were enrolled drank more than one serving of sugar-sweetened beverage per day compared to children who were not enrolled (Figure 23).

Note: Standard error bars represent 95% confidence intervals

Figure 24

Overweight and obesity among Ohio 3rd graders by sugar-sweetened beverage consumption, 2009-10

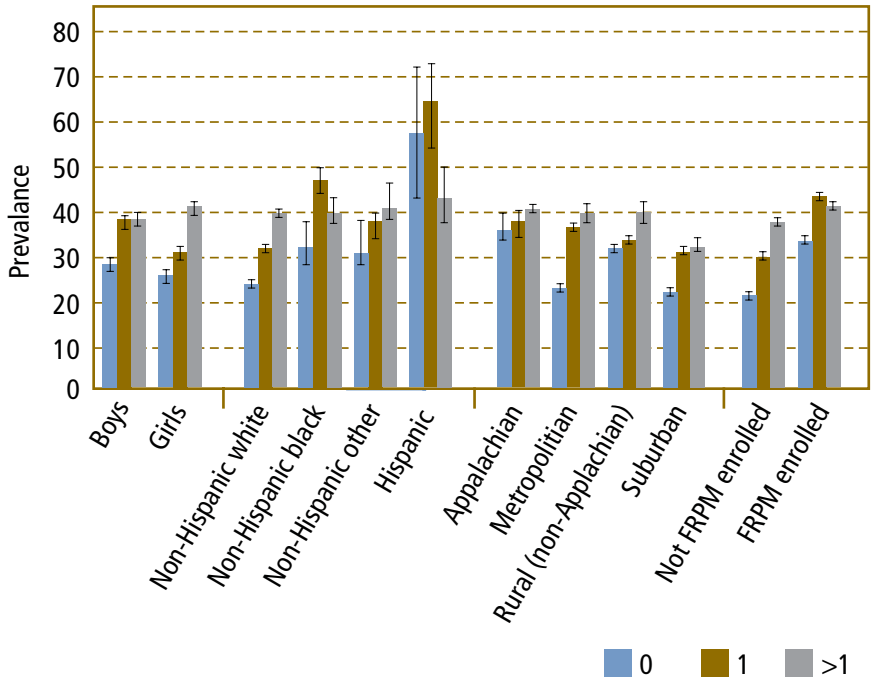


Overweight and obesity prevalence increased with increased sugar-sweetened beverage consumption, with children drinking more than one sugar-sweetened beverage per day having the highest overweight and obesity prevalence (Figure 24). This pattern was generally true by sex, enrollment in the free and reduced-price meal program, race/ethnicity, and county type (Figure 25).

Note: Standard error bars represent 95% confidence intervals

Figure 25

Overweight/obesity among Ohio 3rd graders by sugar-sweetened beverage consumption and sex, race/ethnicity, county type and enrollment in the free and reduced-price meal program, 2009-10



Limitations to the sugar-sweetened beverage data:

- **Parents self-reported children's Sugar-sweetened beverage consumption.**
- **How parents define a sugar-sweetened beverage may differ. (i.e. chocolate milk, 100% juice, etc.)**

Note: Standard error bars represent 95% confidence intervals

Television Viewing

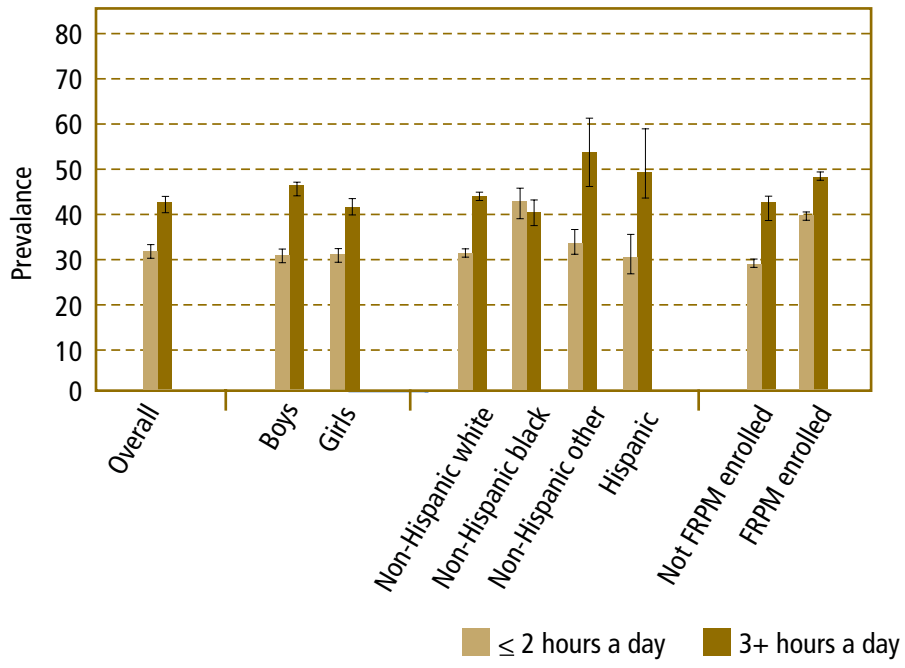
The American Academy of Pediatrics recommends that parents limit children older than two years of age to no more than two hours of combined television and video game screen time per day.

Television Viewing

Excessive time spent viewing television, playing video games and using the computer is associated with obesity in children. This link may be explained several different ways. First, this sedentary time could otherwise be spent getting the recommended amount of daily physical activity. Additionally, when children watch television or are on the computer, they eat less healthy food, and more food in general. In addition, they are exposed to hours of advertising from fast food and other food companies.[14, 15] The American Academy of Pediatrics recommends that parents limit children older than two years of age to no more than two hours of screen time each day, and that those two hours should be spent in educational activities.[13] Screen time can successfully be reduced through interventions. For example, a randomized, controlled, school-based trial indicated that 3rd and 4th grade children who received a six month classroom-based intervention to reduce all screen time had significant decreases in both daily screen time and BMI.[16]

