Ohio Family Health Survey

OBESITY IN CHILDREN AND FAMILIES ACROSS OHIO

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Rainbow Babies & Children's Hospital
The Center for Child Health & Policy

University Hospitals

OFHS

About the Ohio Family Health Survey

With more than 51,000 households interviewed, the Ohio Family Health Survey is one of the largest and most comprehensive state-level health and insurance surveys conducted in the country. The project was managed by The Ohio State University's Ohio Colleges of Medicine Government Resource Center, and the Health Policy Institute of Ohio and the survey was conducted by Macro International. The Ohio Departments of Insurance, Job and Family Services, Health, and Mental Health, the Cleveland State University, and the Ohio Board of Regents funded the project. This current project is the third in a series of statewide health surveys, following family health surveys in 1998 and 2004.

Ohio Family Health Survey Web site (all sponsored research reports are available for download here):
http://grc.osu.edu/ofhs

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I. ABSTRACT

Obesity is a silent killer, a top public health threat, and a national concern. To develop effective policies and wise resource allocation for Ohio, the state must know not only rates of obesity across the population but also how obesity relates to key policy-relevant factors in Ohio – including age, gender, race, geography, income, insurance status, comorbid conditions, and health care utilization. However, systematic data like these have not been available in Ohio until now.

The 2008 Ohio Family Health Survey (OFHS) provides an opportunity for rigorous assessment of obesity in children and families across the state. The survey includes data on obesity for approximately 50,000 adults and 6,000 children (10-17 years). Accordingly, we utilized the OFHS to assess the current scope of obesity and its impact on health in Ohio.

The new results from the 2008 OFHS show that more than 1 in 3 (35.6%) Ohio 10-17 year olds and 2 in 3 (65%) Ohio adults are overweight or obese. Therefore, approximately 500,000 children and 5.5 million adults in Ohio are overweight or obese. These rates greatly exceed national targets.

In adults, the rates of overweight/obesity in Ohio have clearly risen over the past 10 years. Although precise comparative studies are not available for children, existing data suggest that childhood obesity in Ohio may have risen over time.

Obesity in Ohio is pervasive – affecting all geographic regions and almost all segments of Ohio citizens. Yet, the rates are uneven across certain policy-relevant factors. For children, each of the following independently increases the risk of obesity: being male, having Medicaid insurance or being uninsured, having low family income, having an overweight or obese parent (adult in the household), having a parent who has no more than a high school education, and being an African American female.

For Ohio adults, males and African American females are also at highest risk. Lower educational attainment, lower income, and having Medicaid insurance each increase the risk of obesity.

Obesity greatly increases the risk of diseases in both Ohio's children and adults. Compared to children of healthy weight, Ohio's obese children are reported to be:

- 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.

Compared to adults of healthy weight, obese adults are reported to be:

- 5.3-fold more likely to have diabetes,
- 3.1-fold more likely to have heart failure,
- 2.4-fold more likely to have hypertension,
- 2.3-fold more likely to have cardiovascular disease,
- 2.2-fold more likely to have angina,
- 2.1-fold more likely to have poor health status,
- 2.0-fold more likely to have had a heart attack,
- 1.8-fold more likely to have a chronic illness, and
- 1.6-fold more likely to have had a stroke.

Obesity also markedly increases the use of health services by both Ohio children and adults. Compared to healthy weight children, obese children are reported to be:

- 2.1-fold more likely to have had 2 or more hospitalization in the past year,
- 1.8-fold more likely to have had 2 or more Emergency Department (ED) 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.

Compared to healthy weight adults, obese adults are reported to be:

- 1.5-fold more likely to have had 2 or more hospitalizations in the past year,
- 1.5-fold more likely to have had 2 or more ED visits in the past year,
- 1.6-fold more likely to have special health care needs, and
- 1.6-fold more likely to use chronic medications.

Together, these data indicate that obesity in Ohio is a major public health threat. Accordingly, policy interventions are needed. We suggest that principles for obesity policy interventions in Ohio include:

- Start young (i.e., target children)
- Focus on families (i.e., focus on parents as well as children)
- Do not target any single geographic region in Ohio but instead act broadly
- Develop global interventions throughout the state as well as tailored interventions targeted to high risk groups
- Work to change popular perceptions of health, food, and activity
- Develop policies that address both prevention and treatment of obesity
- Define obesity as a chronic disease that requires policies for primary prevention and secondary prevention of co-morbidities
- Act now. Use the best available evidence to develop and implement policies and interventions, evaluate the outcomes, and modify as needed

These are the first comprehensive analyses of obesity in Ohio. Furthermore, they are the first analyses of obesity in Ohio that take into account policy-relevant risk factors and the impact of obesity on health and health care utilization in children and adults. As such, the data provide key insights that are necessary to shape Ohio's policies to combat obesity.

II. INTRODUCTION: BACKGROUND, SIGNIFICANCE, AND GOALS

Obesity is a top priority public health threat, with dramatic ramifications for health and health costs. Obesity has risen to epidemic proportions in the U.S.[1,2,3] Obesity takes a significant toll on the health of Americans – increasing the risk of diabetes, cardiovascular disease, cancer, and more.[4-7] Furthermore, the national economic costs are staggering, estimated at $117 billion in 2000, with half paid by Medicare and Medicaid.[6] Moreover, obesity accounted for 27% of the rise in inflation-adjusted per capita spending between 1987 and 2001,[8] and the costs of obesity now exceed those from smoking or alcohol.[9]

The striking increase in childhood obesity is of particular concern because of the expectation that it will result in escalating morbidity and early mortality as these children mature.[5,10,11] Obese children are significantly more likely to have heart disease as adults;[12] moreover, because of high childhood obesity rates, by 2035 – when today's children are adults – there are expected to be more than 100,000 excess cardiac deaths.[13] Because of the high rates of obesity, the Centers for Disease Control and Prevention (CDC) predicts that the prevalence of diabetes will double by 2050 and that one in three Americans born in 2000 will develop diabetes. These data underscore the looming impact of today's obesity on tomorrow's population health and health costs.

The state of Ohio has identified obesity as a priority target for health policy initiatives and recently published a statewide obesity prevention plan in response to a directive from Governor Ted Strickland.[14,15] However, data needed to develop targeted, informed, resource-savvy, and effective policies to prevent and treat obesity in Ohio have been lacking. Many of the root causes and impacts of obesity are mediated through community and contextual characteristics,[16] therefore understanding obesity within regions and subpopulations in Ohio is fundamental to addressing the problem.

Until now, available information[1,2,17,18] has not provided comprehensive, consistent data across Ohio populations, ages, races, insurance groups, regions, and socioeconomic strata. Moreover, data have been lacking about the impact of obesity on Ohioans' health and use of health resources. These major gaps hinder Ohio's ability to ensure that policies to combat obesity are relevant and that resource allocation is targeted effectively. The current analysis focuses on addressing these gaps.

The 2008 Ohio Family Health Survey (OFHS) provides an extraordinary opportunity to address these deficits. The primary purpose of the OFHS is "to provide policy-makers with updated information on health status, access, and insurance of Ohioans" and thus "inform the health care reform decision-making process."[19] The survey meets a key need and assesses Ohio's health status and risk factors – including obesity.

The goal of the current report is therefore to provide comprehensive current data on child and adult obesity in Ohio – including the prevalence of obesity by subgroups, its impact on co-morbid conditions and health care utilization, and the factors that independently contribute to obesity in children and adults. These analyses are critical as a foundation for Ohio's obesity policy now and as a baseline for future legislative and policy initiatives.

III. METHODS AND DATA SOURCES

Data from the 2008 Ohio Family Health Survey (OFHS) were used to generate findings in this report. The OFHS is a statewide, random digit dial telephone survey of over 50,000 Ohio residents. The OFHS used a stratified, list-assisted sampling frame that sampled respondents using random digit dialing computer assisted telephone interviewing (CATI) methods. The sample was stratified by county with several additional samples. The six largest metropolitan counties were sub-sampled to ensure greater representation of African Americans. Additional targeted supplemental samples were drawn to ensure good representation of Asian and Hispanic residents. Finally, a separate cell phone sample ensured good representation of younger people more often reached via cell phones. A detailed description of the survey methodology can be found in the 2008 OFHS Methodological Report.[20,21]

In each household contacted, an adult respondent was identified and surveyed for health data (including height, weight, and health status) and demographic data (i.e. 50,000 adult respondents). When the household included a child (defined as 17 years or younger), the adult self-identified as having the most knowledge about the child's health was also asked a series of questions (including child's height, weight, and health status) and demography. In this manner, reported weights and heights were obtained for 48,942 adults and 6,086 children. Of adults reporting on the child's health status, 86% were the child's parent (59% mothers, 27% fathers) and approximately 95% also reported their own height, weight, and health status as the adult respondent. Accordingly, in this report we refer to the adult respondent reporting on the child's health status as the parent. The self-report method for ascertaining weight status was modeled after the well-established and extensively used techniques by the Centers for Disease Control and Prevention.[1,22]

Weight status for children and adults was defined in terms of body mass index (BMI; kg/m^2) and categorized as underweight, normal/healthy weight, overweight, or obese according to standards by the CDC, the Expert Committee on Childhood Obesity, and the WHO.[23-26] For adults, BMIs were categorized as: underweight being a BMI below 18.5, healthy weight being a BMI 18.5-24.9, overweight being a BMI of 25-29.9, and obese being a BMI equal or greater than 30 kg/m^2. In sub-analyses, a sub-category of extreme obesity (BMI $\geq$ 40 kg/m^2) was also used. For children, BMI categories are based on percentiles for age and gender: underweight being a BMI below the 5^{th} percentile, healthy weight being a BMI between the 5^{th}-84^{th} percentile, overweight being a BMI between the 85^{th}-94th percentile, and obese being a BMI at or above the 95^{th} percentile for age and gender. In subanalyses, extreme obesity in childhood was defined as a BMI at or above the 97^{th} percentile. Results were analyzed by univariable, bivariable (unadjusted), and multivariable methods (adjusted)

Although the 2008 OFHS was the primary data source, these analyses also include reference to the 1998 OFHS (http://www.odh.ohio.gov/healthStats/survey/ ofhs1.aspx) (the only previous OFHS providing obesity data in adults), the 2003 National Survey of Children's Health (NSCH, 2003, http://www.nschdata. org/Content/Default.aspx), the CDC's Youth Risk Behavior Survey (YRBS, 2007, http://www.cdc.gov/HealthyYouth/

yrbs/index.htm), the Pediatric Nutrition Surveillance Survey (PedNSS, 2006, http://www.cdc.gov/PEDNSS/), the Behavioral Risk Factor Surveillance Survey (BRFSS, 2007, http://www.cdc.gov/BRFSS/), the National Health and Nutrition Examination Survey (NHANES, 1999-2006, http://www.cdc.gov /nchs/nhanes.htm, the Ohio Department of Health's 3rd Grade BMI Surveillance Project (2004-2005 and 2006-2007, http://healthyohioprogram.org/ASSETS/7FBDB7A5C 3FB4977A430A1EA46 C642D9/bmirept.pdf), and the Ohio Department of Health's 7th Grade BMI Surveillance Project (2007-2008, http://www.odh.ohio.gov/healthstats/ healthstatsmainpage.aspx).[1,17,22,27-31]

IV. FINDINGS

Note: The following summarize major findings of the analyses. Please note that the scales for Figures 2, 3, and 5-14 were chosen for clarity. Since the scales differ, care must be exercised when comparing one graph to another. Detailed tables of results are in the Appendices.

A. How common is obesity in Ohio?

1. **Rates of overweight and obesity are currently very high in Ohio – both for children and for adults** (Fig. 1).

   Children: More than **1 out of every 3 children** (10-17 years) in Ohio (35.6%) is overweight or obese (17.1% overweight, 18.5% obese). This translates into approximately ***500,000 overweight or obese youth in Ohio***.

   Adults: Approximately **2 out of every 3 adults** in Ohio (65%) are overweight or obese (35.9% overweight, 29.1% obese). This translates into approximately ***5.5 million overweight or obese adults in Ohio***.

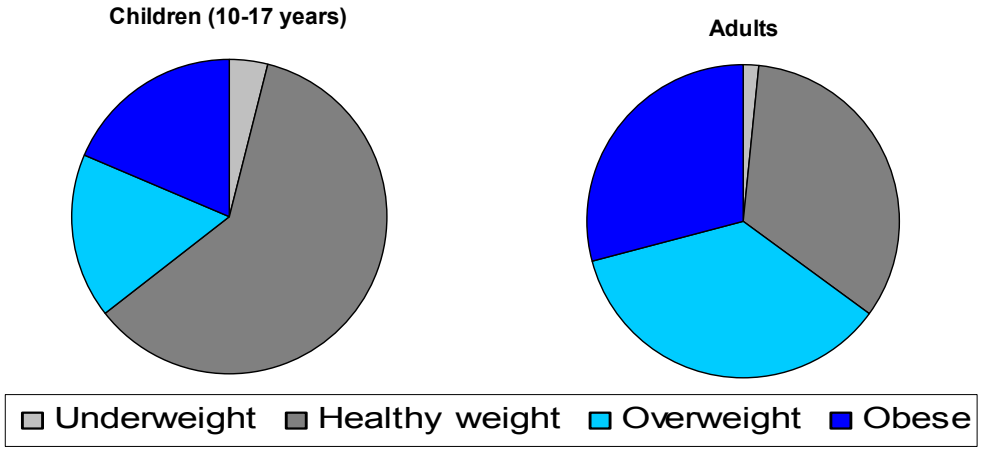

Figure 1 Rates of overweight and obesity in Ohio children and adults

2. **Rates of overweight and obesity are age-dependent in both children and adults.**

Children: The new OFHS data indicate that, among children 10-17 years, all age categories show rates of overweight and obesity that clearly exceed those expected (in children we would expect approximately 10% overweight and 5% obese based on CDC standards). However, the data indicate higher rates of overweight and/or obesity in younger children than older children (Fig. 2).

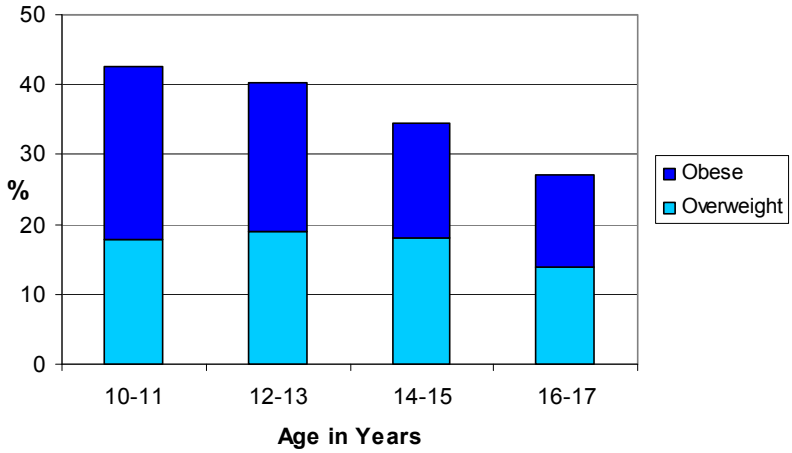

Figure 2 Ohio children: Rates of overweight and obesity by age

These results suggest that obesity may be increasing in younger children. Supporting this interpretation is the recent measurement of a statewide sample of Ohio seventh graders by the Ohio Department of Health (http://www.odh.ohio.gov/healthstats/healthstatsmainpage.aspx), showing similarly high rates of overweight and obesity (42.7%).[31] Nonetheless, the current results should be interpreted with caution since they are based on cross-sectional, self-reported data and alternative explanations are possible.

Adults: Rates of obesity in Ohio adults rise steadily from 18 to 65 years of age, when rates level off or decline (P<0.001; Fig. 3). The highest rate is at 55-64 years, when three quarters of the population (74.3%) are overweight or obese.

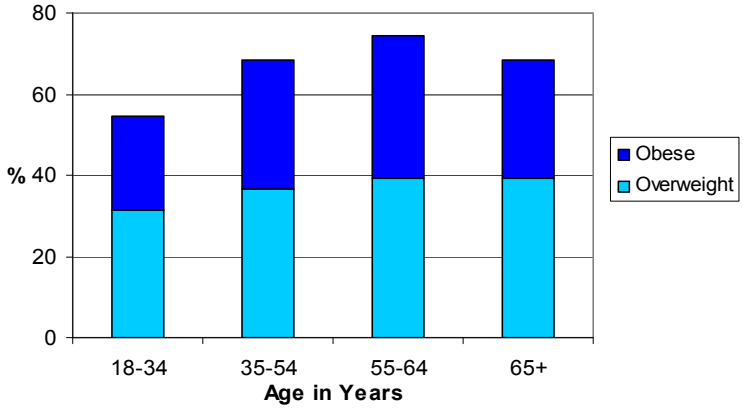

Figure 3 Ohio adults: Rates of overweight and obesity by age

3. **Obesity across the lifespan in Ohio** (Fig. 4)

Overall, combining the current cross-sectional data with an earlier cross-sectional study of 2-5 year olds on government assistance (http://www.cdc.gov/PEDNSS/), it is clear that obesity (defined as BMI equal or greater to 95th percentile in children and ≥ 30 kg/m^2 in adults) is widespread in Ohio's children by even preschool age (overall rate of obesity 12.1%),[28] and increases progressively to reach 18.5% of 10-17 year olds and 29.1% of Ohio adults (2008 OFHS; NS= not sufficient sample in county).

