

The Burden of **Obesity** in North Carolina



*Division of Public Health
North Carolina Department of Health and Human Services*

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Chronic Disease and Injury Section

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“For approximately 20 years, research has indicated that a sedentary lifestyle is a major risk factor for coronary heart disease.”

Executive Summary

Although substantial attention has been focused on the obesity epidemic in the United States, obesity rates have continued to increase in North Carolina. In 2007, a total of 64.6 percent of N.C. adults were overweight or obese, and the state had the fifth highest national rate of obese children.^{1,2} Obesity is alarming because it may increase the risk for health problems, including some chronic diseases, and it is associated with excess morbidity and mortality.³ Four of the ten leading causes of death in the United States are related to obesity, including coronary heart disease, type II diabetes, stroke, and several forms of cancer. Obesity can also increase the severity of disease associated with hypertension, arthritis and other musculoskeletal problems.⁴

North Carolina percentages are the 5th highest in the nation in childhood obesity. Among N.C. children ages 10-17, 20 percent were overweight, and 14 percent were obese (a combined 34 percent were overweight or obese), compared to 62 percent who were at a healthy weight.⁵ High rates of overweight may be attributed to physical inactivity and unhealthy eating habits among youth in the state. Nearly 80 percent of N.C. adults and 85 percent of N.C. high school students ate less than five servings of fruits and vegetables each day, the minimum recommended for good health.^{6,7} In 2006, one-third of N.C. children typically consumed one serving or less of vegetables per day,⁸ and one in three N.C. children eats fast food two or more times per week.⁹

Sedentary lifestyles contribute to overweight and obesity among the state's children and youth. In 2007, 49.9 percent of children watched more than two hours of television on a typical day.¹⁰

Less than half (44 percent) of the state's high school students and just over half (55 percent) of middle school students were physically active for a total of at least 60 minutes per day on five or more of the past seven days.¹¹ Approximately 20 percent of children did not meet the physical activity recommendation of 60 minutes per day.¹²

Among children and youth, obesity is associated with an increased risk of high cholesterol, liver abnormalities, diabetes, and becoming an obese adult.¹³ Obese children and youth may develop type II diabetes, high blood lipids, hypertension, asthma, sleep apnea, early maturation and orthopedic problems. In addition, a significantly higher percentage of adolescents who were obese had a claim for diabetes, asthma, or other respiratory conditions than did adolescents who were at a healthy weight.¹⁴ Despite medical advances, child life expectancy may be declining, due in part to an increase in overweight.¹⁵

The percentage of N.C. adults who are obese has more than doubled in the last decade and a half, from approximately 13 percent in 1990 to 27 percent of the population in 2006, consistently remaining slightly higher than the national average.¹⁶ Poor eating habits and lack of adequate physical activity are widely recognized contributors to the overweight epidemic in North Carolina; physical inactivity and unhealthy eating combined are the second leading preventable cause of death in North Carolina. Both increase the risk of heart disease, certain types of cancer, diabetes, high blood pressure, stroke and obesity.¹⁷ In 2007, 56 percent of N.C. adults did not meet the recommendation for physical activity and nearly 24 percent of

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adults had no leisure-time physical activity within the previous week.¹⁸ Over 77 percent of N.C. adults were not meeting the recommendation of five fruits or vegetables per day.

In 2003, six percent of North Carolina’s healthcare expenses were related to obesity, which translated into over \$2 billion.¹⁹ Obese N.C. adults had costs 32 percent higher than adults at a healthy weight.²⁰ The cost of obesity in N.C. youth was nearly \$16 million per year.²¹ Adolescents who were overweight had Medicaid expenditures that were 33 percent higher, and the obese group had expenditures that were 25 percent higher, than adolescents at a healthy weight.²² Additionally, average expenditures for prescription drugs for adolescents who were obese were 42 percent higher than those for adolescents at a healthy weight.²³