Figure 26

Distribution of television viewing among Ohio 3rd graders, 2006-09



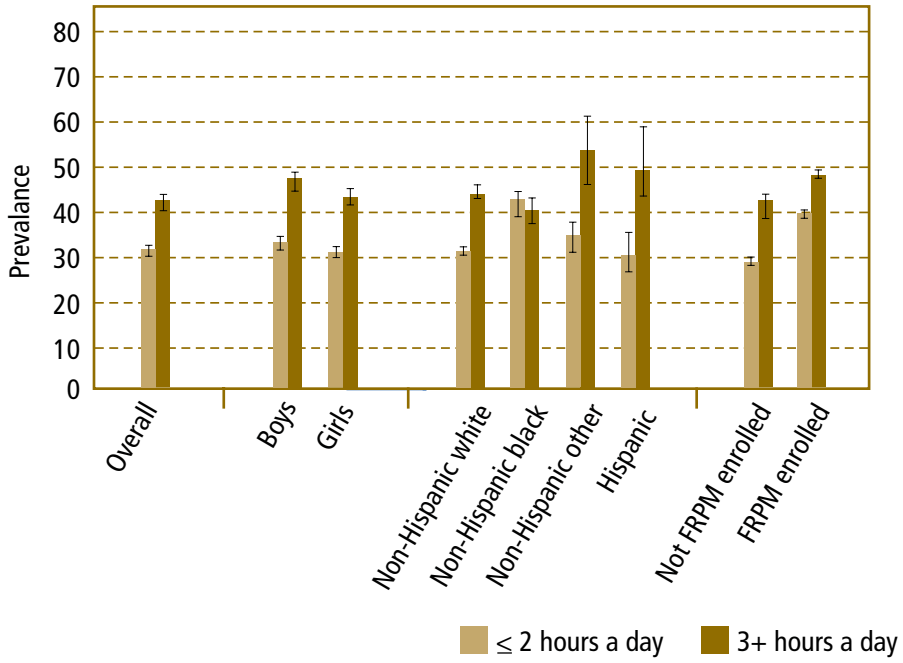
There were no significant differences in TV viewing by sex. However, significantly more children enrolled in the free and reduced-price meal program watched three or more hours of television per day compared to children not enrolled. Similarly, significantly more non-Hispanic black and Hispanic children watched three or more hours of television per day compared to non-Hispanic white or non-Hispanic other children (Figure 26).

Note: Standard error bars represent 95% confidence intervals

Parents were asked: On an average school day, how many hours of television (TV) does your child watch? Potential responses included: Doesn't watch TV on school days, two hours or fewer, three to four hours, five or more hours. Because the American Academy of Pediatrics recommends that parents be encouraged to limit their children's TV viewing to no more than one to two hours per day,[13] we categorized TV viewing into the following categories: less than two hours per day and more than three or more hours per day.

Figure 27

Overweight/obesity among Ohio 3rd graders by television viewing and sex, race/ethnicity,and enrollment in the free and reduced-price meal program, 2006-09



In terms of TV viewing and overweight and obesity prevalence, a significantly higher proportion of children who watched three or more hours of television per day (44 percent (95% CI: 39.1-48.4)) were overweight compared to those children who watched less (33 percent (95% CI: 30.9-35.1)). Similar patterns were observed by sex, free and reduced-price meal enrollment, and race/ethnicity. One exception was that among non-Hispanic black children, there was no difference in prevalence of overweight or obesity, regardless of TV viewing behavior.

Limitations to the TV data:

- **Our data includes TV only (no other media) and total screen time among Ohio 3rd graders may actually be higher.**
- **No physical activity data was collected. Therefore, researchers could not determine if children who watch more TV are also less physically active.**
- **Parents self reported child's TV viewing behavior.**

Note: Standard error bars represent 95% confidence intervals

Summary

In comparing the data collected in 2004-05 and 2009-10 we observed:

- No changes in overweight or obesity prevalence.
- More than 1/3 of Ohio's 3rd graders remain overweight/obese, falling short of the Healthy People 2010 national objective for obesity among children aged 6 to 11 years.
- Ten counties with significantly lower overweight/obesity prevalence between 2004-05 and 2009-10.
- Eight counties with significantly higher overweight/obesity prevalence between 2004-05 and 2009-10.

In Ohio in 2009-10:

- Non-Hispanic black and Hispanic children were significantly more overweight or obese compared to non-Hispanic white children.
- Children residing in Appalachian counties had significantly higher overweight or obesity prevalence compared to children residing in any other county type.
- Low income children were significantly more likely to be obese compared to other children.
- Overweight and obesity prevalence was greatest among children with a higher consumption of sugar-sweetened beverages, with children drinking more than one sugar-sweetened beverage per day having the highest overweight and obesity prevalence.
- Children who drank the most sugar-sweetened beverage per day in Ohio include non-Hispanic black and Hispanic children, children living in Appalachian counties, and low income children.
- Children watching three or more hours of TV per day had a higher prevalence of overweight/obesity compared to children who watched less.
    - Among non-Hispanic black children, there was no difference in prevalence of overweight or obesity, regardless of TV viewing behavior.

This report represents a comprehensive look at the state of obesity for Ohio's 3rd grade children. Based on this data, overweight/obesity prevention interventions should be targeted to Ohio children that are non-Hispanic black, Hispanic, residing in Appalachian counties, and low income. Our data also show that these particular groups of children are drinking more sugar-sweetened beverages and watching more TV than is recommended. We show these two specific behaviors are associated with overweight/obesity, specifically for these high-risk groups.

Though overall rates of overweight and obesity for these children have not increased in five years, they also have not decreased and this remains a priority health issue for both Ohio and the nation. Our data highlights a number of areas requiring shared responsibility and collective action from state government, families, schools, communities, health care providers, and local policy and decision makers. Strategies to improve the policies, systems and environments that impact healthy behaviors should be focused on those populations at highest risk, as identified in this report. Such strategies include:

- Increasing access to fresh fruits and vegetables and limiting exposure to unhealthy options
- Improving access to safe and attractive places to play
- Reducing television and screen time use and exposure
- Reducing consumption of sugar-sweetened beverages

In communities where BMI surveillance is also a local effort, it is important to encourage collaboration with schools and local and state health departments to ensure data quality and coordination efforts with ODH's BMI surveillance program.

The Costs of Childhood Obesity

Studies have shown that there are higher health costs for overweight and obese children – more than $14 billion in additional costs annually in the U.S., compared with children who maintain a healthy weight.