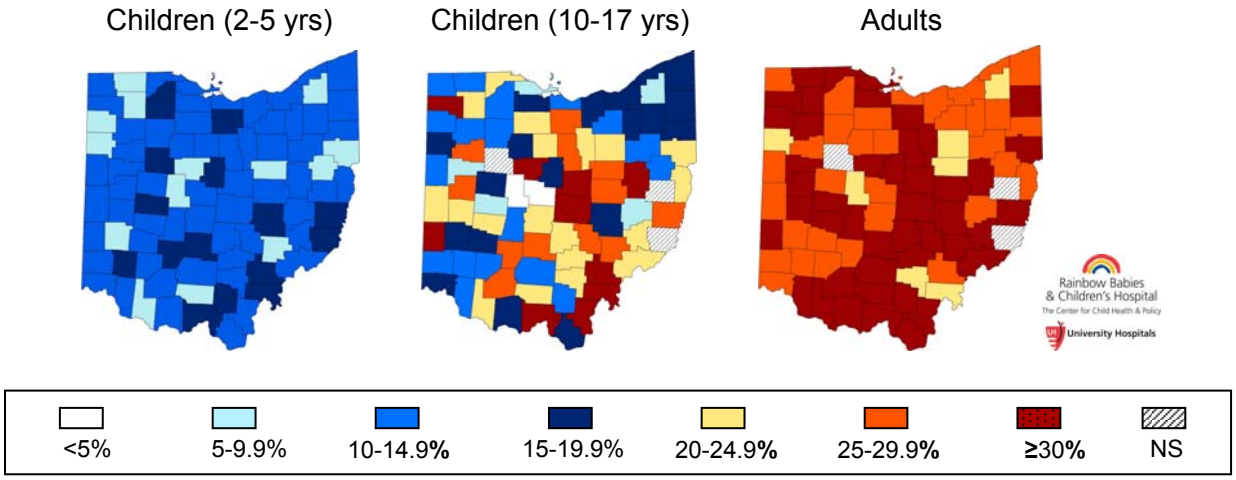

Figure 4 Obesity in Ohio across the lifespan

Note: The data for each county are point estimates. Caution should be used in interpretation as sample size varies by county. For further information, see Appendix C.

4. **The 2008 OFHS data suggest that rates of obesity in Ohio are rising.**

Children: Previous studies often used different methodology or studied different target age groups than the 2008 OFHS. Therefore, caution is needed in comparing previous data with the new OFHS data. However, the current rate of childhood overweight and obesity (35.6%) ascertained by OFHS exceeds that found using similar methods in a 2003 study (30.5%, National Survey of Children's Health, 2003; http://www.nschdata.org/Content/Default.aspx).[17] Furthermore, it is consistent with high rates of overweight and obesity ascertained by measurement of a sample of Ohio 7th grade students (Ohio Department of Health 2007-2008, http://www.odh.ohio.gov/healthstats/healthstatsmainpage.aspx).[31]

Adults: In comparison with the 1998 OFHS (http://www.odh.ohio.gov/healthStats/survey/ofhs1.aspx),[27] the 2008 data indicate that rates of adult overweight and obesity in Ohio rose from 47.5% to 59.1% in women and from 66.6% to 71.2% in men. These data show a substantial rise in adult obesity in Ohio in the past 10 years. The current rate of adult overweight and obesity in Ohio (66%) is also slightly higher than that found using similar methods in Ohio in 2007 (63.5%, http://www.cdc.gov/BRFSS/).[1]

5. **How do Ohio's obesity rates compare with the rest of the U.S.? Ohio is among the 25 fattest states in the U.S.**

Children: Ohio's current rate of childhood overweight and obesity (35.6%) is slightly higher than those identified by different methods or for different age groups in national studies (28.8%-34%; http://www.cdc.gov/HealthyYouth/yrbs/index.htm; http://www.cdc.gov/nchs/nhanes.htm).[22,29] Using CDC data from the NSCH study (2003, http://www.nschdata.org/Content/ Default.aspx),[17] Ohio was rated the 22nd fattest U.S. state for children in 2008 (http://healthyamericans.org/reports/obesity2008/).[32]

Adults: The new OFHS data finding that 65% of Ohio adults are overweight or obese is similar or slightly higher than national averages from recent studies (67.1%, NHANES, 2003-2004, http://www.cdc.gov/nchs/nhanes.htm; 62.9%, BRFSS, 2007, http://www.cdc.gov/BRFSS/).[1,29] Based on the CDC BRFSS data (2005-2007), Ohio was rated the 17th fattest state for adults in 2008 (http://healthyamericans.org/reports/obesity2008/).[32]

B. Policy-relevant factors affect the rates of obesity in Ohio children and adults

The following data describe the overall rates of overweight and obesity according to policy-relevant demographic factors (not controlling for interrelationships among these factors).

1. **Gender: Overweight and obesity are more common in males than females in Ohio.**

Children: In girls, 65.9% are healthy weight, 14.7% are overweight, and 14.8% are obese; by contrast in boys, 55.5% are healthy weight, 19.4% are overweight, and 22.0% are obese. Therefore, 29.5% of girls are overweight or obese, in contrast with 41.3% of boys (P<0.001).

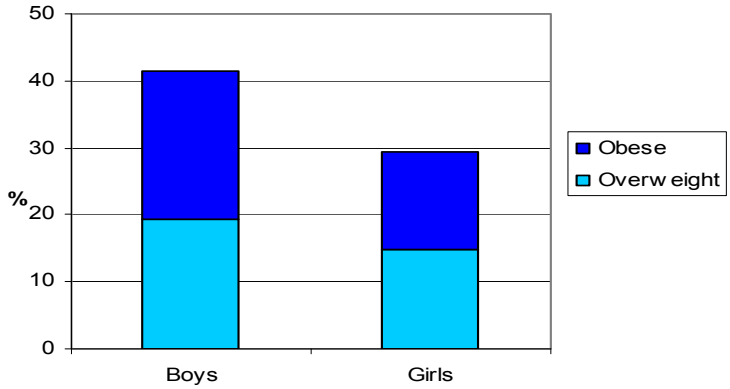

Figure 5 Children: Overweight and obesity rates are higher in boys than girls

Adults: In Ohio, 38.6% of women are healthy weight, 30.0% are overweight, and 29.1% are obese; by contrast, only 27.6% of men are healthy weight, 42.0% are overweight, and 29.2% are obese. Therefore, 59.1% of women and 71.2% of men are overweight or obese (P<0.001).

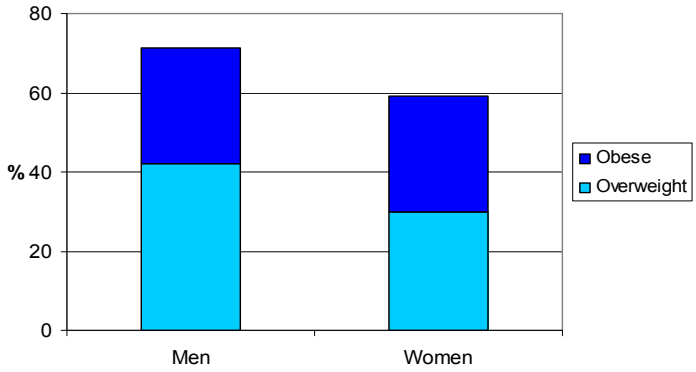

Figure 6 Adults: Overweight and obesity rates are higher in men than women

2. Race/ethnicity

The data suggest that taken as a whole (i.e. not controlling for income, insurance, and education), overweight and obesity vary by race/ethnicity in children and adults.

Children: Half of Ohio's African American children (50.3%) are overweight or obese; in contrast, 42.5% of Hispanics, 32.9% of Whites, and 7.7% of Asian American children are overweight or obese (P<0.001). This translates into approximately 76,000 African American, 11,000 Hispanic, 368,000 White, and 1,200 Asian American children (10-17 years) in Ohio who are overweight or obese.[33,34] Compared with White children, rates of overweight and obesity are significantly higher for African Americans (P<0.001) and Hispanics (P<0.001). Note however, that these racial-ethnic differences may reflect differences in income, education, and insurance since ethnic variation largely disappeared when these factors were controlled (see section IV.B.8).

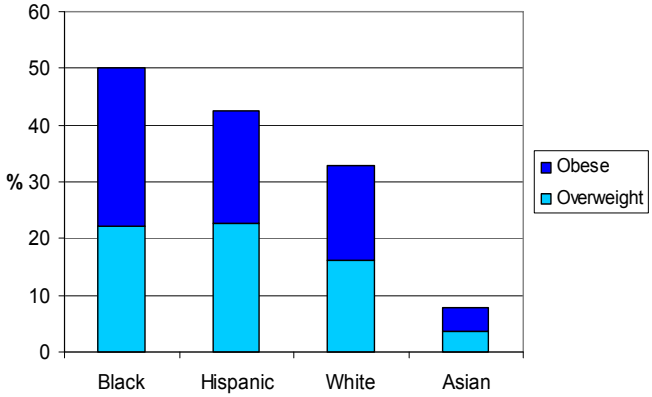

Figure 7 Children: Rates of overweight and obesity differ by race/ethnicity

Of note, the high rates of overweight and obesity in boys is similar among African Americans, Hispanics, and Whites. By contrast, in girls, African Americans have much higher rates of overweight/obesity than girls of other ethnic groups.

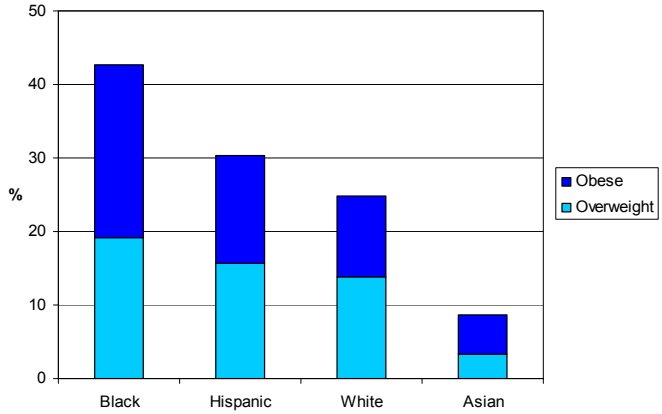

Figure 8 Girls: Rates of overweight and obesity differ by race/ethnicity, with African American girls being disproportionately affected

Adults: Almost three quarters (72.6%) of Ohio African American adults are overweight or obese; by contrast, almost two thirds of Hispanics (65.8%) and Whites (64.7%) are overweight or obese, and one third of Asians (31.9%) are overweight or obese (P<0.001). This translates into about 707,000 overweight or obese African American, 106,000 overweight or obese Hispanic, 4,655,000 overweight or obese White, and 32,400 Asian American adults in Ohio.[34]

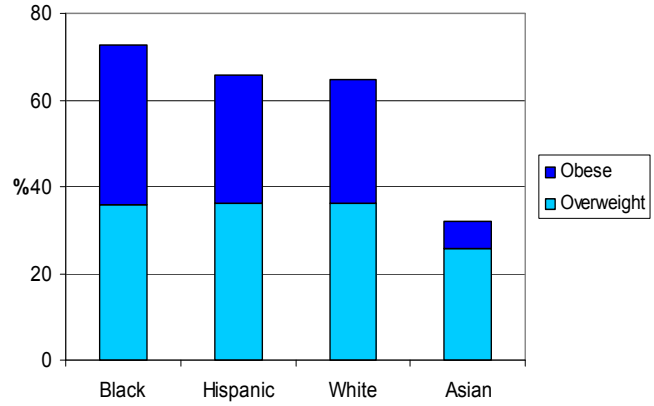

Figure 9 Adults: Rates of overweight/obesity by race/ethnicity

Similar to children, rates of overweight/obesity are comparable among adult males who are African American, Hispanic, or White. However, among females, rates of obesity are higher in African Americans than in other groups.

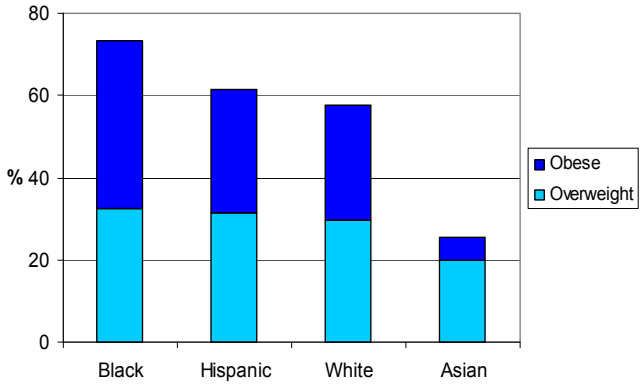

Figure 10 Women: Rates of overweight and obesity differ by race/ethnicity, with African American women being disproportionately affected by obesity

3. Health insurance

Rates of overweight and obesity vary by insurance status and source – although the patterns differ for children and adults.

Children: Children who are on Medicaid alone or uninsured have higher rates of obesity than those with job-based insurance (29.8%, 21.7%, and 13.7%, respectively). Uninsured children have higher rates of overweight (24%) than those on Medicaid (17.6%) and those with job-based insurance (16.5%). Overall, among children who are on Medicaid alone or uninsured, 47.5% and 45.7%, respectively are overweight or obese; by contrast, among those with job-based insurance, 30.1% are overweight or obese.

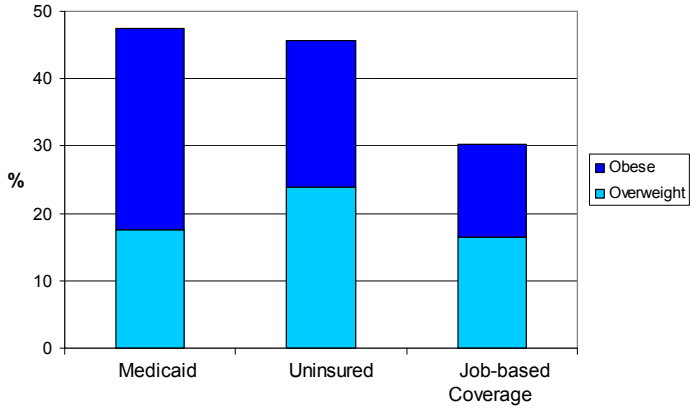

Figure 11 Children: Rates of overweight/obesity by insurance source and status

Adults: In contrast to children, weight status by insurance type differs according to whether one considers overweight or obese. Like children, adults with Medicaid coverage have higher rates of obesity (40.3% for dual eligible, 37.7% for Medicaid only) than those with job-based insurance (28.0%). However, in contrast to obesity, overweight is more common with job-based coverage (37.7%) than Medicaid (30.7% dual eligible, 28.1% Medicaid alone), and uninsured adults have similar or slightly lower rates of overweight/obesity than those with job-based insurance. However, it is important to note that these aggregate data on insurance type do not control for the independent effects of race, income, and educational attainment on obesity (see section IV.B.8 below).

Table 1 Adults: Influence of insurance source and status on overweight/obesity

	Insurance Status and Source					
	Medicaid and Medicare	*Medicaid*	*Medicare*	*Job-based*	*Direct Purchase*	*Uninsured*
% Overweight	30.7	28.1	38.2	37.7	34.6	32.1
% Obese	40.3	37.7	30.6	28	20.7	28.2
% Overweight or Obese	71.1	65.7	68.8	65.7	55.4	60.2

4. Family income

Overweight/obesity rates vary by family income – although the pattern is different for children and adults.

Children: Rates of obesity decline as income rises, ranging from 26.2% for those at or below the federal poverty level (FPL) to 11.4% in those over 300% FPL (P<0.001).

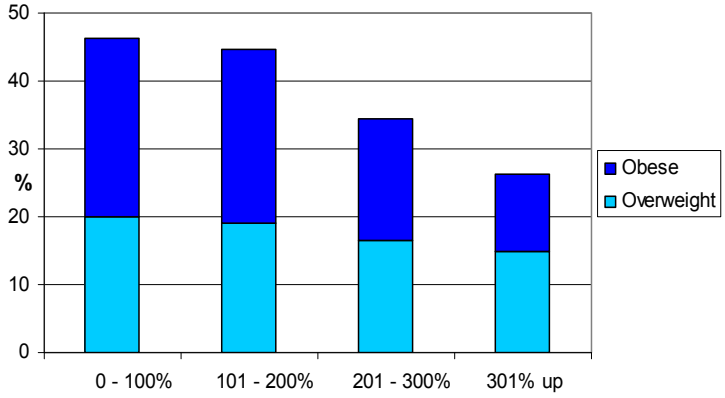

Figure 12 Children: Rates of overweight/obesity by family income

Adults: Similar to children, obesity rates in adults are highest in those with the lowest family incomes (33.6%) and fall progressively to reach the lowest levels when household income exceeds 300% FPL (26%) (P<0.001). By contrast, rates of overweight are lowest in those with incomes at or below FPL (30.1%) and rise progressively with higher income to 38.8% of those with incomes exceeding 300% FPL (P<0.001). Notably, patterns were similar in 1998 but rates of overweight/obesity rose in all income segments compared with 1998.[29] These aggregate data on family income do not control for the effects of insurance, race, and educational attainment on obesity (see section IV.B.8 below).

Table 2 Adults: Influence of family income on rates of adult overweight/obesity

	Family Income (% FPL)			
	0-100%	*101-200%*	*201-300%*	*301% and up*
% Overweight	30.1	32.2	37.7	38.8
% Obese	33.6	32.6	29.2	26
% Overweight or Obese	63.7	64.8	66.9	64.8

5. Adult educational attainment

Adult educational attainment is linked to obesity rates in children and adults.

Children are significantly more likely to be overweight or obese (50.9%) when the adult respondent (most of whom were their parents) has a high school diploma or lower educational attainment, compared with the adult having a college or graduate degree (25.2%).