A 2008 study estimated the total direct and indirect costs of eight risk factors (including excess weight, physical inactivity, type II diabetes, low fruit/vegetable intake, hypertension, high cholesterol, depression and tobacco use) for North Carolina adults was \$57.36 billion. The most expensive risk factor was excess weight—at \$15.57 billion. To put these figures in perspective, the entire annual budget for North Carolina in 2008 was over \$20 billion.²⁴ Of the \$57.36 billion, \$42.62 billion of expenses were accrued in lost productivity, \$10.52 billion in direct and indirect medical care, and \$4.22 in prescription costs. The study found that costs for youth total approximately \$105.13 million for the three risk factors of physical inactivity (\$41.million), excess weight (\$33.32 million), and type II diabetes (\$30.43 million).²⁵

Overweight and obesity pose significant health issues for both children and adults. Excess weight is not only a risk factor for several serious conditions, but also exacerbates existing conditions.²⁶ Heart disease, cancer, stroke and chronic lung disease are the leading causes of death in North Carolina and account for 58 percent of all deaths in the state.²⁷ There have been dramatic increases in diabetes and obesity in the past decade; these conditions exacerbate many other health problems. According to a recent study, more than half (53%) of all deaths of North Carolinians are preventable.²⁸

“According to a recent study, more than half (53%) of all deaths of North Carolinians are preventable. “

Defining Obesity

Obesity and overweight define weight ranges greater than what is generally considered healthy for a given height. The terms also identify weight status associated with increased risks of certain chronic diseases and other acute and chronic health problems.

Body Mass Index

Overweight and obesity are each determined by using weight and height to calculate a measure called the “body mass index” (BMI). BMI is defined as weight (in kilograms) divided by height (in meters) squared [weight in kilograms/ (height in meters)²]. BMI is used because, for most people, it correlates with their amount of body fat and is easily obtainable in a clinical setting. Use the Centers for Disease Control and Prevention (CDC) BMI calculator to calculate your BMI at www.cdc.gov/nccdphp/dnpa/bmi.

BMI for Adults

- An adult who has a BMI between 25 and 29.9 is considered overweight.
- An adult who has a BMI of 30 or higher is considered obese.

BMI for Children and Youth

For children and youth: BMI ranges for children and youth take into account normal differences in body fat between boys and girls as well as differences in body fat at various ages. BMI is plotted on a gender-specific CDC BMI-for-age growth chart to obtain a percentile ranking. A child is overweight if a BMI is ≥ 85 percentile but <95 percentile for age and sex. If a BMI is ≥ 95 percentile for age and sex, or exceeds

The terms used to describe the specific BMI ranges mentioned here have changed over the years for children and youth.

Many sources have used or still use the older categories of at risk of overweight and overweight to describe children and youth between the 85th and 95th percentile and above the 95th percentile, respectively.

30 kg/m² (whichever is smaller), children and youth are classified as *obese*.

For the purposes of this document, the more recent definitions set forth in 2007 by the Expert Committee on the Assessment, Prevention, and Treatment of Child and Adolescent Overweight and Obesity convened by the American Medical Association (AMA), the U.S. Department of Health and Human Services (DHHS), Health Resources and Services Administration (HRSA), and the Centers for Disease Control and Prevention (CDC) will be used throughout. This Expert Committee recommends classifying

children and youth ages 2-18 as overweight if BMI is $\geq$ 85 percentile but $<$ 95 percentile for age and sex. It recommends classifying children and youth ages 2-18 as obese if BMI is $\geq$ 95 percentile for age and sex, or exceeds 30 kg/m².²⁹

In order to keep the terminology consistent, weight data presented throughout this document will be described according to the designations in the below table for adults, youth, and children.

Designations used to describe adult, children, and youth weight status throughout this document.

Weight Status Category	Adults: BMI Category**
Underweight	Adults: BMI below 18.5
Healthy Weight	Adults: BMI of 18.5 to 24.9
Overweight	Adults: BMI of 25 to 29.9
Obese	Adults: BMI of 30 or higher
Weight Status Category	Children and Youth: Percentile Range**
Underweight	Children and youth: Less than the 5th percentile for age and sex
Healthy Weight	Children and youth: 5th percentile to less than the 85th percentile for age and sex
Overweight	Children and youth: Equal to or greater than the 85th, but less than the 95th percentile for age and sex
Obese	Children and youth: Equal to or greater than the 95th percentile for age and sex

**The National Health and Nutrition Examination Survey (NHANES) is a national surveillance system that collects obesity prevalence data using actual measured heights and weights collected by survey staff members. This data source is used to set national standards, including BMI categories and percentile ranges for height and weight. (See "Description of Data Sources" section for more details).