The Costs of Childhood Obesity

Leona Cuttler, M.D.[†], Ann Nevar, MPA[‡]

Recent information will transform the way stakeholders view childhood obesity. Traditionally, the epidemic of childhood obesity in the U.S. has been considered an unfortunate byproduct of changes in lifestyle, but not a problem with large impact on health or the costs of healthcare. Yet, emerging information challenges that view, and underscores both the short-term and long-term burden of childhood obesity.

Data now clearly show that childhood obesity adversely affects health and also leads to increased use of costly health services – even during childhood. Compared with healthy weight children, Ohio's obese children are 4.6-fold more likely to have diabetes, 2.0-fold more likely to have poor health status, 1.9-fold more likely to have limited ability to do things, 1.8-fold more likely to have asthma, and 1.6-fold more likely to have poor mental health.[(1)] These data are consistent with a growing body of evidence on the serious short-term impact of childhood obesity.[(2)] Equally striking is that compared with healthy weight children, Ohio's obese children are 2.1-fold more likely to have had two or more hospitalizations in the past year, 1.8-fold more likely to have had two or more Emergency Department visits in the past year, 1.4-fold more likely to have special health care needs, and 1.4-fold more likely to use chronic medication.[(1)] These findings emphasize that childhood obesity leads to a marked increase in the use of costly health care resources during childhood. Furthermore, they are consistent with recent data documenting substantially higher health costs for overweight and obese children - more than $14 billion in additional costs annually in the U.S., compared with healthy weight children. [(3-5)]

The future for obese children is chilling. Obese school-age children are likely to become obese adults. A recent systematic review showed that overweight and obese children are at significantly increased risk of physical morbidity (including diabetes, hypertension, ischemic heart disease, asthma, and stroke) and premature mortality in adulthood.[(6)] The estimated direct annual costs of treating obesity-related illness in adults is $147 billion in the U.S and indirect costs account for several billion dollars more annually. [(5)]

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How much of a problem is childhood obesity in Ohio?

The data described in this report show that more than one in three students (34.6 percent) are overweight or obese. These figures are consistent with the Ohio Family Health Survey which found 35.6 percent of 10-17 year olds to be overweight (17.1 percent) or obese (18.5 percent),[1] with particularly high rates among racial and ethnic minorities. A recent national report ranked Ohio in the highest quarter of U.S. states for childhood obesity.[7]

Together, these data demonstrate that both the physical and financial costs of childhood obesity are enormous. Without effective changes in policies and practices, childhood obesity is likely to limit the state's ability to be healthy, strong, and economically competitive. Delay will result in increased rates of disease and death, as well as higher health care costs in the short-term and well into the future. Therefore, effective policies and practices, combined with changes in attitudes and outlook, are needed now to prevent and treat childhood obesity.

1. Cuttler, L., Singer, M., Simpson, L., Gallan, A., Nevar, A., Silvers, JB. 2009. *Obesity in Children and Families across Ohio, 2008*. State of Ohio: Department of Insurance, Department of Job and Family Services, Department of Health, and Department of Mental Health. Ohio Family Health Survey, 2008-09 Ohio State University, Ohio Colleges of Medicine Government Resource Center, Columbus, Ohio. The Center for Child Health and Policy at Rainbow Babies & Children's Hospital and Case Western Reserve University and the Child Policy Research Center at Cincinnati Children's Hospital and the University of Cincinnati. Available at: http://ckm.osu.edu/sitetool/sites/pdfs/ofhspublic/OFHSReport_Cuttler.pdf.

2. Daniels SR. *Complications of obesity in children and adolescents*. Int J Obes (Lond) 2009; 33 Suppl 1:S60-5.

3. Kuhle S, Kirk S, Ohinmaa A, Yasui Y, Allen AC, Veugelers PJ. *Use and cost of health services among overweight and obese Canadian children*. Int J Pediatr Obes 2010; Sep 27. [Epub ahead of print]

4. Trasande L, Chatterjee S. *The impact of obesity on health service utilization and costs in childhood*. Obesity (Silver Spring) 2009; 17(9):1749-54.

5. Cawley J. *The economics of Childhood Obesity*. Health Affairs 2010; 29(3):364-371.

6. Reilly JJ, Kelly J. *Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review*. Int J Obes (Lond) 2010; Oct 26. [Epub ahead of print]

7. *F as in Fat: How Obesity Threatens America's Future 2010*. Available at: www.healthyamericans.org/reports/obesity2010 (accessed January 29, 2011).

Taking Action to Create Change

Together, decision makers, families, communities, health care providers, local policy makers and schools can help impact childhood obsesity.

Taking Action to Create Change

The prevention and treatment of childhood obesity will require a coordinated effort between state government and leaders, families, communities, health care providers, local policy makers and schools. The following provides members of each of these groups with information about the role they can play in taking actions that will achieve the change needed to reverse the epidemic of childhood obesity and improve the overall health of Ohio's children.

State Government and Leaders

All state agencies play an active role in addressing childhood obesity. ODH's role as the state public health agency is to support childhood health in many ways. In addition to surveillance, through direct-care programs ODH plays a vital role in the delivery of health care in Ohio. ODH provides both expertise and resources to communities through partnerships with local health departments and other agencies.

ODH's Division of the Family and Community Health Services (DFCHS) currently funds 59 Ohio county agencies working to address childhood obesity. The primary goal is to improve health outcomes for low-income children through measures and strategies committed to ensuring that all mothers and children have the opportunity to lead healthy lives. Areas of focus include: identifying gaps in health care delivery by collaborating with community partners, developing and implementing policies and strategies to increase physical activity and healthy eating in schools and other care facilities and establishing a resource inventory and referral source for overweight children to receive additional nutritional counseling and assessment.

Additionally, DFCHS provides nutrition services and education to eligible low-income pregnant and breastfeeding women, including women with new infants and eligible children from birth to five years of age through the Special Supplemental Nutrition Program For Women, Infants, and Children (WIC) program. This program also provides referrals to prenatal, pediatric, and other maternal and child health care as well as other support services. These services have been shown to improve pregnancy outcomes, infant mortality and are crucial in the identification of children with nutritionally inadequate diets.