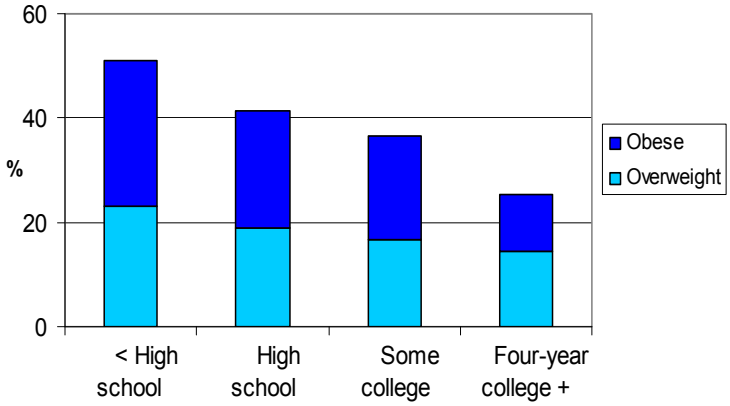

Figure 13 Influence of adult educational attainment

Adults: In adults, educational attainment has opposite effects for overweight and obesity. Obesity rates are highest in those with high school education or less (33.1%) and decline steadily to reach 22.8% among those with a college or advanced degree (P<0.001). By contrast, overweight rates are highest in those with college or advanced degrees (37.8%) and fall to 32.5% in those with less than a high school diploma (P<0.005). It is important to note that these aggregate data on educational attainment do not control for the effects of insurance, income, and race on obesity (see section IV.B.8).

Table 3 Adults: Influence of educational attainment on rates of adult overweight/obesity

	Educational Attainment			
	< High School	*High School*	*Some college*	*Four-year college +*
% Overweight	32.5	36	35.6	37.8
% Obese	33.1	31.6	30.1	22.8
% Overweight or Obese	65.6	67.6	65.6	60.6

6. The adult respondent's weight status is strongly linked to the child's weight status.

When the adult respondent is healthy weight, 67.4% of children are healthy weight, 14.4% overweight, and 13.4% obese (total 27.8% overweight or obese). However, when the adult respondent is overweight, only 62.1% of children are healthy weight and the proportion of overweight and obese children rises to 34.0%. Furthermore, when the adult respondent is obese, the proportion of overweight and obese children increases further to 45.3% (P<0.001).

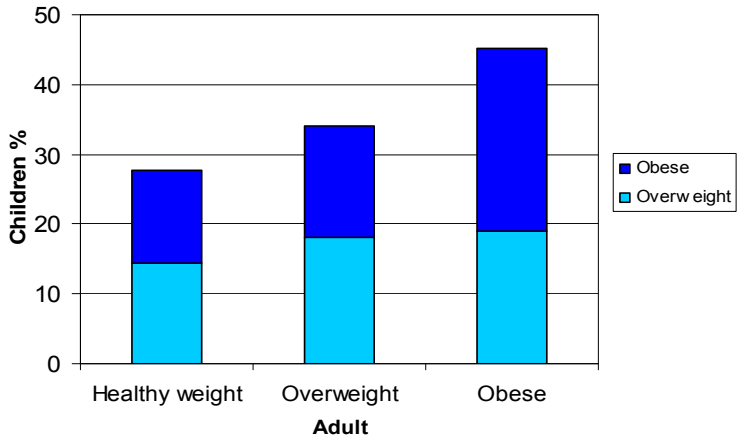

Figure 14 Adult weight status is strongly linked to child weight status

7. **Overweight/obesity is widespread across Ohio, without strong geographic concentration**.

   Almost every county surveyed showed higher than expected rates of overweight and obesity (see Fig. 4). Data on obesity for each Ohio county are shown in Appendix B.

   When county clusters (metropolitan, suburban, rural non-Appalachian, rural Appalachian) are compared, there are no significant differences in overweight/obesity rates for children. For adults, there are no differences among regions for rates of overweight and there are slight, statistically significant differences for obesity (31.9%, 30.0%, 29.7%, and 28.1% rates of obesity in rural Appalachian, rural non-Appalachian, Suburban, and Metropolitan counties, respectively). However, the overall high rate of overweight/obesity across the entire state is a more striking finding.

8. **Which factors are independent predictors of obesity?**

   As many policy-relevant factors may each be associated with obesity (e.g., income, insurance, and education), we performed multivariable logistic regression analyses. By analyzing the variables together in a multivariable model, it is possible to determine the independent effects of each factor adjusted for the other factors (e.g. impact of insurance after adjusting for factors such as income).

   Children: In Ohio, all else being equal (see Appendix E):
   - Children who are 10-11 years or 12-13 years are 2.2-fold and 1.8-fold, respectively, more likely to be obese than those who are 16-17 year-old
   - Boys are 1.8-fold more likely to be obese than girls.
   - Children who are on Medicaid alone or uninsured are 1.3-fold and 1.4-fold, respectively, more likely to be obese than those with job-based insurance.
   - Children whose adult respondent is obese are 1.7-fold more likely to be obese than those whose adult respondent is healthy weight.

- Children with household income at or below the federal poverty level are 1.4-fold more likely to be obese than those with incomes above 300% FPL.
- Children whose adult respondent has a high school education or less is 1.4-fold more likely to be obese than one with a college or graduate degree.
- Children residing in rural non-Appalachian counties have 1.2-fold increased risk of being obese compared to those in suburban counties.
- After controlling for the other demographic factors, race is not an independent predictor of obesity. However, there is a significant interaction between gender and race for African American girls who are 1.8 fold more likely to be obese than other gender-race combinations (Table 4).

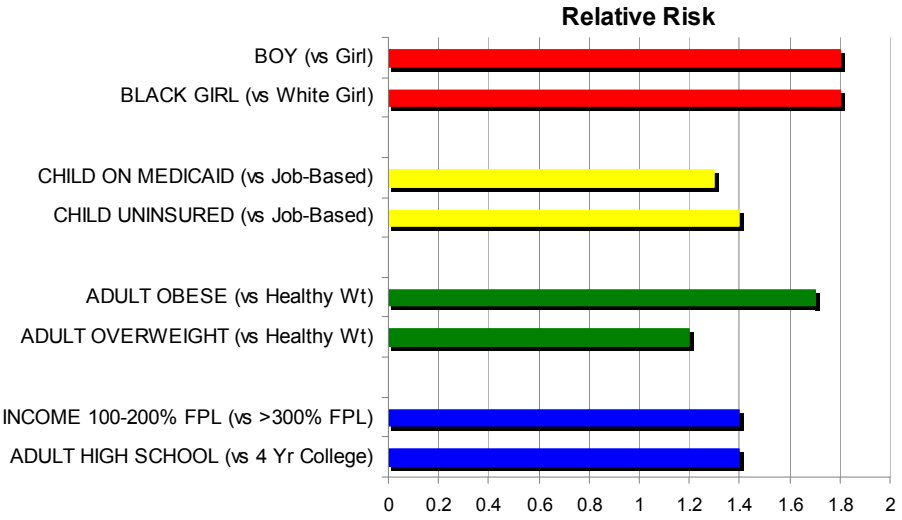

Figure 15 Children: Independent predictors of childhood obesity

Table 4 Relative risk of overweight and obesity in children according to the combination of race and gender

OVERWEIGHT CHILD:	FEMALE	MALE	Mean
WHITE	1.00	1.54	1.3
BLACK	1.57	1.86	1.7
HISPANIC	1.21	2.14	1.7
ASIAN	0.15	0.23	0.2

Base: White Female

OBESE CHILD:	FEMALE	MALE	Mean
WHITE	1.00	1.80	1.4
BLACK	1.84	1.66	1.7
HISPANIC	1.21	1.76	1.5
ASIAN	0.29	0.52	0.4

Base: White Female

Adults: In Ohio, all else being equal (see Appendix E):

- Adults of age group 55-64 years and 35-54 years are, respectively, 1.6 and 1.4-fold more likely to be obese than 18-34 year olds.
- Males are 1.3-fold more likely to be obese than females.
- Adults on Medicaid are 1.3-fold more likely to be obese than those with job-based coverage.
- Adults with household incomes 100-200% FPL are 1.2-fold more likely to be obese than those with incomes exceeding 300% FPL.
- Adults with a high school education or less are more likely to be obese than those with a college or graduate degree.
- Race, as a whole, is less a predictor of obesity when other demographic factors are controlled (except for Asians who have lower obesity rates). However, there is a significant interaction of race with gender, so that African American females are 1.5 fold more likely to be obese compared with White females (see Table 5).

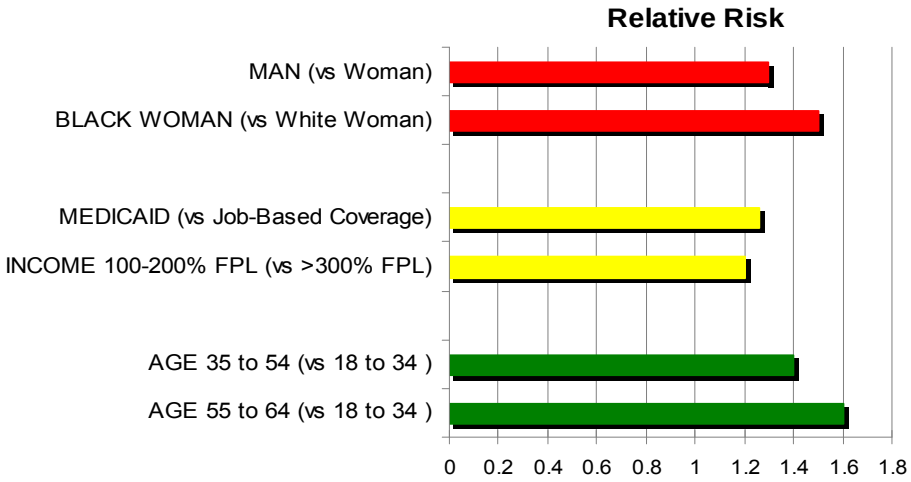

Figure 16 Adults: Independent predictors of adult obesity

Table 5 Relative risk of overweight and obesity in adults according to the combination of race and gender

OVERWEIGHT ADULT :	FEMALE	MALE	Mean
WHITE	1.00	1.44	1.2
BLACK	1.41	1.51	1.5
HISPANIC	1.19	1.49	1.3
ASIAN	0.61	0.88	0.7

Base: White Female

OBESE ADULT:	FEMALE	MALE	Mean
WHITE	1.00	1.29	1.1
BLACK	1.49	1.39	1.4
HISPANIC	1.12	1.29	1.2
ASIAN	0.24	0.31	0.3

Base: White Female

These analyses indicate independent predictors of obesity based on the individual's characteristics (and, for children, those of their parents). They suggest that "one size may not fit all" in obesity prevention or treatment interventions, so that some targeted intervention strategies for high risk groups may be needed.

However, it is also important to note that:

(a) combinations of these risk factors increase the risk of obesity even further (e.g. an African American child who is on Medicaid and has an obese parent is far more likely to be obese than a White child with job-based insurance and a healthy weight parent) and

(b) the home environment can affect the likelihood of obesity even for individuals with the same level of independent risk factors. For example, children with comparable risk factors living in "food deserts," or areas where residents have limited access to supermarkets and supercenter stores,[35] are more likely to be obese than those living in environments with ready access to these resources.

C. How does weight status affect prevalence of diseases and use of health services among Ohio's children and adults?

1. Obese children and adults are at significantly increased risk for many co-morbid conditions, compared with children of healthy weight.

Children: Compared with children of healthy weight, Ohio's obese children are reported to be 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 (Fig. 17). The subset with extreme obesity (BMI ≥ 97th percentile) is particularly affected with even higher likelihood of each of these conditions (Table 6). In contrast to obese children, those who are overweight in the sample did not show increased risk for these conditions.

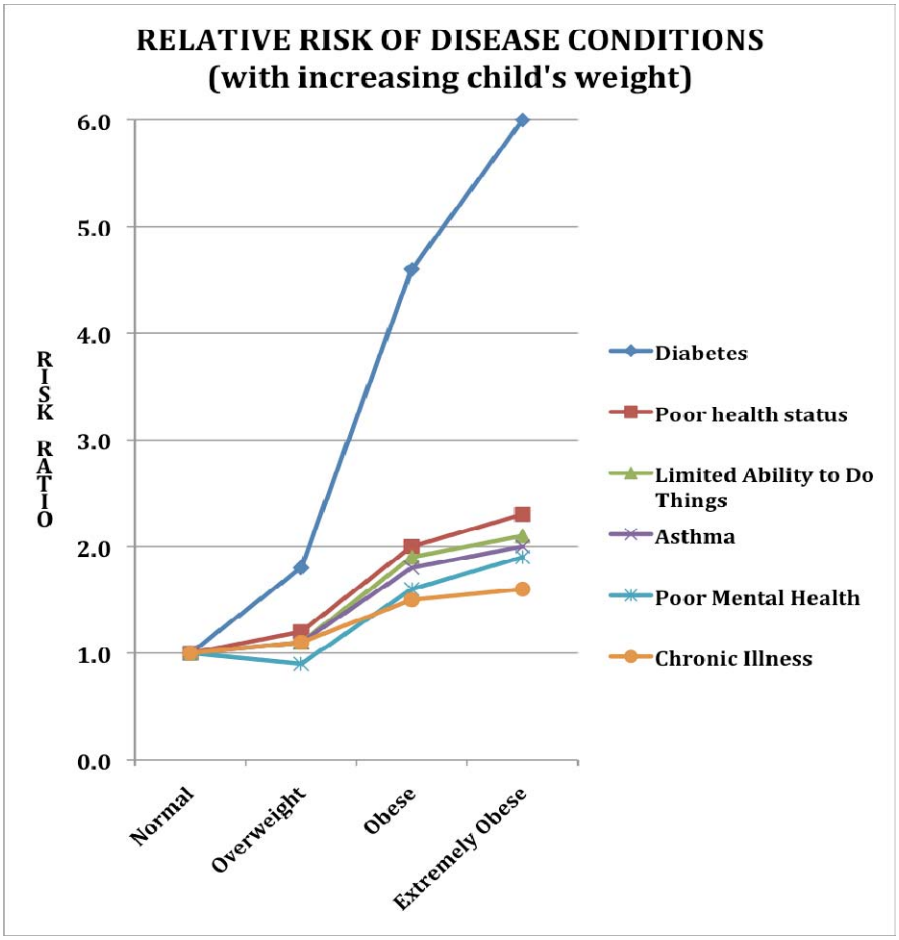

Figure 17 Children: Impact of obesity (BMI ≥ 95th percentile) and extreme obesity (BMI ≥ 97th percentile) on health

Table 6 Children: Relative risk of medical conditions in obese and extremely obese Ohio children

	Obese	**Extremely Obese**
Condition	*Relative Risk*	*Relative Risk*
Diabetes	4.6	6.0
Poor health status	2.0	2.3
Limited ability to do things	1.9	2.1
Asthma	1.8	2.0
Poor mental health	1.6	1.9
Chronic illness	1.5	1.6

Adults: Compared with adults of healthy weight, obese adults in Ohio are much more likely to have serious co-morbid conditions. Specifically, obese adults are reported to be 5.3-fold more likely to have diabetes, 3.1-fold more likely to have heart failure, 2.4-fold more likely to have hypertension, 2.3-fold more likely to have cardiovascular disease, 2.2-fold more likely to have angina, 2.1-fold more likely to have poor health status, 2.0-fold more likely to have had a heart attack, 1.8-fold more likely to have a chronic illness, and 1.6-fold more likely to have had a stroke (Fig 18).

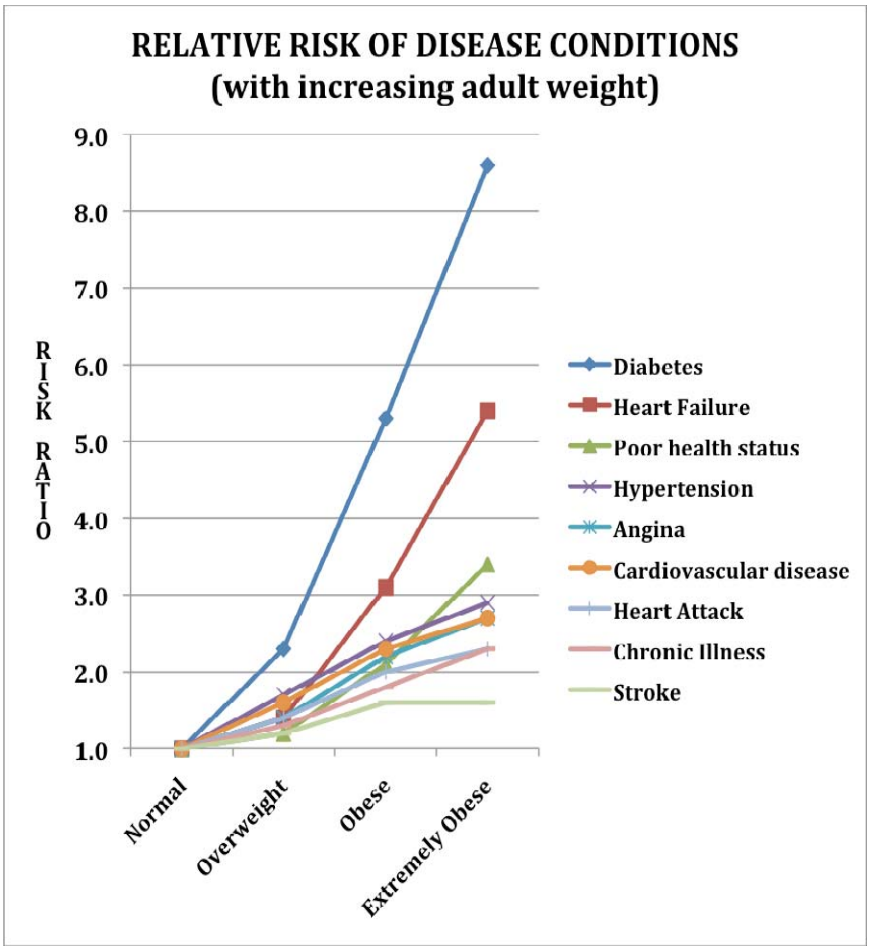

Figure 18 Adults: Impact of overweight, obesity, and extreme obesity (BMI 25-29.9, ≥ 30, and ≥ 40 kg/m2, respectively) on health

Of note, there is a stepwise progression in risk of the above conditions according to weight status in Ohio adults. Overweight adults (BMI 25-29.9 kg/m$^{2)}$ are at significant risk compared with healthy weight adults, but the relative risk is higher for obese (BMI ≥ 30 kg/m^2) individuals, and even higher for the subset with extreme obesity (BMI ≥ 40 kg/m^2) (Table 7 and Appendix D).