Race and Ethnicity Categories

Throughout this document, data from various surveys and resources are used. Many of the surveys ask respondents about their race or ethnicity. For example, the 2005 Youth Risk Behavior Surveillance System (YRBSS) asked, “How do you describe yourself?” and directed the respondent to select one or more categories.³⁰ The BRFSS survey is done via telephone, and the questions read to the respondent in 2005 were “which of the following would you say is your race” and “which would you say best represents your race?”.³¹

There are federal directives by the Office of Management and Budget (OMB) on how to collect and present data on race and ethnicity. For purposes of consistency, the data in this document will be presented using the term African American for categories that in the original surveys indicated that the respondent self-identified as African American or black, and Hispanic or Hispanic/Latino will be used for those who self-identify as Hispanic or Latino. Although survey data is collected from multiple races and ethnicities, the numbers in certain groups are often too small for statistical comparisons and thus are not presented. Raw numbers are available to interested readers by going directly to the data sources described at the

end of this document. Some data sources specifically target or oversample particular populations.



Obesity in Children and Youth

Nationally, more than one-third of children and youth are overweight and more than 17 percent are obese. Approximately 25 million children and youth are obese or overweight. The rate of childhood obesity more than tripled from 1980 to 2004.³³ More than nine million young people ages 6 to 19—one in every six—are considered obese.³⁴ Research has shown that overweight and sedentary children and youth are more likely than healthy weight children and youth to become overweight adults.^{35, 36, 37, 38}

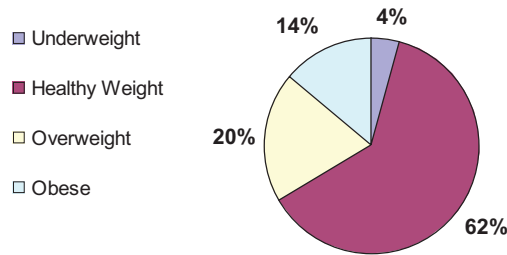
According to the National Survey of Children, 19.3 percent of North Carolina youth are obese, compared with 14.8 percent nationally. This ranks North Carolina the 5th most obese state in the nation for youth ages 10-17.³⁹ Risk factors for heart disease, such as high cholesterol, high blood pressure, and type II diabetes occur with increased frequency in overweight children and youth and adolescents compared to those with a healthy weight.⁴⁰ Overweight adolescents have a 70 percent chance of becoming overweight or obese adults. This increases to 80 percent if at least one parent is overweight or obese. Because habits developed early in life may persist into adulthood,⁴¹ interventions must be

effective in targeting children and adults early on.

The Child Health Assessment and Monitoring Program (CHAMP) is a statewide comprehensive surveillance system that monitors health and risk behaviors for children and adolescents (ages 0-17) and to measure parent opinions related to child health policy objectives. During the Behavioral Risk Factor Surveillance System (BRFSS) interview, households with children are identified as part of the demographic section, the respondent is asked to participate in a survey about child health, and an interviewer calls back within a week to administer CHAMP to the primary caregiver of the child.



N.C. Children (Age 10-17), BMI for Age (2007)

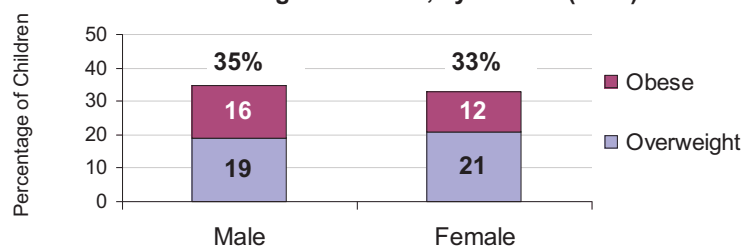


*BMI category based on percentile (underweight= below 5th percentile, healthy weight= 5th percentile to less than the 85th percentile, overweight= equal to or greater than the 85th, but less than the 95th percentile, obese= equal to or greater than the 95th percentile) for age. Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007); State Center for Health Statistics, Raleigh NC.