ODH has also become a leader in the state's efforts to improve the social and environmental systems that impact health and cause disease. ODH's Creating Healthy Communities (CHC) program, a nationally-recognized program based on the most current chronic disease and obesity prevention research, is an example of this leadership. The CHC program, currently in 16 high-need counties in Ohio, brings communities together to assess and prioritize needs, then plan and implement strategies to improve the social and structural barriers, such as access to healthy foods in schools and workplaces, safe places for children to play and healthy food options and daily physical activity. Because obesity is an issue created in large part by the environments people are exposed to, true change in the health of the population can only come from people working together to implement policy, systems and environmental changes that support healthy choices where people live, learn, work and play.

Families

Health begins at home. While the issue of obesity is complicated and no one change is right for everyone, families can work together to improve their home environments to better support wellness by changing unhealthy behaviors and creating a healthy environment for the entire family by:

- **Providing** healthy food choices. Start by conducting an inventory of the type of foods and beverages available at home.
- **Limiting** intake of sugary snacks and drinks.
- **Increasing** offerings of fruits, vegetables and grains. If you pack your child's lunch, include a fruit and a vegetable.
- **Offering** water first, and serve low-fat or fat free milk instead of sugar-sweetened beverages like sodas, pop and sports drinks.
- **Choosing** to feed your infant only breastmilk for the first six months and continue breastfeeding until at least one year of age.
- **Helping** your children understand the importance of being physically active. Be a role model to them. Turn off the TV, computer and video games and go for a bike ride, throw a ball, go swimming or take a family walk. Many area parks and recreation areas are free and accessible to families. Physical activity is important at every age.
- **Encouraging** more physical activity by reducing your child's screen time, including television and computer/video games, to less than two hours a day. Removing the television from your child's bedroom is one way to do start reducing screen time. If turning off video games is a challenge in your home, try one of the new interactive games where the player must move around and be active.
- **Asking** your local school or faith-based organization if there are family nights that involve physical activity or whether they permit families use the gym or playground after hours. If not, form or join their health or wellness team to work with them on ways to increase opportunities for children and families to become more active.
- **Talking** to your child's health care provider about their health and nutrition. Questions regarding their height, weight, and age can impact their overall health and well-being.

Schools

Schools play an essential role in the well-being of children. Through strong school-based policies and strategies including nutrition standards, quality health and physical education and opportunities for daily physical activity, schools can help students adopt and maintain behaviors to maximize their ability to succeed through:[17]

- **Assessing** school policies and practices related to nutrition and physical activity. Use the the Centers for Disease Control and Prevention's (CDC) School Health Index to help identify strengths and barriers to improving school health.
- **Using** school wellness policies to require all foods offered in the school building whether in the cafeteria, vending machines or for classroom parties be nutritious and meet nutritional standards set by the United States Department of Agriculture (USDA) 2010 Dietary Guidelines for Americans [18].
- **Increasing** physical activity during the school day to allow children at least 30 minutes of daily activity. If the school schedule does not allow for physical education daily, then look at creative ways to increase opportunities for students to be physically active. For example, organize a walking club before or after school. Daily physical activity in schools has been associated with improved academic performance.
- **Encouraging** and supporting teachers to incorporate physical activity into their lesson planning and daily teaching.
- **Collaboratin**g with local parks and recreation agencies and other community leaders to provide physical activity/intramural programming during recess or other free time.
- **Creating** school and parent teams that participate in fund-raising events such as community walks and/or runs to raise money, instead of bake-sales or other food-oriented fund-raisers.
- **Educating** families about the benefits of improved nutrition and increased physical activity.
- **Facilitating** referrals to community healthcare providers for families seeking treatment for overweight youth by participating in programs to monitor and identify obesity and obesity-related diseases.

Springfield Local Elementary

Tom Yazvak, Principal

During the 2000-2001 school year, Springfield Local Elementary in New Middletown, Ohio implemented a nutrition and physical activity program in response to growing community and school interest in the health of their children. The program goal is to improve the health and wellness of the Springfield Local faculty, staff and students through engaging not only the school staff, but also the student's families and other community. members

One specific component of the program includes an annual BMI assessment for every participating student at Springfield Local, allowing BMI levels to be tracked over time. Another component of the program includes daily exercise by teachers and students for 10-15 minutes, followed by school breakfast for all students. This allows the teachers to model healthy behaviors to students, while also allowing students to model healthy behaviors to their peers. Both components help to physically and mentally prepare the students for learning. Tom Yazvak, principal, credits the program for improving attendance rates, decreasing the number of visits to the nurse's office and reducing discipline referrals, which have been documented since the program began 10 years ago. He also credits the program for significant improvements in academic achievement in every grade. Mr. Yazvak hopes the program continues to promote healthy behaviors for Springfield Local Elementary and the surrounding community.

Olmsted Falls City School District

Denise B. Tabar, MS, RD, LD, Food Service Director

Olmsted Falls City School District has been collecting BMI data for students in grades 1-5 since the 2004-2005 school year, and for students in grades 6-8 since the 2007-2008 school year. The first year this data was collected, a baseline was established for the numbers of overweight and obese students in Olmsted Falls City Schools. This baseline data provided a valuable tool for the District to use as one objective way to measure progress in future years.

It has been important to look at district trends in BMI data to help the school wellness team better understand the impact of wellness protocols and activities already in place, support program planning and improve its approach to student wellness. In addition, this BMI information has helped improve the overall awareness in the school community of the importance of healthy eating and daily activity.

In the 2004-2005 school year, the Olmsted Falls City School District reported 18.4 percent overweight students and 15 percent obese students. In the 2009-2010 school year, the Olmsted Falls City School District reported 15.7 percent overweight students and 12.8 percent obese students. This is a decrease of 2.7 percent in the overweight category and 2.3 percent in the obese category over a five year period.

To date this information has only been reported as aggregate data by grade, gender and by district.

The BMI data collection is a voluntary process with great attention given to student's privacy. Approximately three percent of the parents decline to have their student(s) measurements taken. Completed for aggregate use only, the collection of BMI data has been one very useful tool to help the district assess the childhood obesity issues in the community.