Table 7 Adults: Relative risk of medical conditions in overweight, obese, and extremely obese Ohio adults

	Overweight	**Obese**	**Extremely Obese**
Condition	*Relative Risk*	*Relative Risk*	*Relative Risk*
Diabetes	2.3	5.3	8.6
Heart failure	1.4	3.1	5.4
Poor health status	1.2	2.1	3.4
Hypertension	1.7	2.4	2.9
Angina	1.4	2.2	2.7
Cardiovascular disease	1.6	2.3	2.7
Heart attack	1.4	2.0	2.3
Chronic illness	1.3	1.8	2.3
Stroke	1.2	1.6	1.6

2. Use of health services:

Children: Obese children in Ohio require significantly more health services compared with healthy weight children. Compared with healthy weight children, obese children are reported to be 2.1-fold more likely to have had 2 or more hospitalizations in the past year, 1.8-fold more likely to have had 2 or more Emergency Department (ED) 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. No significant difference was found in the use of health services between overweight and healthy weight children.

Table 8 Children: Impact of obesity on use of health services

	Obese	**Extremely Obese**
Health care utilization	*Relative Risk*	*Relative Risk*
Multiple hospitalizations in past year	2.1	2.3
Multiple ED visits in past year	1.8	1.6
Need for chronic medication	1.4	1.5
Special health care needs	1.4	1.5

Although the OFHS data do not provide data on costs of illness, the high use of health services among obese children strongly suggests that their health care costs substantially exceed those of healthy weight children. This finding would therefore suggest that employers, insurers, and policy-makers recognize the short-term impact of childhood obesity on health status and health costs and develop policies to reduce obesity through prevention and treatment during childhood.

Adults: Obese adults in Ohio are much more likely than healthy weight adults to require health services. Compared with healthy weight adults, obese adults are reported to be 1.5-fold more likely to have had 2 or more hospitalizations in the past year, 1.5-fold more likely to have had 2 or more ED visits in the past year, 1.6-fold more likely to have special health care needs, and 1.6-fold more likely to use chronic medication. In addition, they are reported to be 1.2-fold more likely to have major medical costs and 1.2-fold more likely to avoid medical care or treatment due to high costs. Use of medical services is further increased in the subset with extreme obesity.

These findings provide Ohio-specific evidence consistent with national data that obesity is associated with increased use of health services and therefore increased healthcare costs. It has therefore been suggested that reducing U.S. health care costs requires policies to reduce the prevalence of obesity and to effectively treat obesity and its co-morbid conditions;[36] the current findings suggest that this principle be applied in Ohio.

Table 9 Adults: Impact of obesity on use of health services

	Obese	Extremely Obese
Health care utilization	*Relative Risk*	*Relative Risk*
Multiple hospitalizations in past year	1.5	2.3
Multiple ED visits in past year	1.5	2.1
Need for chronic medication	1.6	1.9
Special health care needs	1.6	1.8
Major medical costs	1.2	1.3

V. DISCUSSION

These are the first comprehensive analyses of obesity in Ohio across age groups. Furthermore, they are the first analyses of obesity in Ohio that take into account policy-relevant risk factors and the impact of obesity on health and health care utilization in children and adults. Additionally, these are the first data that, to our knowledge, allow us to link adult and child data. The data provide insights that are necessary to shape Ohio's approach to obesity. Accordingly, significant policy implications emanate directly and indirectly from the results of this study. First, we wish to illuminate the magnitude of the overweight and obesity epidemic in Ohio and directly tie it to important issues facing us today and in the foreseeable future. Obesity is a significant issue facing Ohioans. While a rather obvious conclusion from the preceding analyses, we wish to be explicit about its manifestations and potential effects.

1. *The rate of obesity in Ohio is very high as compared to expected rates and appears to be increasing*. More than 1 in 3 children (10-17 years) in Ohio is overweight or obese, meaning that approximately 500,000 children in that age range alone are affected.[33] More than 2 in 3 adults in Ohio are overweight or obese, so that 5.5 million adults are affected.[34] These high rates of obesity are consistent with results from more limited datasets (http://healthyohioprogram.org/ASSETS/7FBDB7A5C3FB4977A430A1EA46C642D9/bmirept.pdf; http://www.cdc.gov/BRFSS/; http://www.odh.ohio.gov/healthstats/healthstatsmainpage.aspx),[1,31] supporting the current data. Comparisons with earlier studies suggest that rates of overweight/obesity have risen in Ohio's children. While the data must be interpreted with caution (as previous surveys used different methodology), the results are concerning and appear to differ from recent national trends suggesting that childhood obesity rates have recently reached a plateau.[3]

   While adult obesity in Ohio was a significant issue in 1998, rates have continued to increase unabated. The finding of a rise in overweight/obesity in adults from 1998 to 2008 is based on comparison of the current data with the 1998 OFHS study that used similar methodology, and this rise is consistent with national trends over that time period (http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/).[27] Of note, the rise in overweight/obesity among adults is consistent across segments stratified by income, race, and educational attainment – underscoring that the problem is pervasive.

2. *Childhood obesity in Ohio is a particularly strong concern.* First, rates of childhood overweight and obesity are high. Second, there appears to be a leading-edge rate of obesity among younger children, suggesting that the top rate of obesity among Ohioans may yet emerge. Third, previous studies suggest that obese children (particularly after age 10 years) are likely to become obese adults.[37]

3. *The data demonstrate that high rates of overweight and obesity are widespread across Ohio*, with almost every county exhibiting rates substantially higher than target levels. This finding is important as it suggests that efforts to counteract obesity will not be effective if they target a single (or a few) geographic regions.

4. *Rates of obesity in both children and adults differ according to several policy-relevant variables – including age, gender, health insurance status, household income, and adult education.* There are likely inter-relationships among these characteristics. Yet, the analyses show that, all things being equal, each remains an independent predictor of obesity in children and adults. Although rates of overweight and obesity are higher in African Americans than Whites, much of this difference appears due to differences in other demographic factors (e.g. income, education, insurance); yet, African American females continue to be a distinctly high risk group. Together, the data indicate high risk populations that may be targeted for tailored interventions.

5. *The finding that childhood overweight/obesity is strongly and independently predicted by overweight/obesity of an adult in the household* is consistent with previous data in smaller populations.[37] As the current findings indicate a rise in rates of adult obesity, a further increase in childhood obesity may well follow – unless new and effective interventions are undertaken. The finding also indicates the importance of not addressing childhood obesity in isolation; instead inclusion of parents and families appears essential.

6. *Diseases associated with obesity, including diabetes, heart disease, and mental illness (in children) and stroke (in adults*) (see Tables 6 and 7), *are among the most resistant and virulent health concerns facing Ohio. Moreover, utilization of resources to treat these and other obesity-related health issues is significantly higher for obese Ohioans than for those in the normal weight range.*

   Children with extreme obesity (BMI at or above the 97th percentile) showed even greater risk for co-morbidities than the obese population as a whole; with 18.5% of Ohio's children obese (243,000 children), and a subset of these (12.9% or 170,000 children) being extremely obese,[33] Ohio clearly faces substantial child morbidity from obesity in the short term – even aside from likely downstream effects as the children age. Moreover, the data, for the first time, demonstrate significant increases in the risk of requiring health services among obese children (including medications, emergency room visits, and hospitalizations) – underscoring the impact of obesity on health care costs for Ohio children. As rates of obesity are particularly high for children on Medicaid, with Medicaid covering 33% of children in Ohio,[38] the data raise the importance of public policy

in addressing childhood obesity. Yet, obesity remains a problem across income and insurance groups, and therefore should not be addressed by public insurers alone.

In Ohio adults, there are stepwise increases in a wide variety of co-morbid conditions as weight status increases from healthy to overweight to obese to extremely obese. In parallel, use of health resources increases markedly. While not unexpected, the data underscore the likely impact of adult obesity on productivity and costs. Consistent with these findings are 2003 data indicating that Ohio's per capita medical costs of obesity were $269, compared with $258 nationally, placing Ohio 11th in the country for medical costs of obesity (http://healthyamericans.org/reports/).[39] If unchecked, the high rate of obesity among Ohioans will likely affect our quality of life. High and increasing rates of obesity can impact Ohioans' ability to fulfill job requirements and productivity expectations, impacting economic progress, creating a circular issue regarding our economic sustainability.

Taken together, the data suggest that, due to high current rates and broad impact on health and use of health services, obesity is a major threat to the medical and financial health of Ohio children and adults.

VI. POLICY RAMIFICATIONS

1. The scope of the obesity problem in Ohio and the threat it poses to public health indicate that policy interventions in both children and adults are now warranted.

2. Policies to address obesity are often stymied by the lack of fully validated evidence in large populations. While unequivocally effective evidence-based interventions are clearly desirable, the magnitude of the obesity problem suggests that policies should be established and implemented now. As such, the policies should (a) use the best available evidence to develop plans, (b) act now, (c) evaluate the impact of the intervention(s), and (d) modify the interventions as needed based on the evaluations. The current data provide bases for action and serve as a baseline for measuring the effect of interventions.

3. Because obesity is related to food (and so differs from anti-smoking efforts in which tobacco can be seen as a toxin) and because obesity cuts across all strata (albeit to different degrees), effectively addressing obesity will require societal change - not only change through government and public institutions. Nevertheless, public policy can lead the way, ideally working through public-private partnerships.

4. The current findings indicate 4 principles for interventions that aim to prevent obesity in Ohio:

    a. *Start young*
    Efforts to reduce the rate of obesity in Ohio should focus on producing effects earlier in the obesity cycle, both across age ranges and within individuals. To overcome obesity in Ohio, we therefore recommend targeting children because:
        - Obesity starts young and becomes more prevalent with advancing age. (Fig. 4)
        - Obesity in Ohio appears to be increasing in the younger part of the 2008 OFHS child cohort. (Fig 2)
        - Obese children (particularly over age 10 years) generally become obese adults.[37]

    b. In addressing childhood obesity, *target parents plus children* because:
        - The data indicate that childhood obesity is strongly linked to adult obesity. (Fig. 14)
        - Children, especially young ones, are dependent on their parents and model their parents.
        - Targeting parents includes focus on their educational attainment. Since adult educational attainment is linked to childhood and adult obesity (Fig. 13), policies that increase educational attainment can be viewed as health interventions as well as economic interventions.

    c. *Do not focus on a single geographic region* since obesity is widespread across Ohio, without a dominant region or type of region. (Fig. 4)

    d. *Use global approaches plus targeted approaches*
        - Due to the pervasive nature of the problem, use policy interventions that have global effects (e.g. addressing the built environment, nutrition and portion labeling, school nutrition and activity, social marketing).
        - However, due to the identification of subgroups at particularly high risk (e.g. African American females), also develop targeted, tailored interventions.
        - Aim to shape both active decisions and passive decisions that can reduce obesity.[5]
        - Develop a program-wide intervention for Ohio Medicaid that targets high-risk populations in order to reduce costs resulting from adverse health outcomes and increased health care utilization.
        - Such multi-level approaches have recently been developed by the Ohio Department of Health's (ODH) Office of Healthy Ohio (http://www.healthyohioprogram.org/).[14,40] ODH, together with the Ohio Business Roundtable, are working on further initiatives.

5. Policy options to prevent obesity have been discussed and reviewed at length. A full discussion is beyond the scope of this report. However, policy options include interventions based on:

a. *Schools:* These include changes in the food environment and activity options, as well as BMI screening. While addressing an important venue for children, they likely should be viewed as part of a wrap-around approach that extends beyond the classroom to the family, rather than being entirely school-based.

b. *Workplace:* Many options have been proposed - including subsidized wellness programs, tax breaks for employers who offer qualified wellness programs, increased options for healthy food and activity, and incentives for maintaining healthy lifestyles.

c. *Financial incentives and disincentives regarding healthy eating and activity:* Examples include subsidized healthy foods for low income families, taxes on unhealthy foods (although this is fraught with operational difficulties), and tax breaks for employers who offer high quality wellness programs).

d. *Reducing food deserts*: including the subsidization of farmers' markets and supermarkets in depressed neighborhoods, incentives for corner groceries to enhance healthy offerings, and prohibition of fast food outlets within some proximity of schools.

e. *Wellness trust model*: create a revenue stream devoted to the funding of clinical and community-based preventive services that will promote health and decrease the prevalence of disease and disability.[41]

f. *Coverage:* Policies to ensure that health insurance covers preventive services such as nutritional counseling.

g. *Education of physicians* and other health professionals about obesity, with provision of user-friendly counseling tools.

h. *Education of parents, teachers, ministers and others* who influence children about healthy lifestyle.

i. *Improving the built environment* to encourage activity.

6. Treatment: Although a focus on preventing obesity is ideal, we are facing large populations of those already obese and developing chronic illnesses that require huge resources (Figs. 17 and 18; Tables 6 and 7). Furthermore, clearly effective methods of preventing obesity have not been proven. Therefore, it is important for policies to address obesity treatment (a method to achieve secondary

prevention of obesity-related morbidity), as well as obesity prevention**.** For example:

a. *Insurers,* including Medicaid, should consider policies that provide Ohio citizens with coverage for qualified obesity management.

b. *Obesity coverage should be based on an ongoing process* of evidence-based review to develop informed policies (rather than blanket approaches) to assess who should be covered for what treatments at what time.

7. Consideration should be given to policy-makers' thinking of obesity as a chronic disease. Like hypertension, it is a silent killer that predisposes to cardiac disease, stroke, and much more. Like hypertension, it may be increased through behavioral indiscretions. Policy to indicate it is a disease, rather than a cultural indiscretion or a risk factor, may well expedite action.

VII. LIMITATIONS

The OFHS is a rigorous, systematic snapshot of the health of Ohioans. Limitations include that it provides cross-sectional rather than longitudinal data. Also, weight status is defined by self-reported height and weight; although this method is well-established and used extensively by the CDC, some may argue that validation with biomeasurements would be useful. The OFHS did not include questions on eating habits or exercise, information that would be useful in considering policy interventions to counteract obesity. Although the vast majority of adults reporting on the child's health status were parents who also reported on their own health status, it would be best that this be a structured requirement in future surveys. In some subgroups, sample size was small (see Appendix) and these data should be interpreted with caution. Finally, since previous OFHS datasets did not examine obesity in children, temporal comparisons must be done with other datasets.

VIII. FURTHER RESEARCH NEEDS

The data indicate the need for:

- Longitudinal study of a cohort(s) of healthy weight and overweight/obese individuals to understand in depth their health risks and the potential impact of interventions.
- Interventions to prevent and treat childhood (and adult) obesity. These can be undertaken as demonstration projects to learn approaches that work best.
- Evaluations of obesity interventions to develop informed approaches to the problem.
- Data on actual health care costs associated with overweight/obesity in Ohio.

IX. CONCLUSION

These analyses of the 2008 OFHS provide new data and insights on the scope of obesity in Ohio's children and adults and its impact on the state. Obesity is a clear public health threat for Ohio, and policies are needed to develop informed interventions. The current data will provide a benchmark to evaluate the impact of these interventions.