Among N.C. children ages 10-17, 20 percent were overweight, and 14 percent were obese (a combined 34 percent were overweight or obese), compared to 62 percent who were at a healthy weight.⁴²

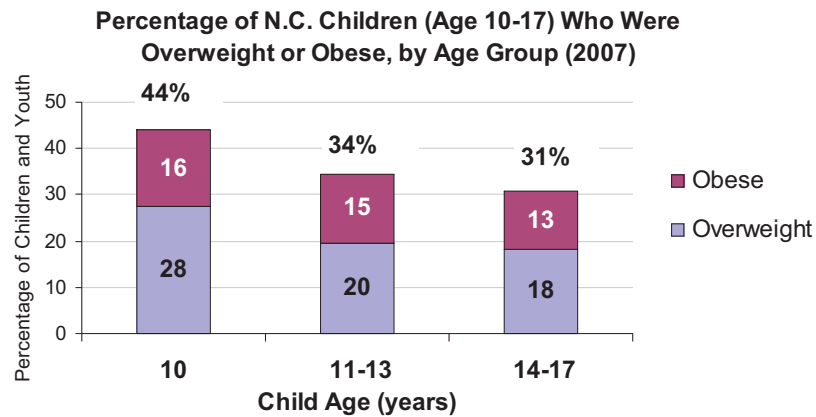
Similar to the pattern seen in N.C. adults, male N.C. children and youth are more likely to be obese (16 percent) than are female children and youth (12 percent), whereas female N.C. children and youth are more likely to be overweight (21 percent) than are male children and youth (19 percent).

Percentage of N.C. Children (Age 10-17) Who Were Overweight or Obese, by Gender (2007)

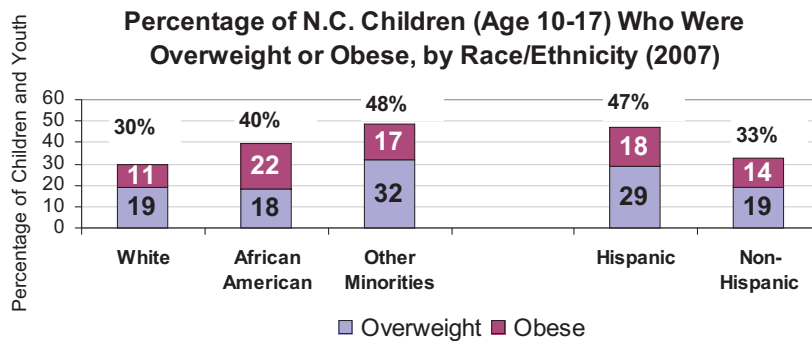


*BMI category based on percentile (underweight= below 5th percentile, healthy weight= 5th percentile to less than the 85th percentile, overweight= equal to or greater than the 85th, but less than the 95th percentile, obese= equal to or greater than the 95th percentile) for age. Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007); State Center for Health Statistics, Raleigh NC.

Out of 2,297 children, ages 3 to 17, 648 were flagged to be called back of which 82 percent were successfully updated with new height/weight information. The calculations of BMI-for-Age Categories include the corrected heights & weights obtained from these callbacks for children 10 and older. North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007); State Center for Health Statistics, Raleigh NC.



BMI category based on percentile (underweight= below 5th percentile, healthy weight= 5th percentile to less than the 85th percentile, overweight= equal to or greater than the 85th, but less than the 95th percentile, obese= equal to or greater than the 95th percentile) for age. Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh NC.