Communities

Communities play a vital role in the health and wellbeing of all people. Community members can work together to mpower and support personal responsibility by addressing the social and environmental factors that contribute to childhood obesity by:

- **Assessing** the physical environment of neighborhoods including the accessibility of healthy food, recreational centers, bike paths, playgrounds, sidewalks and routes for walking, neighborhood safety and other parts of the built environment.

- **Creating** a safe and pedestrian-friendly community through police patrols, crosswalks, traffic lights, bike lanes and well-lit streets to enable more people to be active outside without fear or hesitation.

- **Ensuring** that all people have opportunities to buy healthy, affordable food in their neighborhoods and working to limit access to less healthy choices in local markets and grocery stores.

- **Building** private/public partnerships involving private developers and businesses that have a financial interest in building safer and healthier communities. Communities that offer attractive outdoor environments with easy access to outdoor activities are often sought by homebuyers as priority neighborhood.

Health Care Providers

Health care providers play crucial roles within our communities to prevent and reduce childhood obesity. Weight-related health concerns are diagnosed by providers and treatment is then tailored for each families needs. Often just the identification of risk factors can stimulate an important discussion between a family and their provider. As both health care practitioners and patient advocates, there is much this group can do to help.

- **Incorporating** BMI assessment of children and youth into regular health visits and counsel all families on the importance of daily physical activity and healthy eating.

- **Educating** and offer guidance to families regarding their children's BMI based on national recommendations involving personalized risk-factor assessments and behavioral modification techniques.

- **Referring** families for additional treatment when primary-care based interventions fail.

There is no doubt that childhood obesity is an epidemic that has severely affected both Ohio and the nation. In the last seven years, the number of patients seen at Nationwide Children's Hospital with a diagnosis of obesity or excessive weight gain has increased more than six fold, and a study in the journal Pediatrics found that expenses for obesity-related hospitalizations in children tripled from $35 million to $127 million between 1979-1981 and 1997-1999. More than 27 percent of the growth in overall health care spending between 1987 and 2002 has been attributed to treating obese patients.

Addressing the causes of obesity is a moral and economic imperative. As a society, we simply cannot afford to continue on this trajectory. At Nationwide Children's, we believe that preventing and treating obesity in childhood offers the best opportunity to turn the tide on this epidemic and bend the long-term health care cost curve and we've targeted it as a key area for organizational focus and investment. We also realize that no one organization can tackle this alone and collaboration is the only hope for success. With this in mind, we actively seek out and have been working with business and community partners, including ODH, to pool our expertise and resources in a unified effort to make Ohio a leader in combating pediatric obesity.

This focus has already resulted in several key collaborations. Along with Dr. Toby Cosgrove, CEO of the Cleveland Clinic, I co-chair the Ohio Business Roundtable Childhood Obesity Task Force. We also help lead the Healthy Choices for Health Children coalition, which supported passage this year of landmark legislation to improve fitness and nutritional standards in Ohio schools. Locally, we join many organizations in partnering with our school systems and the community to implement innovative programs for children and families to encourage healthy lifestyles. At the state level, our physicians have partnered with the Ohio Department of Health to create the Ounce of Prevention is Worth a Pound toolkit to assist physicians with educating families on raising healthy children.

There is no simple fix for childhood obesity because it is a complex issue with many causes. However, by rallying the community, and collaborating to take steps we believe can help, together we can start to move the numbers in the right direction.

Steve Allen, MD
CEO, Nationwide Children's Hospital

Coming together to prevent childhood obesity.

Ounce of Prevention is Worth a Pound

Ounce of Prevention is Worth a Pound (Ounce) is a toolkit for primary care providers to use to discuss nutrition and physical activity with parents during routine well-child visits. Recognizing that early childhood is the most important time to teach infants and children healthy behaviors, parents are given simple, evidence-based information beginning with their baby's first office visit. Topics include breastfeeding, appropriate solid food introduction, juice and water intake and appropriate meals. The kit was developed in 2007 through a collaboration between ODH, Nationwide Children's Hospital, the Ohio Chapter of the American Academy of Pediatrics, American Dairy Association Mideast and Ohio Dietetic Association. Recently, the kit was expanded to follow children to their 18th birthday and was translated into Spanish. Additional fact sheets for this age group include calcium intake, healthy activity and current guidelines for nutrition in young athletes. Overall, more than 500 physicians have attended Ounce of Prevention trainings in Ohio in more than 80 practices throughout Ohio.

Local policy and decision makers

An effective response to the problem of childhood obesity demands a comprehensive approach involving a wide range of partners in the public and private sectors. Local government leaders are key components in this effort since they can provide the vision, advocacy and policies to bring about change in the community. These include:

- **Facilitating** partnerships with community agencies and stakeholders that expand strategies to improve nutrition and increase physical activity.
- **Expanding** opportunities for physical activity in your community or agency by changing ordinances, through capital improvement and by considering access to healthy food and physical activity in all policy and planning activities.
- **Implementing** policies and incentives that support health choices by ensuring that all Ohioans have the opportunity to lead healthy lives.

Meigs County Health Department

Andrew Brumfield,
Creating Healthy Communities Coordinator

Another valuable resource for collecting and sharing data are the local health departments. The local health departments across Ohio are instrumental in facilitating public health efforts in all community settings, and in many counties they have partnered with schools to assist in data collection and decision making. The importance of BMI in school health is demonstrated by one of these partnerships in Meigs County.

Through funding from ODH's Creating Healthy Communities program, Andrew Brumfield and his staff from the Meigs County Health Department partnered with the county's three school districts to measure BMI in their elementary school children from 2003 through 2007. Having identified a significant amount of their students as being overweight or obese, the health department and the districts worked together to develop numerous physical activity and nutrition strategies to improve the health of all students. These initiatives included removing soda and vending machines from schools, starting walking clubs, expanding their breakfast program to include all students and engaging families to be physically active.

Over the next few years, schools found that the number of overweight and obese kids seemed to decrease during the school year, only to rebound during the summer. Having this new information spurred the coalition to build upon their existing programs to include programs that impacted their students homes as well. This just one example of groups coming together to identify problems, create solutions and measure success to impact health.