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Appendix A

TABLE A Prevalence of overweight and obesity in children and adults: Percent of population

		% Underweight [a] (95% CI)	% Healthy Weight [a] (95% CI)	% Overweight [a] (95% CI)	% Obese [a] (95% CI)	% Extremely Obese [a] (95% CI)	% Overweight or Obese [a] (95% CI)
Children	10-11 y	7.1 (5.1-9.1)	50.2 (46.5-54.0)	17.9* (15.1-20.7)	24.7^ (21.6-27.9)	17.9+ (15.1-20.7)	42.6# (39.0-46.3)
	12-13 y	2.7 (1.7-3.7)	57.1 (53.5-60.8)	19.0* (16.2-21.8)	21.2^ (18.1-24.3)	14.9+ (12.2-17.6)	40.2# (36.6-43.8)
	14-15 y	2.3 (1.3-3.3)	63.3 (60.0-66.6)	18.0* (15.4-20.7)	16.4^ (13.9-18.9)	10.9+ (8.8-13.0)	34.4# (31.2-37.7)
	16-17 y	3.8 (2.4-5.1)	69.1 (66.1-72.1)	14.0* (11.9-16.2)	13.1^ (10.9-15.3)	9.2+ (7.2-11.1)	27.1# (24.3-29.9)
	Total children 10-17 y	3.9 (3.2-4.6)	60.5 (58.8-62.2)	17.1* (15.8-18.4)	18.5^ (17.1-19.8)	12.9+ (11.7-14.1)	35.6# (33.9-37.2)
Adults	18-34 y	3.0 (2.5-3.6)	42.6 (41.2-44.1)	31.3** (29.9-32.6)	23.1^^ (21.9-24.3)	3.5++ (3.0-4.0)	54.4## (52.9-55.8)
	35-54 y	1.3 (1.1-1.6)	30.4 (29.4-31.3)	36.6** (35.6-37.6)	31.7^^ (30.7-32.7)	5.5++ (5.0-5.9)	68.3## (67.3-69.3)
	55-64 y	1.0 (0.8-1.3)	24.6 (23.4-25.9)	39.4** (37.9-40.8)	35.0^^ (33.6-36.3)	5.9++ (5.2-6.5)	74.3## (73.1-75.6)
	65+ y	1.3 (1.0-1.5)	30.3 (29.2-31.5)	39.3** (38.0-40.5)	29.1^^ (28.0-30.3)	3.3++ (2.8-3.7)	68.4## (67.2-69.6)
	Total adults	1.8 (1.6-2.0)	33.2 (32.6-33.8)	35.9** (35.3-36.5)	29.1^^ (28.6-29.7)	4.5++ (4.3-4.8)	65.0## (64.4-65.7)

[a] Weight categories defined according to CDC standards. For adults: underweight = BMI <18.5 kg/m^2, healthy weight = BMI 18.5-24.9 kg/m^2, overweight = BMI 25-29.9 kg/m^2, obese= BMI≥30 kg/m^2, extremely obese = BMI ≥ 40 kg/m^2, overweight/obese = BMI ≥25 kg/m^2. For children, underweight = BMI <5th percentile, healthy weight = BMI 5-84th percentile, overweight = BMI 85th-94th percentile, obese = BMI ≥ 95th percentile, extremely obese = BMI ≥ 97th percentile, overweight/obese = BMI ≥ 85th percentile for age and sex.

Comparisons of age groups in each weight category: * P=0.03 ^ P<0.0001 + P<0.0001 # P<0.0001 ** P<0.0001 ^^ P<0.0001 ++ P<0.0001 ## P<0.0001

Appendix A

TABLE B Prevalence of overweight and obesity in Ohio: Comparison of 2008 OFHS data with previous U.S. and Ohio data

		U.S.			*Ohio*		
Data Source	Age Group	% Overweight	% Obese	% Overweight or Obese	% Overweight	% Obese	% Overweight or Obese
Self report surveys							
Children							
National Survey of Children's Health (NSCH), 2003 (95% CI)	10-17 y	15.7 (15.1 - 16.3)	14.8 (14.2 - 15.4)	30.5	16.3 (13.6 - 18.9)	14.2 (11.7 - 16.6)	30.5
Youth Risk Behavior Survey (YRBS), 2007 (95% CI)	14-18 y	15.8 (14.8-16.8)	13.0 (11.9-14.1)	28.8	15.0 (13.4-16.7)	12.4 (10.4-14.7)	27.4
Ohio Family Health Survey (OFHS), 2008 (95% CI)	*10-17 y*	*N/A*	*N/A*	*N/A*	*17.1 (15.8-18.4)*	*18.5 (17.1-19.8)*	35.6 (33.9-37.2)
Adults							
Behavioral Risk Factor Surveillance Survey (BRFSS), 2007 (95% CI)	18+ y	36.6 (median)	26.3 (median)	62.9	35.4 (34.0-36.8)	28.1 (26.9-29.3)	63.5
Ohio Family Health Survey (OFHS), 2008 (95% CI)	*18+ y*	*N/A*	*N/A*	*N/A*	*35.9 (35.3-36.5)*	*29.1 (28.6-29.7)*	*65.0 (64.4-65.7)*
Bio-Measurement Surveys							
Children							
National Health and Nutrition Examination Survey (NHANES), 2003-2006 (SE)	2-5 y	12.0	12.4 (1.0)	24.4 (1.6)	N/A	N/A	N/A
NHANES, 2003-2006 (SE)	6-11 y	16.3	17.0 (1.3)	33.3 (2.0)	N/A	N/A	N/A
NHANES, 2003-2006 (SE)	12-19 y	16.5	17.6 (1.2)	34.1 (1.5)	N/A	N/A	N/A
NHANES 2005-2006	10-11 y	13.6	20.8	34.4	N/A	N/A	N/A
NHANES 2005-2006	12-13 y	15.9	19.9	35.8	N/A	N/A	N/A
NHANES 2005-2006	14-15 y	14.0	15.8	29.8	N/A	N/A	N/A
NHANES 2005-2006	16-17 y	14.1	18.0	32.1	N/A	N/A	N/A
Ohio Third Graders, 2004-2005 (95% CI)	8-9 y	N/A	N/A	N/A	16.7 (15.7–17.7)	18.9 (17.5–20.3)	35.6
Ohio Third Graders, 2006-2007 (95% CI)	8-9 y	N/A	N/A	N/A	17.7 (15.1-20.6)	16.6 (14.2-19.4)	34.3
Ohio Seventh Graders, 2007-2008 (95% CI)	12-13 y	N/A	N/A	N/A	19.0 (16.5-21.5)	23.7 (21.1-26.2)	42.7
Adults							
NHANES, 1999-2000 (SE)	20-74 y	31.0 (1.5)	33.1 (1.1)	64.1 (1.9)	N/A	N/A	N/A
NHANES, 2001-2002 (SE)	20-74 y	33.6 (1.1)	32.1 (1.2)	65.7 (0.9)	N/A	N/A	N/A
NHANES, 2003-2004 (SE)	20-74 y	33.2 (1.1)	33.9 (1.3)	67.1 (1.3)	N/A	N/A	N/A

Appendix B

Table A CHILDREN: Rates of overweight and obesity according to policy-relevant factors

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
*Child Age***				
Age 10-11	50.2 (46.5-54.0)	17.9 (15.1-20.7)	24.7 (21.6-27.9)	42.6 (39.0-46.3)
Age 12-13	57.1 (53.5-60.8)	19.0 (16.2-21.8)	21.2 (18.1-24.3)	40.2 (36.6-43.8)
Age 14-15	63.3 (60.0-66.6)	18.0 (15.4-20.7)	16.4 (13.9-18.9)	34.4 (31.2-37.7)
Age 16-17	69.1 (66.1-72.1)	14.0 (11.9-16.2)	13.1 (10.9-15.3)	27.1 (24.3-29.9)
		P=0.0002	P=<.0001	P=<.0001
*Child Gender***				
Female	65.9 (63.5-68.3)	14.7 (13.0-16.4)	14.8 (13.0-16.5)	29.5 (27.2-31.7)
Male	55.5 (53.1-57.9)	19.4 (17.5-21.3)	22.0 (19.9-24.0)	41.3 (38.9-43.7)
		P=<.0001	P=<.0001	P=<.0001
*Child Race/Ethnicity***				
Asian (n=238)	81.7 (66.7-96.7)	3.6 (0.1-7.0)	4.2 (0.0-9.3)	7.7 (1.4-14.0)
Black	48.3 (43.4-53.1)	22.2 (18.2-26.3)	28.0 (23.6-32.4)	50.3 (45.4-55.1)
Hispanic	51.3 (44.3-58.3)	22.7 (16.9-28.5)	19.8 (14.1-25.5)	42.5 (35.6-49.5)
Other (n=105)	40.5 (23.0-58.0)	19.0 (4.9-33.2)	29.0 (13.0-45.1)	48.1 (30.2-65.9)
White	63.0 (61.1-64.9)	16.1 (14.7-17.6)	16.8 (15.3-18.3)	32.9 (31.1-34.8)
		P=<.0001	P=<.0001	P=<.0001
*Child Black vs. White***				
White	63.0 (61.1-64.9)	16.1 (14.7-17.6)	16.8 (15.3-18.3)	32.9 (31.1-34.8)
Black	48.3 (43.4-53.1)	22.2 (18.2-26.3)	28.0 (23.6-32.4)	50.3 (45.4-55.1)
		P=<.0001	P=<.0001	P=<.0001
*Child Hispanic vs. White***				
White	63.0 (61.1-64.9)	16.1 (14.7-17.6)	16.8 (15.3-18.3)	32.9 (31.1-34.8)
Hispanic	51.3 (44.3-58.3)	22.7 (16.9-28.5)	19.8 (14.1-25.5)	42.5 (35.6-49.5)
		P=0.0029	P=0.0619	P=0.0024
*Child Current Insurance Status***				
Uninsured	51.2 (43.8-58.7)	24.0 (17.6-30.4)	21.7 (15.3-28.1)	45.7 (38.2-53.1)
Insured	61.0 (59.3-62.8)	16.8 (15.5-18.1)	18.3 (16.9-19.7)	35.1 (33.4-36.8)
		P=0.0058	P=0.0951	P=0.0060
Child Uninsured Any Time in Last 12 Months				
No	64.0 (58.5-69.5)	17.1 (12.8-21.5)	16.1 (11.7-20.5)	33.2 (27.7-38.8)
Yes	59.4 (49.6-69.2)	16.9 (9.7-24.1)	19.5 (11.4-27.5)	36.4 (26.9-45.9)
		P=0.8454	P=0.4110	P=0.5077
*Child Insurance Source***				
Medicaid and Medicare	48.8 (36.5-61.1)	19.9 (10.7-29.1)	24.2 (13.7-34.8)	44.1 (32.0-56.2)
Medicaid, No Medicare	50.2 (46.6-53.8)	17.6 (15.0-20.3)	29.8 (26.5-33.2)	47.5 (43.9-51.1)
Job-based Coverage	65.3 (63.3-67.4)	16.5 (14.8-18.1)	13.7 (12.2-15.1)	30.1 (28.2-32.1)
Direct Purchase Insurance	77.1 (69.2-85.0)	12.8 (6.3-19.3)	6.0 (2.0-10.1)	18.8 (11.5-26.2)
Uninsured	51.2 (43.8-58.7)	24.0 (17.6-30.4)	21.7 (15.3-28.1)	45.7 (38.2-53.1)
		P=0.0004	P=<.0001	P=<.0001
*Child Well Doctor Visit in Last Year **				
No	56.2 (53.1-59.4)	19.2 (16.7-21.7)	21.2 (18.5-23.8)	40.3 (37.2-43.5)
Yes	62.3 (60.3-64.4)	16.2 (14.7-17.7)	17.4 (15.8-19.0)	33.6 (31.6-35.6)
		P=0.0082	P=0.0036	P=0.0004
*Child Well Dentist Visit in Last Year***				
No	56.2 (51.6-60.8)	18.5 (15.0-22.0)	23.2 (19.3-27.2)	41.8 (37.2-46.3)
Yes	61.3 (59.4-63.1)	16.8 (15.4-18.2)	17.7 (16.3-19.2)	34.6 (32.8-36.4)
		P=0.1765	P=0.0055	P=0.0086

Appendix B

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
Child Any Doctor Visit in Last Year				
No	59.4 (54.4-64.5)	19.6 (15.6-23.6)	17.5 (13.6-21.4)	37.1 (32.1-42.0)
Yes	61.1 (59.1-63.1)	16.6 (15.1-18.1)	18.2 (16.6-19.8)	34.8 (32.9-36.7)
		P=0.1848	P=0.9377	P=0.4393
Child Any Dentist Visit in Last Year **				
No	53.0 (46.7-59.3)	20.8 (15.8-25.9)	23.3 (18.0-28.6)	44.1 (37.8-50.4)
Yes	61.2 (59.4-63.0)	16.8 (15.4-18.1)	18.0 (16.6-19.4)	34.8 (33.0-36.5)
		P=0.0342	P=0.0169	P=0.0052
Child has Usual Source of Care				
No	60.5 (52.7-68.2)	14.6 (9.5-19.7)	20.2 (13.9-26.6)	35.5 (33.8-37.2)
Yes	60.6 (58.8-62.3)	17.1 (15.7-18.4)	18.4 (17.0-19.8)	34.9 (33.1-36.6)
		P=0.4885	P=0.6525	P=0.9237
Child Avoided Medical Care due to Cost				
No	60.7 (58.9-62.4)	17.2 (15.8-18.5)	18.3 (16.9-19.7)	37.0 (30.7-43.3)
Yes	59.2 (52.7-65.7)	16.5 (12.0-20.9)	20.6 (15.3-25.9)	35.9 (34.1-37.7)
		P=0.9233	P=0.4314	P=0.6401
Child Major Medical Costs				
No	60.0 (58.2-61.9)	17.2 (15.8-18.6)	18.7 (17.2-20.2)	33.9 (29.7-38.1)
Yes	63.2 (58.9-67.5)	16.5 (13.3-19.6)	17.4 (14.0-20.8)	34.9 (27.5-42.3)
		P=0.4647	P=0.3661	P=0.2982
*Child Special Health Care Need***				
No	61.3 (59.5-63.1)	17.3 (15.9-18.7)	17.5 (16.1-18.9)	40.4 (35.2-45.7)
Yes	54.7 (49.4-60.1)	15.1 (11.5-18.8)	25.3 (20.6-30.0)	40.4 (35.2-45.7)
		P=0.8979	P=0.0007	P=0.0293
ADULT RESPONDENT CHARACTERISTICS				
*Adult Respondent Education Level***				
Some high school, no diploma	45.7 (39.0-52.4)	23.2 (17.6-28.8)	27.7 (21.5-33.9)	50.9 (44.2-57.6)
High school graduate or GED	54.6 (51.6-57.7)	18.8 (16.4-21.2)	22.7 (20.1-25.2)	41.5 (38.5-44.5)
Some college, no four-year degree	60.2 (57.2-63.3)	16.7 (14.5-19.0)	19.8 (17.2-22.3)	36.5 (33.5-39.5)
Four-year college degree or more	70.2 (67.3-73.1)	14.4 (12.2-16.6)	10.8 (8.8-12.8)	25.2 (22.5-27.9)
		P=<.0001	P=<.0001	P=<.0001
*Adult Residence by Region***				
Appalachian	57.1 (53.2-60.9)	15.7 (13.2-18.2)	22.4 (19.1-25.8)	38.1 (34.4-41.9)
Metropolitan	61.5 (59.1-64.0)	16.9 (15.0-18.7)	18.2 (16.3-20.1)	35.0 (32.7-37.4)
Rural Non-Appalachian	59.3 (55.6-63.0)	18.2 (15.4-21.1)	19.7 (16.7-22.8)	38.0 (34.4-41.7)
Suburban	60.9 (56.5-65.3)	17.9 (14.4-21.3)	15.7 (12.4-19.0)	33.5 (29.3-37.8)
		P=0.8008	P=0.0537	P=0.2953
*Adult Income as % of FPL***				
0 - 100%	51.2 (47.1-55.3)	20.0 (16.7-23.2)	26.2 (22.5-29.9)	46.2 (42.1-50.3)
101 - 200%	52.1 (48.3-55.9)	19.1 (16.2-22.0)	25.5 (22.1-28.8)	44.5 (40.7-48.3)
201 - 300%	61.8 (57.9-65.7)	16.6 (13.6-19.6)	17.9 (14.8-21.1)	34.6 (30.7-38.4)
301% and up	68.9 (66.4-71.3)	14.9 (13.1-16.8)	11.4 (9.7-13.0)	26.3 (24.0-28.6)
		P=<.0001	P=<.0001	P=<.0001
*Adult Family Income***				
Low Income (<150% FPL)	65.1 (63.2-67.1)	16.0 (14.5-17.5)	14.5 (13.1-16.0)	30.6 (28.7-32.5)
Not low income (≥150% FPL)	50.7 (47.5-53.9)	19.4 (16.9-21.8)	26.9 (24.1-29.8)	46.3 (43.1-49.5)
		P=<.0001	P=<.0001	P=<.0001

Appendix B

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
ADULT RESPONDENT CHARACTERISTICS				
Adult Respondent BMI Category*				
Underweight Respondent	71.7 (58.7-84.6)	6.2 (0.0-12.8)	17.2 (5.9-28.4)	23.4 (11.0-35.8)
Normal weight Respondent	67.4 (64.6-70.3)	14.4 (12.3-16.5)	13.4 (11.2-15.5)	27.8 (25.0-30.5)
Overweight Respondent	62.1 (59.2-65.0)	18.1 (15.7-20.4)	15.9 (13.7-18.1)	34.0 (31.1-36.8)
Obese Respondent	51.7 (48.5-54.9)	19.0 (16.6-21.5)	26.3 (23.5-29.1)	45.3 (42.2-48.5)
		P=<.0001	P=<.0001	P=<.0001

** P<0.05 Yellow shading indicates significant differences in rates of overweight/obesity according to the designated policy-relevant factor (P<0.05)

Appendix B

Table B ADULTS: Rates of overweight and obesity according to policy-relevant factors