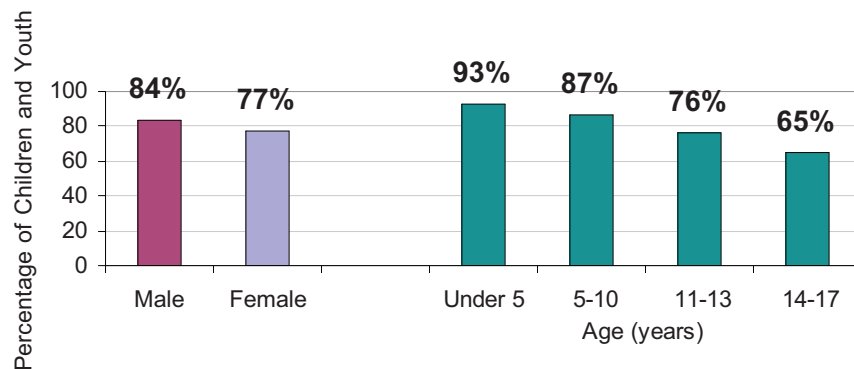
BMI category based on percentile (underweight= below 5th percentile, healthy weight= 5th percentile to less than the 85th percentile, overweight= equal to or greater than the 85th, but less than the 95th percentile, obese= equal to or greater than the 95th percentile) for age. Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh NC.

Among N.C. children and youth ages 10-17, both the highest percentage of overweight (28 percent) and the highest percentage of obesity (16 percent) was in the, 10 year-old age group. Among N.C. children in this age group, there is a 12 percent difference in the percentage of overweight versus the percentage of obese children.

Among N.C. children and youth who are white, 30 percent were overweight or obese, compared with 40 percent of African American children who were overweight or obese. Among children of other minorities, 48 percent were overweight or obese. Additionally, 14 percent more of the Hispanic children (47 percent) were overweight or obese, compared to non-Hispanics (33 percent).

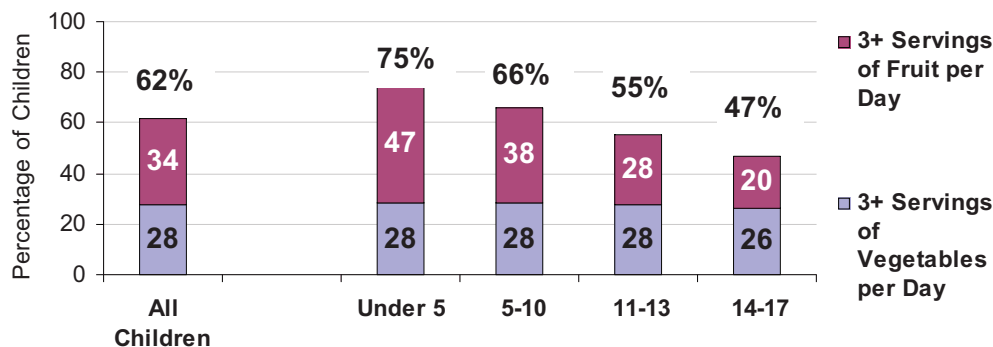
In 2007, the percentage of N.C. children and youth who met the recommendation of 60 minutes of physical activity on a typical day was 7 percent higher for males (84 percent) than females (77 percent). Additionally, in 2007, the rate of physical activity decreased with increasing age, with 93 percent of children under 5 meeting the recommended 60 minutes of physical activity and only 65 percent of children age 14-17 meeting the recommendation.

Percentage of N.C. Children (Age 2-17) Who Met the Recommendation of 60 Minutes of Physical Activity on a Typical Day, by Gender and Age Group (2007)



Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh NC.

Percentage of N.C. Children (Age 1-17) Who Ate 3+ Servings of Fruit or Vegetables on a Typical Day, by Age (2007)



Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh NC.

Also in 2007, the percentage of N.C. children and youth who ate three or more servings of fruit or vegetables on a typical day was 28 percent higher for children under 5 years old (75 percent) than for children age 14-17 (47 percent). Additionally, in 2007, the percentage of children who ate three or more servings of vegetables on a typical day decreased with increasing age, while the percentage of children who ate three or more servings of fruit on a typical day stayed the same with increasing age.