Definitions

Body Mass Index (BMI):

A number calculated from a child's weight and height to assess presence of excess body fat (weight in kilograms divided by height in meters squared). BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat. BMI is an inexpensive and easy-to-perform method of identifying weight categories that may lead to health problems. For children and teens, BMI is age- and sex-specific and is often referred to as BMI-for-age.

BMI percentile:

After BMI is calculated for children and teens, the BMI number is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the United States. The percentile indicates the relative position of the child's BMI number among children of the same sex and agein the U.S. The growth charts show the following BMI-for-age weight status categories:[19]

1. Underweight: <5th percentile
2. Healthy weight: 5th-<85th percentile
3. Overweight: 85th-<95th percentile
4. Obese: ≥95th percentile
5. Obese level 2: ≥97th percentile
6. Overweight/obese: ≥85th percentile

Survey Design

Height/weight data were added to the Ohio's Oral Health Survey in the 2004-05 school year. The survey was designed to provide yearly representative, state-level data and every five years representative, state- and county-level data. To provide comparable estimates across the years, state level data from all survey years (2004-05, 2006-07, 2007-08, 2008-09, 2009-10) were analyzed.

The sampling frame included all public schools in the state of Ohio that were not community schools (community schools are independently operated, publicly funded, tuition-free public schools that are created on the basis of a contract or "charter"). A stratified, cluster-sampling survey design was used, in which schools were considered clusters and chosen within each county by probability proportional to size sampling. The Free and Reduced-price Meal Program (FRPM) is a proven indicator of dental health and participation varies widely in many counties. Therefore, counties were further divided into two smaller strata when possible (schools with less than 50 percent of students on FRPM and schools with 50 percent or more students on FRPM). Replacement schools were chosen for each stratum, in the event that schools were not able to or decline to be involved in the survey.

For the state-level survey years (2006-07, 2007-08, 2008-09), schools were selected once and evaluated each year until the next state and county level survey (2009-10). The percentage of students eligible for FRPM and the percentage of African-American students at each school were used to stratify eligible schools. Each stratification variable had two levels, creating four stratification groups. The purpose of this stratification was to obtain a representative sample, and not to obtain stratum-level estimates. Estimating the proportion of 3rd grade students with untreated decay with 12 percent relative precision would require sampling 30 schools and offering screening to each 3rd grade student in each of the selected schools. For the BMI study, the precision of estimates for both the proportion of overweight students and the proportion of students at risk for becoming overweight (each estimated separately) would have been approximately the same as for Oral Health. Replacement schools were sampled when selected schools choose not to participate.

All third graders at the selected schools are eligible to participate, with parental permission. Sample size estimates for the number of schools to sample within each county were calculated from dental caries information in the 2004-2005 data. The number of schools required for screening in each county was calculated to be almost certain (α=0.001) of estimating the total number of Ohio 3rd graders with dental caries to within 10 percent of the true value in a one stage cluster sample, given these previous estimates.

School Year	Number of Schools Participating	Response Rate	Sample Size
2004-05	387	56%	14,501
2006-07	30	56%	1,201
2007-08	30	58%	1,251
2008-09	30	61%	1,357
2009-10	377	50%	15,362

Sample weights were calculated to adjust responses to be representative of the underlying population. Adjustment for survey non response is incorporated into the sampling weights, outlined below. Post stratification adjustment for FRPM participation was also built into the final sampling weight. The following steps were followed for sample weight calculations:

1. Calculation of the anticipated sampling weight.
2. Adjustment of the sampling weight for nonresponse by weight class adjustment.
3. Calibration of nonresponse adjusted weights to match the population control totals by county for FRPM participation.

Assumptions

1. Schools sampled in each county are selected by probability proportional to size.
2. The schools which refused to participate are no different from those which did.
3. Those students who were eligible but not evaluated in each school (because of absenteeism or lack of permission) were no different with respect to oral health and height and weight from those who were eligible and evaluated.
4. Total enrollment in each facility as reported by ODH is correct.
5. Eligible children are all in third grade in a public school.
6. All eligible children in each facility selected were to be sampled. (Response rates were approximately 50 percent)
7. Children were only screened when parental/guardian consent was given.
8. In the 2009-2000 school year, there were 131,392 3rd graders in Ohio schools who participated in FRPM programs.

Data Collection

In each county, health care professionals were recruited to be volunteer screeners through local programs of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and through local health departments. School nurses also volunteered.

ODH staff trained more than 300 health care professionals to be screeners through regional training sessions. Training was conducted using a protocol for weighing and measuring based on Guidelines for Measuring Heights and Weights and Calculation of Body Mass Index-for-Age in Ohio's Schools, a document developed by ODH, School and Adolescent Health Program in 2003.[20] Each volunteer signed a confidentiality statement, ensuring that the data collected would not be used for any purpose other than our BMI surveillance program.

Measures

All methods and equipment to collect height and weight data were consistent across years. Students were weighed twice to the nearest 0.2 pound, averaging the two weights if different, using Tanita electronic scales, model BWB-800 (Tanita Corporation of America, Inc, Arlington Heights, Illinois). Standing height was measured to the nearest 0.25 inch using SECA portable stadiometers, model 214 (seca gmbh & co, Hamburg, Germany).

Data Analysis

BMI calculations for children are dependent on five pieces of information: date of birth, sex, height, weight, and date of data collection. If any of these pieces of information were missing or implausible, the original data forms and classroom rosters were checked, and correct/verified information was inserted into the dataset, with an accompanying data cleaning note. If the data could not be verified from the original data form or classroom roster, schools were contacted to obtain the correct information, which was then inserted into the dataset, with an accompanying cleaning note. If data could not be verified, the data was considered missing. If birth date was missing, but age was available, the average age in months of all children in the sample of that age in years was used. This assumes that at this age, having exact age in months is not critical for calculating BMI percentile and that having age within one year of actual age is better than discarding the observation.

We calculated percentiles for BMI-for-age and sex according to the 2000 CDC growth charts, using a CDC-provided program.[21] We calculated age in months from the date of measurement and the reported date of birth. Outliers of the BMI-for-age percentile were flagged by the CDC-provided SAS program and are based on World Health Organization fixed-exclusion ranges. The heights and weights corresponding to the implausible BMIs were verified using the original data forms. If the values in the dataset were the same as on the data form, then the BMI was considered valid, otherwise the value was considered invalid.