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
*Adult Age***				
Age 18-34	42.6 (41.2-44.1)	31.3 (29.9-32.6)	23.1 (21.9-24.3)	54.4 (52.9-55.8)
Age 35-54	30.4 (29.4-31.3)	36.6 (35.6-37.6)	31.7 (30.7-32.7)	68.3 (67.3-69.3)
Age 55-64	24.6 (23.4-25.9)	39.4 (37.9-40.8)	35.0 (33.6-36.3)	74.3 (73.1-75.6)
Age 65+	30.3 (29.2-31.5)	39.3 (38.0-40.5)	29.1 (28.0-30.3)	68.4 (67.2-69.6)
		P=<.0001	P=<.0001	P=<.0001
*Adult Gender***				
Female	38.6 (37.8-39.4)	30.0 (29.3-30.8)	29.1 (28.3-29.8)	59.1 (58.2-59.9)
Male	27.6 (26.6-28.5)	42.0 (41.0-43.0)	29.2 (28.3-30.1)	71.2 (70.3-72.2)
		P=<.0001	P=<.0001	P=<.0001
*Adult Race/Ethnicity***				
Asian	63.2 (59.0-67.3)	25.8 (22.0-29.6)	6.1 (4.2-8.1)	31.9 (28.0-35.9)
Black	26.0 (24.2-27.8)	35.7 (33.8-37.6)	36.9 (35.0-38.8)	72.6 (70.7-74.4)
Hispanic	32.2 (29.1-35.3)	36.3 (33.3-39.3)	29.6 (26.7-32.4)	65.8 (62.7-69.0)
Other	32.2 (26.4-38.1)	38.3 (32.4-44.2)	26.4 (21.2-31.6)	64.7 (58.7-70.6)
White	33.6 (32.9-34.3)	36.1 (35.4-36.8)	28.6 (28.0-29.2)	64.7 (64.0-65.4)
		P=<.0001	P=<.0001	P=<.0001
*Adult Black vs. White***				
White	33.6 (32.9-34.3)	36.1 (35.4-36.8)	28.6 (28.0-29.2)	64.7 (64.0-65.4)
Black	26.0 (24.2-27.8)	35.7 (33.8-37.6)	36.9 (35.0-38.8)	72.6 (70.7-74.4)
		P=<.0001	P=<.0001	P=<.0001
Adult Hispanic vs. White				
White	33.6 (32.9-34.3)	36.1 (35.4-36.8)	28.6 (28.0-29.2)	64.7 (64.0-65.4)
Hispanic	32.2 (29.1-35.2)	36.3 (33.3-39.3)	29.6 (26.7-32.4)	65.8 (62.7-68.9)
		P=0.5454	P=0.3663	P=0.4016
*Adult Insurance Source***				
Medicaid and Medicare	26.3 (23.5-29.2)	30.7 (27.8-33.7)	40.3 (37.3-43.4)	71.1 (68.1-74.0)
Medicaid, No Medicare	30.8 (28.2-33.3)	28.1 (25.6-30.5)	37.7 (35.1-40.2)	65.7 (63.1-68.4)
Medicare, No Medicaid	29.9 (28.7-31.0)	38.2 (37.0-39.4)	30.6 (29.4-31.8)	68.8 (67.6-69.9)
Job-based Coverage	32.8 (32.0-33.7)	37.7 (36.8-38.6)	28.0 (27.2-28.8)	65.7 (64.8-66.6)
Direct Purchase Insurance	42.3 (38.8-45.9)	34.6 (31.3-38.0)	20.7 (18.0-23.5)	55.4 (51.8-58.9)
Uninsured	37.4 (35.4-39.3)	32.1 (30.2-33.9)	28.2 (26.5-29.8)	60.2 (58.3-62.1)
		P=<.0001	P=<.0001	P=<.0001
*Adult Current Insurance Status***				
Uninsured	37.4 (35.4-39.3)	32.1 (30.2-33.9)	28.2 (26.5-29.8)	60.2 (58.3-62.1)
Insured	32.5 (31.8-33.2)	36.5 (35.9-37.2)	29.3 (28.7-29.9)	65.8 (65.2-66.5)
		P=<0.0001	P=0.0006	P=<0.0001
Adult Uninsured Any Time in Last 12 Months				
No	35.3 (33.1-37.5)	34.5 (32.4-36.7)	28.4 (26.4-30.5)	63.0 (60.8-65.2)
Yes	33.7 (30.1-37.4)	32.3 (28.8-35.9)	30.9 (27.4-34.3)	63.2 (59.5-66.9)
		P=0.8566	P=0.2555	P=0.6096
*Adult Well Doctor Visit in Last Year***				
No	36.7 (35.2-38.1)	36.8 (35.4-38.2)	24.8 (23.5-26.0)	61.6 (60.2-63.1)
Yes	31.8 (31.1-32.5)	35.7 (34.9-36.4)	30.8 (30.1-31.5)	66.5 (65.8-67.2)
		P=0.0062	P=<.0001	P=<.0001

Appendix B

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
*Adult Any Doctor Visit in Last Year***				
No	38.3 (36.2-40.4)	38.1 (36.0-40.2)	22.1 (20.4-23.9)	60.2 (58.1-62.3)
Yes	32.4 (31.8-33.1)	35.7 (35.1-36.4)	30.1 (29.5-30.7)	65.8 (65.2-66.5)
		P=0.0552	P=<.0001	P=<.0001
*Adult Any Dentist Visit in Last Year***				
No	29.7 (28.6-30.9)	33.8 (32.6-35.0)	34.7 (33.5-35.9)	68.5 (67.3-69.7)
Yes	34.7 (33.9-35.4)	36.8 (36.1-37.6)	26.8 (26.1-27.5)	63.6 (62.9-64.4)
		P=0.0698	P=<.0001	P=<.0001
*Adult Avoided Medical Care due to Cost***				
No	33.2 (32.5-33.9)	37.0 (36.3-37.7)	28.1 (27.5-28.7)	65.1 (64.4-65.8)
Yes	32.8 (31.4-34.2)	31.6 (30.2-33.0)	33.3 (32.0-34.7)	64.9 (63.5-66.4)
		P=0.0006	P=<.0001	P=0.7802
*Adult Major Medical Costs***				
No	33.8 (33.1-34.6)	36.6 (35.8-37.3)	27.9 (27.3-28.6)	64.5 (63.8-65.2)
Yes	31.4 (30.2-32.6)	34.1 (32.9-35.3)	32.6 (31.4-33.7)	66.6 (65.4-67.8)
		P=0.9382	P=<.0001	P=0.0013
*Adult Education Level***				
Some high school, no diploma	31.5 (29.6-33.4)	32.5 (30.7-34.3)	33.1 (31.3-34.9)	65.6 (63.7-67.5)
High school graduate or GED	31.0 (30.0-32.0)	36.0 (35.0-37.0)	31.6 (30.6-32.6)	67.6 (66.6-68.6)
Some college, no four-year degree	32.2 (30.9-33.5)	35.6 (34.3-36.9)	30.1 (28.9-31.3)	65.7 (64.4-67.0)
Four-year college degree or more	38.1 (36.8-39.3)	37.8 (36.6-39.0)	22.8 (21.7-23.8)	60.6 (59.3-61.8)
		P=0.0013	P=<.0001	P=<.0001
*Adult Residence by Region***				
Appalachian	31.5 (29.9-33.0)	34.4 (32.9-35.9)	31.9 (30.4-33.3)	66.3 (64.7-67.8)
Metropolitan	34.0 (33.1-34.8)	36.2 (35.4-37.1)	28.1 (27.3-28.9)	64.3 (63.4-65.2)
Rural Non-Appalachian	31.3 (29.9-32.7)	36.7 (35.2-38.1)	30.0 (28.7-31.3)	66.7 (65.2-68.1)
Suburban	33.5 (31.9-35.1)	35.4 (33.8-37.0)	29.7 (28.2-31.2)	65.1 (63.5-66.7)
		P=0.2132	P=<.0001	P=0.0077
*Adult Income as % of FPL***				
0 - 100%	33.4 (31.8-35.0)	30.1 (28.6-31.7)	33.6 (32.0-35.1)	63.7 (62.1-65.3)
101 - 200%	32.8 (31.4-34.3)	32.2 (30.8-33.6)	32.6 (31.2-34.0)	64.8 (63.4-66.2)
201 - 300%	31.5 (30.1-32.9)	37.7 (36.3-39.2)	29.2 (27.9-30.6)	66.9 (65.5-68.4)
301% and up	34.0 (33.0-34.9)	38.8 (37.9-39.7)	26.0 (25.2-26.9)	64.8 (63.9-65.8)
		P=<.0001	P=<.0001	P=0.0517
*Adult Family Income***				
Not low income (≥150% FPL)	33.2 (32.5-34.0)	37.7 (37.0-38.5)	27.7 (27.0-28.3)	65.4 (64.7-66.1)
Low Income (<150% FPL)	33.1 (31.8-34.3)	30.9 (29.8-32.1)	33.2 (32.0-34.4)	64.1 (62.9-65.4)
		P=<.0001	P=<.0001	P=0.6646
*Adult Marital Status***				
Married	30.5 (29.7-31.3)	38.5 (37.7-39.3)	29.7 (29.0-30.5)	68.2 (67.4-69.0)
Not Married	37.1 (36.0-38.3)	32.0 (31.0-33.1)	28.3 (27.3-29.3)	60.4 (59.2-61.5)
Widowed	33.9 (32.2-35.6)	35.2 (33.4-37.0)	29.0 (27.3-30.7)	64.2 (62.4-65.9)
		P=<.0001	P=<.0001	P=<.0001
*Child Lives in Household***				
No	31.9 (31.1-32.7)	36.7 (35.9-37.5)	29.7 (29.0-30.4)	66.4 (65.7-67.2)
Yes	35.3 (34.2-36.3)	34.6 (33.5-35.6)	28.2 (27.2-29.2)	62.8 (61.7-63.9)
		P=<.0001	P=<.0001	P=<.0001

Appendix B

Policy-Relevant Factor	Healthy Weight % (95% CI)	Overweight % (95% CI)	Obese % (95% CI)	Overweight or Obese % (95% CI)
*Child Family Member Lives in Household***				
No	31.9 (31.2-32.7)	36.6 (35.9-37.4)	29.7 (29.0-30.5)	66.4 (65.6-67.1)
Yes	35.4 (34.3-36.5)	34.6 (33.5-35.7)	28.1 (27.1-29.1)	62.7 (61.6-63.8)
		P=<.0001	P=<.0001	P=<.0001
Adult Heavy Alcohol Use				
No	34.8 (33.7-35.8)	37.3 (36.2-38.3)	26.4 (25.4-27.4)	63.7 (62.6-64.8)
Yes	35.0 (33.3-36.6)	38.5 (36.9-40.2)	25.1 (23.6-26.6)	63.6 (62.0-65.3)
		P=0.5791	P=0.2951	P=0.8791
*Adult Smoker***				
No	31.9 (31.2-32.6)	36.6 (35.8-37.3)	30.0 (29.3-30.6)	66.5 (65.8-67.2)
Yes	37.0 (35.6-38.3)	33.9 (32.6-35.2)	26.7 (25.5-27.9)	60.6 (59.3-62.0)
		P=<.0001	P=<.0001	P=<.0001

** P < 0.05 Yellow shading indicates a significant difference in rates of overweight/obesity according to designated policy relevant factor (P<0.05)

Appendix C

Table A CHILDREN: Prevalence of overweight and obesity by Ohio County							
County Name	n	% Overweight	(95% CI)	% Obese	(95% CI)	% Overweight or Obese	(95% CI)
Adams	51	11.6	(2.5-20.7)	17.9	(6.4-29.5)	29.5	(15.3-43.6)
Allen	50	9.4	(1.1-17.6)	29.8	(13.5-46.2)	39.2	(22.7-55.7)
Ashland	40	22.9	(6.5-39.2)	21.3	(4.8-37.8)	44.1	(25.3-62.9)
Ashtabula	45	15.3	(3.2-27.4)	19.0	(4.7-33.3)	34.2	(17.4-51.1)
Athens	41	7.1	(0.0-14.9)	32.9	(14.0-51.7)	40.0	(19.9-60.0)
Auglaize	27	17.6	(1.0-34.2)	7.9	(0.0-16.2)	25.5	(7.2-43.8)
Belmont	28	15.4	(1.9-28.8)	27.9	(5.9-49.9)	43.2	(21.3-65.1)
Brown	74	14.5	(5.9-23.2)	21.1	(9.0-33.2)	35.6	(21.5-49.8)
Butler	158	15.6	(9.0-22.2)	14.1	(7.7-20.6)	29.7	(21.4-38.1)
Carroll	30	10.1	(0.0-22.7)	12.5	(0.0-28.4)	22.6	(3.4-41.8)
Champaign	32	7.0	(0.0-15.3)	8.9	(0.0-20.0)	15.9	(2.4-29.3)
Clark	40	20.5	(4.6-36.4)	21.0	(4.9-37.1)	41.5	(23.2-59.7)
Clermont	132	14.3	(8.0-20.7)	10.5	(4.7-16.4)	24.9	(16.6-33.2)
Clinton	43	20.6	(6.8-34.4)	11.4	(2.5-20.3)	32.0	(15.9-48.0)
Columbiana	42	22.3	(7.4-37.1)	22.6	(5.7-39.6)	44.9	(26.1-63.7)
Coshocton	35	15.8	(1.7-30.0)	26.6	(6.2-47.1)	42.5	(18.2-66.7)
Crawford	33	9.9	(0.0-20.2)	21.8	(6.0-37.6)	31.7	(13.5-49.8)
Cuyahoga	497	14.2	(10.4-18.0)	16.7	(12.6-20.8)	30.9	(25.9-36.0)
Darke	44	17.0	(0.9-33.0)	20.9	(0.0-45.0)	37.9	(13.3-62.5)
Defiance	37	7.2	(0.0-15.5)	39.7	(11.5-67.9)	49.2	(21.2-77.2)
Delaware	38	20.0	(3.2-36.9)	0.9	(0.0-2.7)	20.9	(4.0-37.8)
Erie	43	29.0	(10.2-47.8)	12.0	(1.8-22.3)	41.0	(22.0-60.1)
Fairfield	28	17.9	(0.7-35.1)	22.7	(3.1-42.3)	40.6	(18.3-62.9)
Fayette	38	19.3	(7.2-31.3)	27.3	(10.4-44.3)	46.6	(28.4-64.7)
Franklin	397	17.4	(12.9-21.8)	20.4	(15.5-25.3)	37.7	(31.9-43.6)
Fulton	41	23.2	(7.1-39.4)	12.7	(2.1-23.4)	36.0	(18.5-53.4)
Gallia	39	22.4	(6.7-38.1)	33.1	(14.7-51.5)	55.5	(37.2-73.9)
Geauga	28	18.1	(2.5-33.7)	7.5	(0.0-16.2)	25.6	(8.4-42.9)
Greene	51	23.5	(9.3-37.7)	16.7	(2.8-30.7)	40.2	(23.8-56.7)
Guernsey	38	27.8	(9.7-45.8)	6.4	(0.0-14.0)	34.2	(15.0-53.5)
Hamilton	247	14.0	(9.0-19.0)	17.2	(11.7-22.8)	31.2	(24.5-38.0)
Hancock	52	22.1	(8.8-35.4)	12.6	(3.3-21.9)	34.7	(19.6-49.7)
Hardin	24	7.7	(0.0-17.6)	24.9	(5.1-44.6)	32.6	(11.1-54.0)
Harrison	20	17.1	(0.0-36.0)	9.9	(0.0-23.4)	27.0	(5.2-48.7)
Henry	47	24.9	(10.0-39.8)	24.8	(10.5-39.1)	49.7	(32.3-67.1)
Highland	93	22.4	(10.9-33.9)	26.6	(14.6-38.6)	49.0	(35.2-62.9)
Hocking	29	10.8	(0.0-23.3)	22.5	(3.5-41.6)	33.3	(12.4-54.3)
Holmes	49	14.7	(3.3-26.1)	28.3	(11.7-44.9)	43.0	(24.7-61.4)
Huron	50	15.5	(2.8-28.1)	25.5	(9.4-41.6)	41.0	(22.8-59.2)
Jackson	47	32.1	(12.0-52.1)	14.7	(5.1-24.3)	46.8	(26.2-67.3)
Jefferson	27	26.8	(6.0-47.7)	22.5	(5.0-40.0)	49.3	(26.9-71.6)
Knox	42	11.6	(2.2-21.0)	33.2	(10.3-56.1)	44.8	(22.9-66.8)
Lake	51	11.5	(2.2-20.9)	15.1	(4.4-25.7)	26.6	(13.6-39.7)
Lawrence	48	14.3	(4.4-24.3)	19.8	(7.3-32.4)	34.2	(18.4-50.0)
Licking	40	14.1	(1.9-26.3)	31.2	(13.6-48.8)	45.3	(27.1-63.4)
Logan	27	17.4	(2.1-32.7)	15.5	(1.0-30.0)	32.9	(12.8-53.0)
Lorain	236	14.1	(8.4-19.8)	18.7	(11.9-25.6)	32.9	(24.7-41.0)
Lucas	209	18.4	(11.8-24.9)	20.6	(13.3-27.8)	38.9	(30.4-47.5)
Madison	27	23.9	(4.2-43.6)	10.7	(0.0-22.2)	34.7	(13.3-56.0)
Mahoning	129	17.3	(9.7-24.9)	18.6	(9.9-27.4)	35.9	(25.2-46.7)