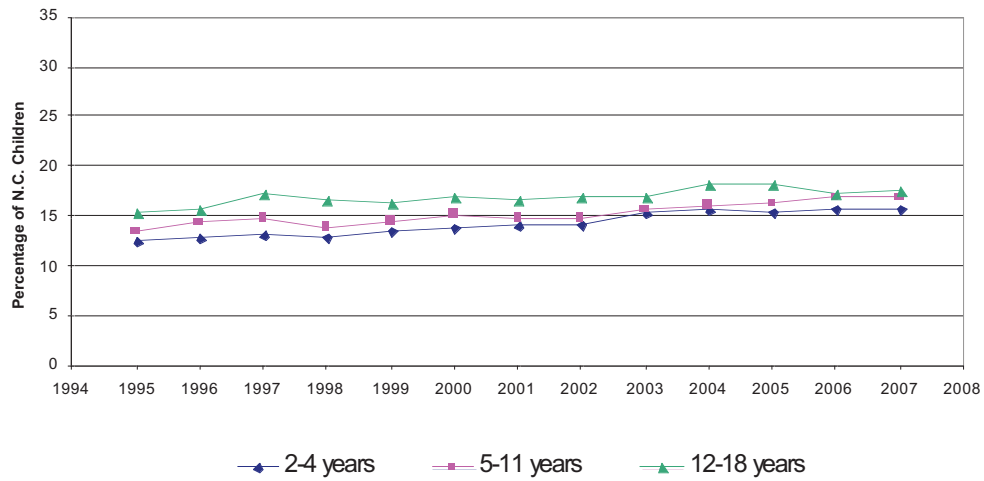
The North Carolina Nutrition and Physical Activity Surveillance System (NC-NPASS) provides accurate, timely information relevant to child health indicators from local public health departments and WIC programs. NC-NPASS includes height, weight, a few lab measures and limited behavioral data. The data set used to generate NC-NPASS reports may not be representative of the population

as a whole, since it consists of data collected on children seen in N.C. Public Health-sponsored Women, Infants and Children (WIC) and child health clinics and some school-based health centers.

As the graph illustrates, the percentage of overweight N.C. children and youth, ages 2-18, has been steadily increasing between 1995 (13.8 percent) and 2007 (16.7 percent). When examining characteristics of N.C. children and youth by age group over time, the highest percentage of overweight is in the age 12-18 group, but both the 2-4 and 5-11 age groups show a similar trend of increasing over time.

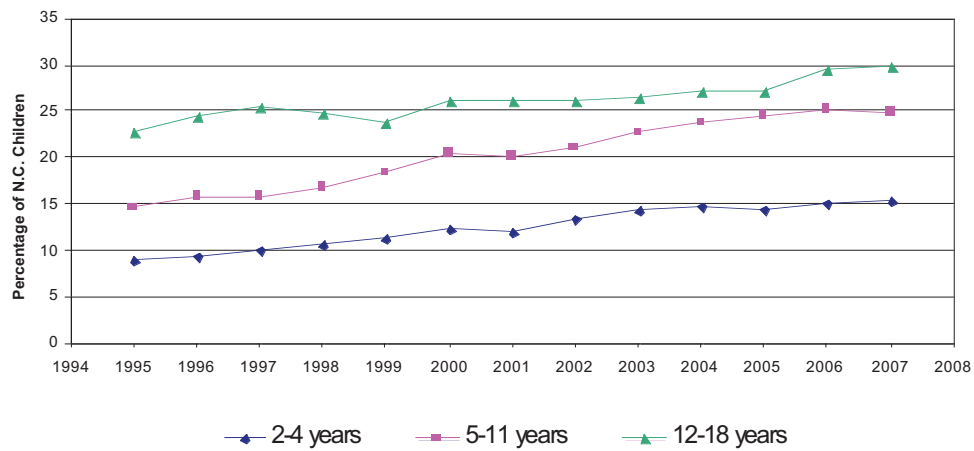
As the graph illustrates, the percentage of N.C. children and youth, ages 2-18, who are obese has been steadily increasing in parallel between 1995

Percentage of N.C. Children and Youth Who Were Overweight, by Age Group (1995-2007)



Source: North Carolina-Nutrition and Physical Activity Surveillance System (NC-NPASS) includes data on children seen in North Carolina Public Health Sponsored WIC and Child Health Clinics and some School Based Health Centers. (1995-2007).