Statistical analyses were done using SAS (version 9.1; SAS Institute Inc, Cary, North Carolina) and SUDAAN (version 10; Research Triangle Institute, Research Triangle Park, North Carolina). Sample weights were used to account for differential nonresponse and to adjust for sampling by strata. Poststratified adjusted weight is the product of the nonresponse adjusted weight and the poststratification adjustment factor.

The differences between point estimates within the same year by demographics were completed using chi-squared tests, using $p<0.05$ as the significance level. Comparisons across years (2004-05 vs. 2009-10) and trends over five time periods (2004-05, 2006-07, 2007-08, 2008-09, 2009-10) were modeled using logistic regression with time period included as an ordinal variable.[2] Data presented in the report represent unadjusted results, however while controlling for age, sex, race/ethnicity, and enrollment in the free and reduced-price meal program results did not change.

Reliability of Estimates

The prevalence estimates (percentages) in this report were derived from surveying a sample of 3rd grade children in each Ohio county. Therefore, the percentages presented in this report are estimates of the true values. The only way to get true values of overweight/obesity is to measure every 3rd grader, throughout the entire state. Because this would require a vast amount of additional resources, we applied scientific survey designs in the sample selection to make inferences about our population of interest (3rd grade children in Ohio). In order to make statistically valid inferences for the population of interest, we incorporated the sample design in our data analyses.[22] Regardless of designing the survey to generate reliable (or precise) estimates, we must consider the possibility that estimates still may not reflect the true prevalence; to evaluate this, we assessed the reliability of each estimate using recommendations provided by CDC. Specifically, estimates in this report were termed unreliable, and should be interpreted with caution, if either of the following conditions were met:

1. The 95% confidence interval (CI) of the estimate has a width or range greater than 20 (e.g., 95% CI = 10.0-30.5). The CI is a range of values around an estimate, which reflects sampling error and represents the uncertainty of the estimate. The width of the CI gives us an idea of how certain we are about the true prevalence of children who are overweight/obese in each county and within the state. For estimates with intervals greater than 20, we are less certain about the true prevalence; for estimates with intervals <20, we are more certain. In technical terms, the 95% CI means that if we were to repeat this study 100 times, 95 of the intervals generated would contain the true estimate.

2. The estimate has a relative standard error (RSE) of 30.0% or higher. The RSE is obtained by dividing the standard error (SE) of the estimate by the estimate itself (calculated using SAS-callable SUDAAN statistical software) and expressing it as a percentage. The standard error (SE) is primarily a measure of the variability and part of the measurement error that occurs by chance due to measuring a sample, rather than the entire population of interest.[23]

Overweight/obesity prevalence among Ohio 3rd graders by county, 2004-05 and 2009-10

The number of schools selected per county is based on previous data related to county specific demographic characteristics of interest. Using previous data allows us to maximize the reliability and variability in demographics among 3rd graders. However, we may still get unreliable estimates due to low response rates, which led to small sample sizes and inadequate representation of a county. Local efforts to increase participation can help improve reliability of county specific estimates in future surveys.

	2004–05 Overweight/ obesity (95% CI)	2009–10 Overweight/ obesity (95% CI)
Adams	31.0 (28.8 – 33.3)	48.8 (46.0 – 51.5)[d]
Allen	35.0 (31.0 – 39.1)	39.3 (34.0 – 44.6)
Ashland	40.8 (33.1 – 49.0)	42.2 (36.9 – 47.6)
Ashtabula	40.7 (35.9 – 45.7)	36.3 (31.3 – 41.3)
Athens	36.7 (29.8 – 44.3)	40.4 (31.7 – 49.1)
Auglaize	35.6 (31.3 – 40.1)	31.6 (24.9 – 38.3)
Belmont	39.3 (34.9 – 44.0)	40.5 (33.4 – 47.5)
Brown	37.6 (36.7 – 38.6)	38.1 (34.4 – 41.8)
Butler	26.1 (19.0 – 34.8)	40.1 (32.9 – 47.4)[d]
Carroll	37.1 (30.2 – 44.6)	43.3 (41.6 – 45.1)
Champaign	29.8 (23.4 – 37.2)	45.6 (37.8 – 53.5)[d]
Clark	30.6 (28.9 – 32.4)	28.7 (17.5 – 39.9)[b]
Clermont	30.2 (22.0 – 40.0)	37.2 (34.1 – 40.4)
Clinton	43.1 (41.3 – 44.9)	46.1 (42.2 – 50.0)
Columbiana	35.8 (22.0 – 52.4)[b]	35.8 (29.8 – 41.7)
Coshocton	49.1 (41.5 – 56.8)	40.2 (33.0 – 47.5)[c]
Crawford	32.8 (26.0 – 40.5)	33.6 (28.7 – 38.5)
Cuyahoga	34.0 (29.0 – 39.5)	37.7 (27.9 – 47.5)
Darke	26.9 (25.2 – 28.6)	24.1 (16.8 – 31.4)
Defiance	35.4 (28.0 – 43.6)	34.5 (30.4 – 38.6)
Delaware	29.7 (25.1 – 34.6)	25.7 (22.6 – 28.7)
Erie	38.1 (35.4 – 41.0)	39.7 (35.1 – 44.3)
Fairfield	33.0 (29.2 – 37.0)	27.5 (20.3 – 34.7)
Fayette	37.7 (27.3 – 49.3)[b]	45.7 (37.2 – 54.1)
Franklin	33.2 (27.5 – 39.6)	31.2 (22.4 – 40.1)
Fulton	32.7 (25.4 – 40.9)	29.2 (24.8 – 33.6)
Gallia	43.9 (40.0 – 47.9)	44.3 (32.0 – 56.5)[b]
Geauga	30.3 (24.0 – 37.3)	23.3 (19.0 – 27.6)[c]
Greene	32.9 (27.0 – 39.5)	28.5 (22.2 – 34.9)
Guernsey	41.7 (33.7 – 50.2)	45.3 (43.1 – 47.5)
Hamilton	37.9 (28.0 – 48.9)[b]	31.7 (25.9 – 37.4)
Hancock	36.9 (33.7 – 40.1)	30.3 (23.7 – 37.0)
Hardin	36.0 (24.7 – 49.1)	51.5 (46.3 – 56.8)[d]
Harrison	39.0 (35.1 – 43.0)	38.9 (36.3 – 41.6)
Henry	29.9 (22.2 – 39.0)	33.3 (25.1 – 41.6)
Highland	45.7 (41.6 – 49.8)	39.3 (34.8 – 43.8)[c]
Hocking	33.3 (29.2 – 37.7)	41.3 (35.1 – 47.5)[d]
Holmes	29.1 (13.4 – 52.0)[a,b]	35.2 (17.2 – 53.1)[b]
Huron	38.5 (29.7 – 48.1)	41.1 (36.3 – 46.0)
Jackson	51.4 (41.9 – 60.9)	45.0 (40.6 – 49.5)
Jefferson	45.5 (39.7 – 51.4)	32.9 (22.9 – 42.8)[c]
Knox	35.9 (23.4 – 50.6)[b]	33.0 (16.9 – 49.1)[b]
Lake	25.9 (18.9 – 34.3)	28.0 (24.1 – 32.0)