Appendix C

County Name	n	% Overweight	(95% CI)	% Obese	(95% CI)	% Overweight or Obese	(95% CI)
Marion	36	6.6	(0.0-14.4)	33.0	(14.1-51.9)	39.7	(20.1-59.3)
Medina	30	16.8	(2.4-31.2)	11.6	(0.5-22.7)	28.4	(11.5-45.3)
Meigs	45	11.9	(2.4-21.5)	36.7	(18.0-55.4)	48.7	(30.3-67.1)
Mercer	39	7.9	(0.0-17.4)	13.7	(1.5-26.0)	21.7	(6.5-36.8)
Miami	37	14.6	(1.5-27.8)	22.4	(6.8-38.0)	37.0	(18.8-55.2)
Monroe	24	45.3	(20.8-69.8)	6.4	(0.0-15.8)	51.7	(27.4-76.0)
Montgomery	219	22.1	(14.8-29.3)	17.4	(10.8-24.0)	39.5	(31.0-47.9)
Morgan	43	8.1	(0.0-18.4)	28.9	(12.0-45.7)	37.0	(19.4-54.6)
Morrow	31	11.1	(0.0-22.9)	19.2	(3.4-35.1)	30.3	(11.4-49.3)
Muskingum	45	12.3	(1.7-22.8)	17.4	(5.3-29.4)	29.6	(14.3-45.0)
Noble	25	15.8	(0.0-36.3)	23.4	(4.3-42.4)	39.2	(15.1-63.2)
Ottawa	28	5.5	(0.0-12.4)	5.3	(0.0-13.1)	10.8	(0.5-21.2)
Paulding	42	34.6	(13.0-56.2)	10.5	(0.3-20.6)	45.1	(24.5-65.6)
Perry	36	7.2	(0.0-14.7)	28.5	(9.3-47.7)	35.6	(16.4-54.9)
Pickaway	31	25.8	(0.3-51.3)	25.1	(4.9-45.3)	50.9	(24.5-77.3)
Pike	42	32.6	(16.5-48.6)	21.8	(6.7-37.0)	54.4	(37.2-71.6)
Portage	35	22.1	(6.2-38.0)	19.1	(2.4-35.7)	41.2	(21.7-60.7)
Preble	35	4.7	(0.0-10.4)	31.5	(13.1-49.9)	36.2	(17.6-54.8)
Putnam	54	15.4	(4.4-26.3)	14.9	(3.9-26.0)	30.3	(16.1-44.5)
Richland	35	14.2	(1.9-26.5)	27.4	(9.3-45.5)	41.6	(22.5-60.6)
Ross	54	12.9	(4.0-21.8)	13.6	(1.9-25.3)	26.5	(12.6-40.5)
Sandusky	55	14.8	(4.1-25.5)	17.4	(5.1-29.8)	32.2	(17.1-47.4)
Scioto	53	19.4	(4.9-33.9)	39.7	(20.1-59.4)	59.2	(41.5-76.8)
Seneca	43	27.0	(10.2-43.8)	20.2	(0.7-39.7)	47.2	(27.5-67.0)
Shelby	32	24.9	(6.2-43.7)	28.2	(9.8-46.6)	53.2	(32.8-73.5)
Stark	161	18.8	(10.6-27.1)	14.5	(8.1-20.8)	33.3	(24.1-42.5)
Summit	421	21.4	(15.7-27.2)	17.4	(12.3-22.4)	38.8	(32.1-45.5)
Trumbull	62	22.3	(9.1-35.4)	18.2	(6.8-29.6)	40.5	(25.8-55.2)
Tuscarawas	72	5.7	(1.1-10.3)	32.1	(16.8-47.4)	37.7	(22.4-53.0)
Union	50	16.2	(4.6-27.8)	2.5	(0.0-6.3)	18.8	(6.6-30.9)
Van Wert	33	22.7	(4.5-40.9)	16.1	(2.4-29.8)	38.8	(18.3-59.4)
Vinton	29	5.1	(0.0-11.8)	21.3	(5.4-37.3)	26.5	(9.2-43.7)
Warren	130	20.7	(11.0-30.4)	10.3	(2.9-17.8)	31.0	(20.2-41.9)
Washington	51	21.7	(8.5-34.8)	24.2	(9.7-38.7)	45.9	(30.1-61.7)
Wayne	72	20.5	(9.1-31.9)	22.4	(10.2-34.6)	42.9	(28.6-57.3)
Williams	29	28.2	(9.2-47.2)	11.8	(0.0-24.5)	40.0	(19.8-60.2)
Wood	88	19.6	(10.4-28.9)	11.6	(2.1-21.0)	31.2	(19.5-42.9)
Wyandot	26	13.2	(1.1-25.3)	15.4	(0.0-31.9)	28.6	(9.5-47.7)

Gray highlighting indicates counties with insufficient data for analysis, n<25

Appendix C

Table B ADULTS: Prevalence of overweight and obesity by Ohio County							
County Name	n	% Overweight	(95% CI)	% Obese	(95% CI)	% Overweight or Obese	(95% CI)
Adams	51	34.1	(21.8-46.4)	32.0	(20.4-43.7)	66.1	(54.0-78.3)
Allen	50	44.0	(37.3-50.7)	25.8	(20.4-31.2)	69.8	(63.5-76.1)
Ashland	40	32.5	(24.9-40.2)	34.3	(26.5-42.0)	66.8	(58.7-74.9)
Ashtabula	45	40.3	(33.8-46.9)	28.1	(22.4-33.8)	68.5	(62.1-74.8)
Athens	41	30.5	(23.5-37.4)	29.3	(21.9-36.7)	59.8	(51.8-67.8)
Auglaize	27	34.7	(26.7-42.8)	34.1	(25.6-42.6)	68.8	(60.9-76.8)
Belmont	28	34.3	(27.0-41.6)	32.3	(25.3-39.3)	66.6	(59.4-73.8)
Brown	74	35.7	(28.5-42.9)	35.3	(27.8-42.9)	71.0	(64.0-78.1)
Butler	158	36.2	(32.9-39.6)	27.6	(24.5-30.7)	63.9	(60.4-67.3)
Carroll	30	35.3	(24.9-45.6)	27.8	(18.5-37.0)	63.0	(51.7-74.3)
Champaign	32	26.3	(19.7-32.8)	39.9	(30.8-49.0)	66.2	(57.4-74.9)
Clark	40	36.2	(30.1-42.2)	37.4	(31.2-43.6)	73.6	(68.2-79.0)
Clermont	132	36.0	(31.8-40.3)	30.8	(26.8-34.9)	66.9	(62.7-71.1)
Clinton	43	39.2	(30.5-47.9)	29.8	(21.5-38.1)	69.0	(60.6-77.4)
Columbiana	42	33.8	(27.6-40.1)	30.3	(24.5-36.2)	64.2	(57.7-70.6)
Coshocton	35	34.9	(26.5-43.2)	32.9	(24.4-41.3)	67.7	(59.2-76.3)
Crawford	33	38.8	(30.2-47.4)	27.3	(20.3-34.3)	66.1	(57.4-74.8)
Cuyahoga	497	36.6	(34.6-38.5)	25.6	(23.9-27.3)	62.2	(60.2-64.2)
Darke	44	36.3	(27.9-44.8)	26.8	(19.6-34.0)	63.1	(54.2-72.0)
Defiance	37	38.4	(29.8-47.0)	34.9	(27.3-42.6)	73.4	(65.9-80.8)
Delaware	38	35.4	(28.3-42.6)	27.2	(20.4-34.0)	62.6	(55.5-69.7)
Erie	43	39.8	(33.1-46.6)	26.7	(21.1-32.3)	66.5	(60.1-73.0)
Fairfield	28	30.3	(23.9-36.8)	39.8	(32.5-47.1)	70.2	(63.5-76.9)
Fayette	38	35.7	(25.1-46.3)	25.7	(17.3-34.1)	61.4	(50.2-72.6)
Franklin	397	36.3	(34.2-38.5)	29.4	(27.4-31.4)	65.7	(63.6-67.8)
Fulton	41	32.5	(24.5-40.5)	32.8	(24.7-41.0)	65.3	(55.6-75.1)
Gallia	39	34.3	(25.4-43.1)	34.2	(25.3-43.0)	68.4	(59.5-77.3)
Geauga	28	30.2	(23.1-37.2)	22.7	(16.0-29.4)	52.9	(44.9-60.8)
Greene	51	33.8	(27.7-40.0)	29.0	(23.2-34.9)	62.9	(56.6-69.1)
Guernsey	38	37.5	(28.5-46.5)	25.2	(18.3-32.1)	62.7	(53.1-72.2)
Hamilton	247	34.9	(32.4-37.4)	27.7	(25.4-30.1)	62.6	(60.1-65.1)
Hancock	52	37.8	(30.7-45.0)	27.9	(21.4-34.4)	65.7	(58.8-72.6)
Hardin	24	31.4	(22.8-40.0)	35.1	(26.4-43.8)	66.6	(56.8-76.4)
Harrison	20	30.2	(18.8-41.5)	29.1	(19.4-38.8)	59.3	(46.3-72.3)
Henry	47	37.8	(29.1-46.5)	30.9	(21.5-40.3)	68.7	(60.2-77.3)
Highland	93	35.4	(27.7-43.0)	32.3	(24.2-40.3)	67.6	(59.5-75.8)
Hocking	29	34.4	(23.1-45.7)	33.0	(23.4-42.7)	67.4	(55.8-79.1)
Holmes	49	32.8	(23.6-42.0)	23.2	(16.1-30.2)	56.0	(45.1-66.9)
Huron	50	32.7	(25.4-40.0)	33.0	(25.7-40.2)	65.6	(57.5-73.8)
Jackson	47	36.8	(27.1-46.5)	40.7	(31.4-50.0)	77.5	(69.7-85.3)
Jefferson	27	37.8	(30.3-45.3)	28.6	(22.2-35.0)	66.4	(58.8-74.0)
Knox	42	38.1	(30.6-45.5)	31.1	(23.8-38.4)	69.2	(62.1-76.2)
Lake	51	34.7	(29.6-39.8)	25.6	(20.9-30.3)	60.3	(55.0-65.6)
Lawrence	48	39.1	(31.5-46.7)	34.5	(27.2-41.9)	73.6	(66.7-80.6)
Licking	40	32.6	(26.0-39.1)	32.2	(25.6-38.8)	64.7	(58.0-71.4)
Logan	27	38.5	(29.9-47.1)	29.3	(21.8-36.9)	67.8	(59.2-76.4)
Lorain	236	34.0	(30.6-37.4)	29.6	(26.4-32.9)	63.7	(60.0-67.3)
Lucas	209	35.1	(32.0-38.3)	30.1	(27.1-33.0)	65.2	(62.0-68.4)
Madison	27	36.8	(26.2-47.4)	33.9	(24.4-43.4)	70.7	(60.5-80.9)

Appendix C

County Name	n	% Overweight	(95% CI)	% Obese	(95% CI)	% Overweight or Obese	(95% CI)
Mahoning	129	36.0	(32.1-39.9)	29.8	(26.1-33.5)	65.8	(61.9-69.8)
Marion	36	31.1	(23.9-38.4)	33.7	(26.0-41.5)	64.9	(56.4-73.3)
Medina	30	40.7	(33.7-47.8)	25.2	(19.0-31.4)	65.9	(59.2-72.7)
Meigs	45	36.7	(25.4-48.0)	22.6	(14.9-30.3)	59.3	(46.3-72.3)
Mercer	39	41.2	(32.1-50.2)	25.5	(18.1-32.8)	66.6	(57.5-75.7)
Miami	37	34.3	(27.6-41.1)	31.7	(25.3-38.1)	66.0	(59.0-72.9)
Monroe	24	35.6	(16.7-54.6)	44.4	(27.0-61.9)	80.1	(71.0-89.1)
Montgomery	219	38.6	(35.6-41.6)	29.6	(26.8-32.4)	68.2	(65.3-71.1)
Morgan	43	29.4	(18.5-40.3)	33.2	(19.0-47.4)	62.6	(48.3-76.9)
Morrow	31	36.2	(26.9-45.6)	32.5	(23.3-41.7)	68.7	(59.1-78.3)
Muskingum	45	34.6	(27.9-41.3)	37.2	(30.4-44.0)	71.8	(65.2-78.3)
Noble	25	36.7	(24.0-49.5)	37.5	(24.3-50.8)	74.2	(60.9-87.6)
Ottawa	28	32.1	(24.8-39.4)	40.9	(32.3-49.5)	73.0	(66.5-79.5)
Paulding	42	30.2	(19.5-40.8)	34.4	(23.7-45.0)	64.5	(51.1-77.9)
Perry	36	32.0	(23.0-40.9)	33.4	(25.0-41.9)	65.4	(55.9-74.9)
Pickaway	31	29.3	(20.0-38.5)	35.9	(26.4-45.4)	65.2	(55.5-74.8)
Pike	42	31.1	(20.1-42.1)	35.5	(24.0-47.1)	66.6	(55.5-77.7)
Portage	35	32.7	(25.5-39.9)	28.9	(21.9-36.0)	61.6	(54.2-69.1)
Preble	35	36.3	(29.5-43.1)	33.6	(26.3-40.8)	69.9	(62.9-76.9)
Putnam	54	30.5	(23.1-37.9)	35.2	(26.2-44.1)	65.7	(56.6-74.7)
Richland	35	42.2	(35.6-48.7)	30.3	(24.2-36.4)	72.5	(66.6-78.4)
Ross	54	36.2	(28.8-43.6)	35.2	(28.0-42.4)	71.4	(64.7-78.2)
Sandusky	55	29.2	(22.9-35.5)	36.0	(29.0-43.0)	65.2	(57.9-72.5)
Scioto	53	29.1	(23.2-34.9)	35.3	(28.8-41.9)	64.4	(57.6-71.3)
Seneca	43	39.8	(32.0-47.6)	28.7	(22.1-35.2)	68.4	(61.1-75.8)
Shelby	32	30.0	(22.5-37.5)	33.5	(24.8-42.1)	63.5	(54.3-72.6)
Stark	161	37.9	(34.5-41.4)	25.9	(22.8-28.9)	63.8	(60.3-67.3)
Summit	421	35.3	(32.8-37.9)	27.7	(25.3-30.1)	63.0	(60.4-65.7)
Trumbull	62	37.4	(32.7-42.2)	34.5	(29.8-39.1)	71.9	(67.5-76.2)
Tuscarawas	72	31.5	(25.8-37.1)	31.0	(25.0-36.9)	62.4	(56.2-68.7)
Union	50	33.1	(25.6-40.6)	23.3	(16.3-30.4)	56.4	(48.0-64.8)
Van Wert	33	46.3	(34.2-58.4)	24.4	(14.8-34.1)	70.7	(59.8-81.6)
Vinton	29	30.3	(19.5-41.1)	23.8	(15.3-32.4)	54.1	(39.8-68.4)
Warren	130	34.7	(30.2-39.1)	25.1	(21.0-29.2)	59.8	(55.2-64.4)
Washington	51	32.7	(25.6-39.8)	33.0	(26.4-39.6)	65.7	(58.8-72.6)
Wayne	72	42.4	(36.7-48.1)	22.5	(18.1-26.8)	64.9	(59.0-70.8)
Williams	29	36.9	(28.0-45.8)	29.7	(21.4-38.0)	66.6	(57.2-75.9)
Wood	88	36.3	(31.1-41.5)	29.7	(24.8-34.6)	66.0	(61.1-70.9)
Wyandot	26	39.6	(29.7-49.5)	26.6	(19.4-33.9)	66.3	(57.0-75.5)

Gray highlighting indicates counties with insufficient data for analysis, n<25

Appendix D

	Table A CHILDREN: Impact of obesity on health and use of health services in Ohio								
Health Status and Use of Health Services	Healthy Weight	Overweight	*Overweight*	Obese	*Obese*	Extremely Obese	*Extremely Obese*	Overweight or Obese	*Overweight or Obese*
	%	%	*Risk Ratio*	%	*Risk Ratio*	%	*Risk Ratio*	%	*Risk Ratio*
Poor health status (95% CI)	3.1 (2.4-3.9)	3.6 (2.1-5.1)	*1.2*	6.3 (4.3-8.2)	*2.0***	7.3 (4.7-9.8)	*2.3***	5.0 (3.7-6.2)	*1.6***
Asthma (95% CI)	10.9 (9.5-12.2)	11.6 (9.1-14.1)	*1.1*	19.2 (15.9-22.5)	*1.8***	21.7 (17.5-25.8)	*2.0***	15.5 (13.4-17.6)	*1.4***
Diabetes (95% CI)	0.5 (0.1-0.8)	0.8 (0.0-1.6)	*1.8*	2.1 (0.8-3.3)	*4.6***	2.7 (0.9-4.5)	*6.0***	1.5 (0.7-2.2)	*3.2***
Poor mental health (95% CI)	4.9 (3.9-5.9)	4.5 (2.8-6.2)	*0.9*	8.1 (5.9-10.3)	*1.6***	9.1 (6.4-11.9)	*1.9***	6.4 (5.0-7.8)	*1.3*
Chronic Illness (95% CI)	12.0 (10.5-13.5)	13.7 (10.9-16.5)	*1.1*	18.3 (14.9-21.6)	*1.5***	19.5 (15.4-23.6)	*1.6***	16.1 (13.9-18.3)	*1.3***
Special health care needs (95% CI)	25.9 (23.9-27.9)	27.2 (23.5-30.9)	*1.1*	36.2 (32.1-40.2)	*1.4***	38.2 (33.3-43.1)	*1.5***	31.8 (29.1-34.6)	*1.2***
Limited ability to do things (95% CI)	5.4 (4.4-6.4)	6.0 (4.2-7.8)	*1.1*	10.5 (7.9-13.1)	*1.9***	11.3 (8.1-14.5)	*2.1***	8.3 (6.7-9.9)	*1.5***
Any ED visits in past year (95% CI)	18.1 (16.4-19.9)	17.1 (14.1-20.1)	*0.9*	23.1 (19.5-26.6)	*1.3***	23.1 (18.8-27.4)	*1.3***	20.2 (17.9-22.6)	*1.1*
Multiple ED visits in past year (95% CI)	5.3 (4.3-6.3)	6.4 (4.3-8.6)	*1.2*	9.3 (7.0-11.7)	*1.8***	8.6 (6.0-11.2)	*1.6***	8.0 (6.4-9.5)	*1.5***
Any Hospitalizations in past year (95% CI)	4.2 (3.3-5.1)	3.6 (2.2-5.0)	*0.9*	7.0 (5.0-9.1)	*1.7***	7.3 (4.7-9.9)	*1.7***	5.4 (4.1-6.6)	*1.3*
Multiple Hospitalizations in past year (95% CI)	1.1 (0.7-1.5)	0.5 (0.1-0.9)	*0.5*	2.3 (1.2-3.4)	*2.1***	2.4 (1.1-3.8)	*2.3***	1.4 (0.8-2.0)	*1.3*
Need for chronic medication (95% CI)	20.1 (18.3-21.9)	21.2 (17.8-24.5)	*1.1*	27.9 (24.1-31.6)	*1.4***	30.9 (26.2-35.7)	*1.5***	24.7 (22.1-27.2)	*1.2***
Avoided Medical Care/Rx due to Cost (95% CI)	6.2 (5.1-7.3)	6.1 (4.4-7.8)	*1.0*	7.1 (5.1-9.1)	*1.1*	6.4 (4.2-8.5)	*1.0*	6.6 (5.3-7.9)	*1.1*
Major Medical Costs (95 %CI)	17.0 (15.3-18.7)	15.7 (12.7-18.7)	*0.9*	15.4 (12.3-18.4)	*0.9*	15.9 (12.2-19.7)	*0.9*	15.5 (13.4-17.7)	*0.9*

** P < 0.05 Points: (bright yellow highlighting indicates risk ratio >2, and pale yellow highlighting indicates all other risk ratios that are significant.