Percentage of N.C. Children and Youth Who Were Obese, by Age Group (1995-2007)



Source: North Carolina-Nutrition and Physical Activity Surveillance System (NC-NPASS) includes data on children seen in North Carolina Public Health Sponsored WIC and Child Health Clinics and some School Based Health Centers. (1995-2007).

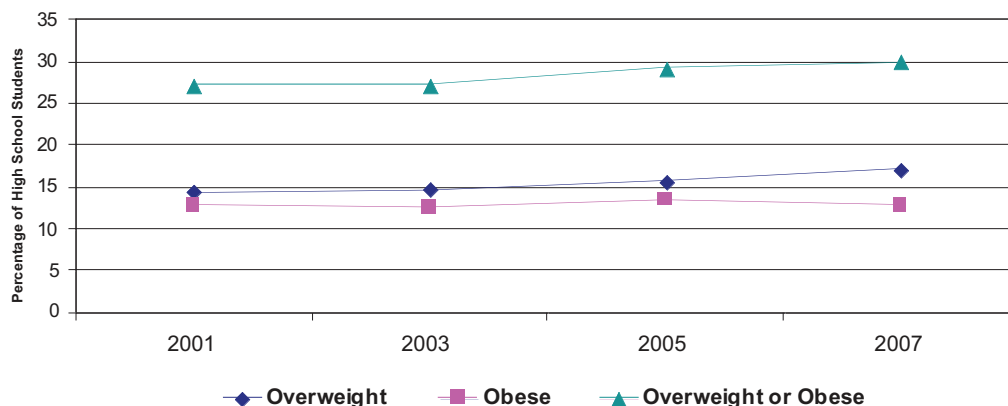
(15.4 percent) and 2007 (23.6 percent). The highest percentage of overweight is in the 12-18 year age group (29.9 percent in 2007), then the 5-11 year age group (24.9 percent in 2007), and finally the 2-4 year age group (15.3 percent in 2007).

N.C. High School and Middle School Students

The Youth Risk Behavior Surveillance System (YRBSS) is a surveillance system developed by CDC to monitor priority health-risk behaviors among youth. The national, school-based survey is completed by students (in approximately 45 minutes) in the classroom. These surveys have been conducted biennially since 1991, drawing representative samples of students in grades 9–12. The survey is conducted biennially, every odd year, at the national, state and local levels.

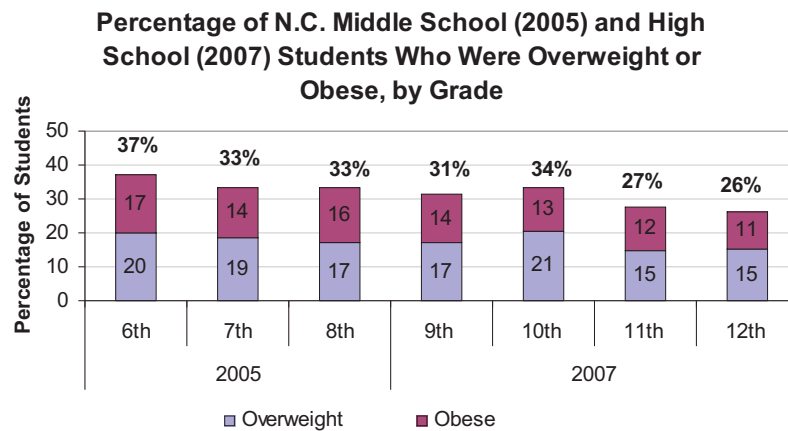
Looking at the prevalence of overweight over time reveals a steady increase in the overall percentage of high school students who are in the overweight category since 2001. In 2001, 14.4 percent of all N.C. high school students were overweight; just six years later, in 2007, the prevalence of overweight among the students increased to 17.1 percent.⁴³