Lawrence	44.5 (36.9 – 52.3)	51.0 (40.6 – 61.4)[b]
Licking	33.1 (23.7 – 44.0)[b]	31.6 (28.8 – 34.4)
Logan	51.5 (48.9 – 54.0)	38.2 (34.8 – 41.5)[c]
Lorain	41.3 (35.4 – 47.5)	39.2 (27.4 – 51.0)[b]
Lucas	28.3 (27.1 – 29.6)	36.8 (31.0 – 42.7)[d]
Madison	35.2 (28.5 – 42.4)	30.0 (22.6 – 37.4)
Mahoning	42.9 (28.4 –58.7)[b]	38.2 (30.1 – 46.3)
Marion	38.3 (32.4 – 44.7)	34.1 (26.8 – 41.3)
Medina	30.8 (19.3 – 45.4)[b]	25.4 (18.5 – 32.3)
Meigs	48.4 (35.7 – 61.3)[b]	44.4 (40.6 – 48.2)
Mercer	35.4 (24.7 – 45.6)[b]	32.5 (19.0 – 46.1)[b]
Miami	37.0 (32.0 – 42.3)	29.3 (24.0 – 34.5)[c]
Monroe	44.9 (40.8 – 49.0)	44.5 (35.2 – 53.8)
Montgomery	43.4 (34.4 – 52.7)	33.2 (26.9 – 39.5)[c]
Morgan	43.3 (32.0 – 55.2)b	34.1 (26.3 – 41.9)
Morrow	29.5 (28.4 – 30.6)	35.6 (29.5 – 41.6)
Muskingum	37.1 (18.8 – 60.0)[a,b]	36.4 (28.8 – 43.9)
Noble	33.4 (26.2 – 41.3)	34.4 (23.4 – 45.4)[b]
Ottawa	35.7 (27.7 – 44.5)	32.4 (27.9 – 37.0)
Paulding	28.4 (26.1 – 30.8)	37.5 (33.2 – 41.8)[d]
Perry	39.4 (26.0 – 54.5)[b]	38.8 (37.2 – 40.4)
Pickaway	42.7 (37.3 – 48.3)	37.9 (30.1 – 45.7)
Pike	43.3 (38.3 – 48.4)	46.9 (42.6 – 51.1)
Portage	32.6 (26.0 – 40.0)	30.0 (25.7 – 34.2)
Preble	41.0 (32.6 – 50.0)	37.1 (25.6 – 48.6)
Putnam	37.0 (30.0 – 44.1)	33.9 (30.3 – 37.5)
Richland	32.7 (25.6 – 40.7)	29.4 (25.7 – 33.1)
Ross	47.2 (32.1 – 62.9)[b]	37.1 (26.5 – 47.7)[b]
Sandusky	47.7 (43.1 – 52.3)	37.7 (29.6 – 45.7)[c]
Scioto	50.2 (35.2 – 65.2)[b]	44.5 (37.8 – 51.2)
Seneca	28.1 (18.5 – 40.2)[b]	44.6 (35.7 – 53.5)
Shelby	46.8 (44.7 – 48.8)	31.7 (28.1 – 42.2)[c]
Stark	33.5 (27.5 – 40.0)	34.1 (26.1 – 42.2)
Summit	43.3 (25.4 – 63.1)[b]	30.9 (20.5 – 41.3)[b]
Trumbull	38.5 (36.0 – 41.1)	43.3 (40.8 – 45.8)[d]
Tuscarawas	37.6 (31.9 – 43.6)	35.7 (33.7 – 37.7)
Union	no data	36.0 (32.9 – 39.2)
Van Wert	41.3 (41.1 – 41.5)	39.6 (27.9 – 51.3)[b]
Vinton	41.7 (40.4 – 43.0)	38.4 (36.5 – 40.3)[c]
Warren	24.2 (18.7 – 30.5)	29.3 (22.9 – 35.7)
Washington	33.6 (22.8 – 46.3)[b]	40.4 (32.4 – 48.4)
Wayne	33.0 (29.3 – 37.0)	31.6 (28.3 – 34.9)
Williams	41.7 (38.2 – 45.3)	38.2 (37.5 – 38.9)
Wood	31.3 (25.9 – 37.3)	36.5 (28.8 – 44.3)
Wyandot	39.6 (31.4 – 48.5)	39.3 (38.0 – 40.7)

Abbreviations: CI, confidence interval

[a] Does not meet standard of statistical reliability and precision, interpret with caution (relative standard error ≥30%, The RSE is obtained by dividing the standard error of the estimate by the estimate itself. It is calculated by the SAS-callable SUDAAN software.

[b] Does not meet standard of statistical reliability and precision, interpret with caution (95% confidence interval of the estimate has a width or range greater than 20 [e.g., 95% CI = 10.0– 30.5]).

[c] Significantly lower overweight/obesity prevalence from 2004-05 to 2009-10 (comparisons could not be made in counties with unreliable estimates in either 2004-05 or 2009-10)

[d] Significantly higher overweight/obesity prevalence from 2004-05 to 2009-10 (comparisons could not be made in counties with unreliable estimates in either 2004-05 or 2009-10)

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