Appendix D

	Table B ADULTS: Impact of obesity on health and use of health services in Ohio								
Health Status and Use of Health Services	Healthy Weight	Overweight	*Overweight*	Obese	*Obese*	Extremely Obese	*Extremely Obese*	Overweight or Obese	*Overweight or Obese*
	%	%	*Risk Ratio*	%	*Risk Ratio*	%	*Risk Ratio*	%	*Risk Ratio*
Poor health status (95% CI)	13.3 (12.5-14.0)	15.3 (14.5-16.0)	*1.2***	27.4 (26. 3-28.4)	*2.1***	44.5 (41.6-47.4)	*3.4***	20.7 (20.1-21.3)	*1.6***
Cardiovascular disease (95% CI)	23.3 (22.4-24.2)	36.8 (35.7-37.8)	*1.6***	53.1 (52.0-54.3)	*2.3***	62.9 (60.0-65.8)	*2.7***	44.1 (43.3-44.9)	*1.9***
Hypertension (95% CI)	20.5 (19.7-21.4)	34.1 (33.1-35.1)	*1.7***	50.2 (49.0-51.3)	*2.4***	59.4 (56.5-62.4)	*2.9***	41.3 (40.5-42.0)	*2.0***
Heart Attack (95% CI)	3.8 (3.4-4.2)	5.2 (4.8-5.7)	*1.4***	7.8 (7.2-8.4)	*2.0***	8.9 (7.3-10.5)	*2.3***	6.4 (6.0-6.7)	*1.7***
Angina (95% CI)	4.3 (3.9-4.7)	6.1 (5.7-6.6)	*1.4***	9.6 (8.9-10.2)	*2.2***	11.4 (9.6-13.1)	*2.7***	7.7 (7.3-8.1)	*1.8***
Stroke (95% CI)	2.8 (2.5-3.2)	3.4 (3.0-3.7)	*1.2***	4.4 (4.0-4.9)	*1.6***	4.4 (3.3-5.5)	*1.6***	3.9 (3.6-4.1)	*1.4***
Heart Failure (95% CI)	1.7 (1.5-2.0)	2.4 (2.1-2.6)	*1.4***	5.4 (4.9-6.0)	*3.1***	9.4 (7.7-11.1)	*5.4***	3.7 (3.5-4.0)	*2.2***
Diabetes (95% CI)	3.8 (3.4-4.2)	8.9 (8.4-9.5)	*2.3***	20.2 (19.3-21.1)	*5.3***	33.1 (30.4-35.9)	*8.6***	13.9 (13.4-14.5)	*3.6***
Borderline Diabetes (95% CI)	0.4 (0.3-0.5)	0.8 (0.6-1.0)	*2.0***	1.6 (1.3-1.9)	*4.1***	2.0 (1.1-3.0)	*5.3***	1.1 (0.9-1.3)	*2.9***
Poor oral health (95% CI)	54.2 (51.2-57.2)	50.5 (47.9-53.2)	*0.9*	54.1 (51.9-56.3)	*1.0*	57.3 (53.1-61.6)	*1.1*	52.7 (51.0-54.3)	*1.0*
Chronic Illness (95% CI)	19.5 (18.6-20.4)	24.8 (23.9-25.7)	*1.3***	34.9 (33.8-36.0)	*1.8***	44.5 (41.6-47.4)	*2.3***	29.3 (28.6-30.1)	*1.5***
Special health care needs (95% CI)	40.2 (39.1-41.4)	48.9 (47.8-50.0)	*1.2***	62.9 (61.7-64.0)	*1.6***	72.4 (69.6-75.3)	*1.8***	55.2 (54.4-56.0)	*1.4***
Limited ability to do things (95% CI)	6.1 (5.6-6.6)	6.5 (6.0-7.0)	*1.1*	12.5 (11.7-13.2)	*2.0***	21.6 (19.3-23.8)	*3.5***	9.2 (8.7-9.6)	*1.5***
Any ED visits in past year (95% CI)	20.8 (19.8-21.8)	20.6 (19.7-21.5)	*1.0*	26.4 (25.4-27.4)	*1.3***	31.9 (29.1-34.6)	*1.5***	23.2 (22.5-23.9)	*1.1***
Multiple ED visits in past year (95% CI)	7.2 (6.5-7.8)	6.9 (6.3-7.5)	*1.0*	10.7 (10.0-11.5)	*1.5***	14.8 (12.8-16.9)	*2.1***	8.6 (8.2-9.1)	*1.2***
Any Hospitalizations in past year (95% CI)	12.7 (11.9-13.4)	13.0 (12.3-13.7)	*1.0*	16.7 (15.9-17.6)	*1.3***	21.0 (18.7-23.3)	*1.7***	14.6 (14.1-15.2)	*1.2***
Multiple Hospitalizations in past year (95% CI)	3.6 (3.1-4.0)	3.4 (3.0-3.7)	*0.9*	5.2 (4.7-5.7)	*1.5***	8.1 (6.6-9.7)	*2.3***	4.2 (3.9-4.5)	*1.2***
Need for chronic medication (95% CI)	36.3 (35.2-37.4)	45.8 (44.7-46.9)	*1.3***	59.1 (57.9-60.3)	*1.6***	68.1 (65.2-71.0)	*1.9***	51.8 (51.0-52.6)	*1.4***
Avoided Medical Care/Rx due to Cost (95% CI)	20.0 (19.0-20.9)	17.8 (16.9-18.6)	*0.9***	23.1 (22.1-24.1)	*1.2***	30.5 (27.8-33.2)	*1.5***	20.2 (19.5-20.8)	*1.0*
Major Medical Costs (95 %CI)	24.8 (23.8-25.8)	24.9 (23.9-25.8)	*1.0*	29.3 (28.2-30.4)	*1.2***	33.4 (30.6-36.1)	*1.3***	26.9 (26.1-27.6)	*1.1***

** P < 0.05 Points: (**bright yellow** highlighting indicates risk ratio >2, and **pale yellow** highlighting indicates all other risk ratios that are significant.

Appendix E

Table A CHILDREN: Relative risk of policy-relevant factors on weight status									
	Overweight			Obese			Overweight or Obese		
Policy-relevant Factor	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI
Child Gender									
Female	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Male	1.5	1.7	(1.4-2.2)	1.8	2.3	(1.8-2.9)	1.5	2.0	(1.7-2.4)
Child Race									
White	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Black	1.2	1.3	(0.9-2.1)	0.9	0.9	(0.6-1.4)	1.0	1.1	(0.8-1.6)
Hispanic	1.2	1.2	(0.7-2.3)	1.2	1.3	(0.6-2.6)	1.2	1.2	(0.8-2.0)
Asian	0.1	0.1	(0.0-0.4)	0.3	0.2	(0.1-1.1)	0.3	0.2	(0.1-0.6)
Other	1.8	2.2	(0.7-6.6)	1.7	2.9	(0.9-9.3)	1.6	2.7	(1.0-7.0)
Child Race and Gender Interaction									
All Other Interaction	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Black Female	1.3	1.3	(0.7-2.4)	2.0	2.7	(1.5-4.9)	1.5	1.9	(1.2-3.0)
Hispanic Male	1.2	1.4	(0.6-3.1)	0.8	0.8	(0.3-1.9)	1.0	1.1	(0.6-2.1)
Child Region									
Metropolitan	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Appalachian	1.0	1.0	(0.7-1.3)	1.1	1.2	(0.9-1.6)	1.1	1.1	(0.9-1.4)
Rural Non-Appalachian	1.2	1.2	(0.9-1.6)	1.2	1.3	(1.0-1.8)	1.2	1.3	(1.0-1.6)
Suburban	1.2	1.2	(0.9-1.7)	1.0	1.0	(0.8-1.4)	1.1	1.2	(0.9-1.5)
Child Insurance Type									
Job-based coverage	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Medicaid	0.9	0.8	(0.6-1.1)	1.3	1.5	(1.1-2.1)	1.1	1.2	(0.9-1.5)
Directly Purchased Insurance	0.6	0.6	(0.3-1.1)	0.4	0.3	(0.2-0.7)	0.6	0.5	(0.3-0.8)
Uninsured	1.2	1.3	(0.8-2.0)	1.4	1.6	(1.0-2.5)	1.2	1.4	(1.0-2.0)
Child's usual source of care (USC)									
Child doesn't have USC	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Child has USC	1.2	1.3	(0.8-2.1)	1.2	1.3	(0.8-2.1)	1.2	1.3	(0.9-1.9)
Child Age									
Age 10 to 11	1.6	1.9	(1.4-2.5)	2.2	3.3	(2.4-4.4)	1.7	2.5	(2.0-3.2)
Age 12 to 13	1.6	1.8	(1.4-2.4)	1.8	2.4	(1.7-3.2)	1.5	2.0	(1.6-2.6)
Age 14 to 15	1.3	1.4	(1.0-1.8)	1.4	1.5	(1.1-2.1)	1.3	1.4	(1.2-1.8)
Age 16 to 17	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Adult Respondent Weight Status									
Adult is healthy weight	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Adult is overweight	1.3	1.4	(1.1-1.7)	1.2	1.3	(1.0-1.7)	1.2	1.4	(1.1-1.7)
Adult is obese	1.4	1.6	(1.2-2.1)	1.7	2.3	(1.8-3.0)	1.5	2.0	(1.6-2.4)
Adult Family Income									
Income <100% FPL	1.3	1.5	(1.0-2.1)	1.3	1.4	(1.0-2.1)	1.2	1.4	(1.0-1.9)
Income 100% - <200% FPL	1.3	1.5	(1.1-2.0)	1.4	1.6	(1.1-2.2)	1.3	1.5	(1.2-1.9)
Income 200% - <300% FPL	1.1	1.2	(0.9-1.5)	1.3	1.4	(1.0-1.9)	1.2	1.2	(1.0-1.6)
Income ≥300% FPL	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Adult Respondent Marital Status									
Married	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Not Married	1.1	1.1	(0.9-1.4)	1.1	1.1	(0.9-1.5)	1.1	1.2	(0.9-1.4)
Widowed	1.2	1.2	(0.7-2.3)	1.5	1.9	(1.1-3.4)	1.3	1.6	(1.0-2.6)

Appendix E

	Overweight			Obese			Overweight or Obese		
Policy-relevant Factor	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI
Adult Respondent Education Level									
Some high school, no diploma	1.2	1.3	(0.8-1.9)	1.0	1.0	(0.7-1.6)	1.1	1.2	(0.8-1.6)
High school graduate or GED	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Some college, no four-year degree	0.8	0.8	(0.6-1.0)	0.9	0.8	(0.6-1.1)	0.9	0.8	(0.7-1.0)
Four-year college degree or more	0.8	0.7	(0.5-0.9)	0.7	0.6	(0.4-0.8)	0.8	0.6	(0.5-0.8)

** P < 0.05 Points with yellow highlighting indicate significant odds ratio and risk ratio.

Appendix E

Table B ADULTS: Relative risk of policy-relevant factors on weight status									
	Overweight			Obese			Overweight or Obese		
Policy-relevant Factor	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI
Adult Gender									
Female	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Male	1.44	2.21	(2.05-2.38)	1.29	1.67	(1.54-1.81)	1.24	1.94	(1.82-2.07)
Adult Race									
White	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Black	1.05	1.12	(0.92-1.35)	1.08	1.18	(0.97-1.45)	1.04	1.13	(0.95-1.35)
Hispanic	1.19	1.42	(1.12-1.81)	1.12	1.25	(0.98-1.58)	1.11	1.35	(1.10-1.67)
Asian	0.61	0.41	(0.33-0.51)	0.24	0.15	(0.10-0.21)	0.57	0.31	(0.25-0.38)
Other	1.10	1.26	(0.91-1.74)	1.01	1.02	(0.73-1.43)	1.04	1.15	(0.86-1.54)
Adult Race and Gender Interaction									
All Other Interaction	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Black Female	1.34	1.83	(1.45-2.32)	1.38	2.05	(1.61-2.61)	1.24	1.96	(1.59-2.42)
Hispanic Male	0.87	0.74	(0.53-1.05)	0.89	0.78	(0.55-1.13)	0.91	0.75	(0.55-1.02)
Adult Region									
Metropolitan	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Appalachian	1.03	1.07	(0.96-1.18)	1.10	1.23	(1.11-1.36)	1.04	1.14	(1.04-1.24)
Rural Non-Appalachian	1.03	1.07	(0.98-1.18)	1.08	1.17	(1.06-1.29)	1.03	1.11	(1.02-1.21)
Suburban	0.97	0.94	(0.85-1.04)	1.04	1.09	(0.98-1.21)	1.00	1.01	(0.92-1.10)
Adult Insurance Type									
Job-based coverage	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Medicaid and Medicare	1.03	1.06	(0.85-1.32)	1.22	1.65	(1.33-2.04)	1.09	1.37	(1.13-1.65)
Medicaid	1.08	1.18	(0.98-1.43)	1.26	1.64	(1.38-1.96)	1.12	1.43	(1.22-1.68)
Medicare	0.98	0.96	(0.80-1.14)	1.07	1.21	(1.02-1.43)	1.02	1.10	(0.95-1.27)
Directly Purchased Insurance	0.87	0.74	(0.62-0.88)	0.75	0.60	(0.49-0.73)	0.87	0.68	(0.58-0.79)
Uninsured	0.93	0.86	(0.76-0.97)	0.96	0.92	(0.81-1.04)	0.96	0.89	(0.80-0.99)
Adult Age									
Age 18 to 34	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Age 35 to 54	1.25	1.57	(1.43-1.72)	1.43	1.96	(1.77-2.17)	1.21	1.71	(1.58-1.86)
Age 55 to 64	1.38	2.05	(1.82-2.31)	1.59	2.54	(2.24-2.88)	1.30	2.24	(2.02-2.49)
Age 65 +	1.28	1.68	(1.39-2.04)	1.18	1.26	(1.04-1.53)	1.15	1.44	(1.22-1.70)
Adult Education Level									
Some high school, no diploma	0.96	0.90	(0.80-1.02)	0.98	0.97	(0.86-1.10)	0.98	0.93	(0.83-1.04)
High school graduate or GED	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Some college, no four-year degree	1.01	1.01	(0.92-1.11)	1.00	0.99	(0.90-1.09)	1.00	1.01	(0.93-1.09)
Four-year college degree or more	0.89	0.78	(0.71-0.85)	0.77	0.61	(0.55-0.67)	0.89	0.71	(0.65-0.77)
Adult Family Income									
Income <100% FPL	0.96	0.92	(0.81-1.05)	1.13	1.29	(1.13-1.47)	1.03	1.09	(0.97-1.23)
Income 100% - <200% FPL	0.97	0.94	(0.84-1.04)	1.15	1.34	(1.20-1.50)	1.03	1.11	(1.01-1.22)
Income 200% - <300% FPL	1.04	1.11	(1.01-1.22)	1.11	1.25	(1.13-1.38)	1.05	1.16	(1.07-1.27)
Income ≥300% FPL	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Adult Cigarette Use									
Smoke cigarettes never	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Smoke cigarettes some days	0.90	0.80	(0.68-0.93)	0.84	0.71	(0.60-0.84)	0.92	0.76	(0.66-0.87)
Smoke cigarettes daily	0.89	0.78	(0.71-0.86)	0.78	0.60	(0.55-0.67)	0.89	0.71	(0.65-0.77)

Appendix E

	Overweight			Obese			Overweight or Obese		
Policy-relevant factor	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI	Risk Ratio	Odds Ratio	95% CI
Household Structure									
Child does not live in home	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Child lives in home	0.99	0.99	(0.91-1.08)	0.96	0.91	(0.84-1.00)	0.98	0.95	(0.88-1.02)
Adult Marital Status									
Adult Married	--	1 (Ref)	--	--	1 (Ref)	--	--	1 (Ref)	--
Adult Not Married	0.89	0.77	(0.71-0.84)	0.87	0.76	(0.70-0.83)	0.92	0.77	(0.71-0.83)
Adult Widowed	0.94	0.85	(0.76-0.96)	0.86	0.73	(0.64-0.83)	0.93	0.79	(0.71-0.88)

** P < 0.05 Points with yellow highlighting indicate significant odds ratio and risk ratio.