Trends in the Percentage of N.C. High School Students Who Were Overweight or Obese (2001, 2003, 2005, and 2007)

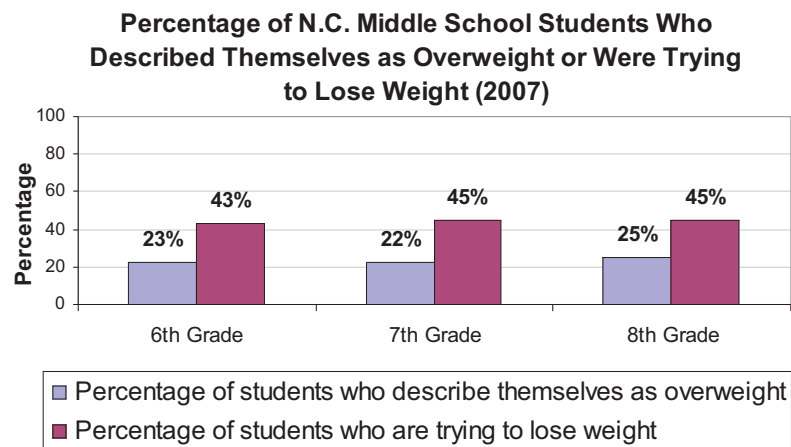


Weight category based percentile (overweight= equal to or greater than the 85th, but less than the 95th percentile, obese= equal to or greater than the 95th percentile) for age and gender. Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2001, 2003, 2005, and 2007).

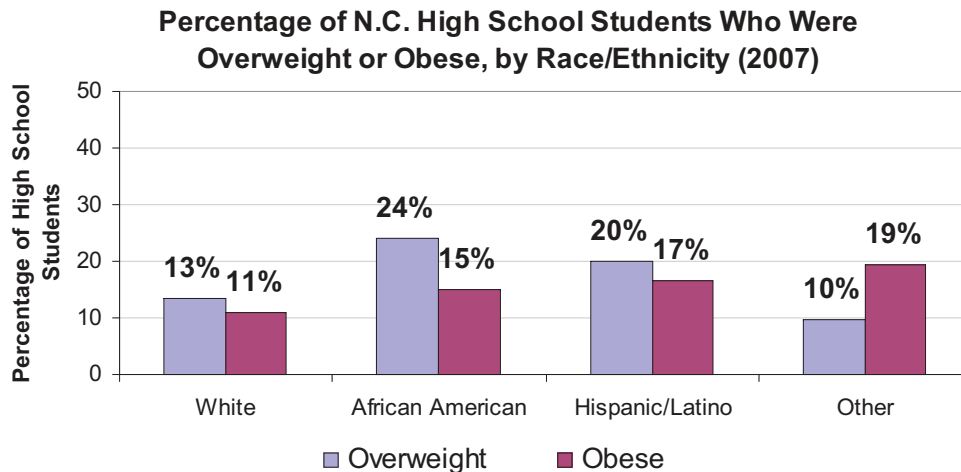
Although only 23 percent of N.C. 6th grade middle school students described themselves as overweight, 43 percent of students reported that they were trying to lose weight. The percentages for 7th grade and 8th grade are similar, with 22 percent and 25 percent, respectively, describing themselves as overweight and 45 percent (both grades) reporting they were trying to lose weight.⁴⁴



Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2005 and 2007).



Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2007).



Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2007).

In 2005, N.C. high schools had the same percentage of overweight students, 15.7 percent, as the U.S. average. However, the percentage of obese high school students was higher in North Carolina than in the U.S.; an average of 13.5 percent in N.C. compared to 13.1 percent in the U.S.⁴⁵ African American high school students had the highest percentage of overweight (24 percent), while the Hispanics/Latinos group had the highest percentage of obesity (17 percent).⁴⁶

Obesity in Adults

Despite the increased attention that the obesity epidemic is receiving in the United States, obesity rates continue to rise, with two-thirds of adults being either overweight or obese.⁴⁷ No state has experienced a decrease in obesity rates over the past 16 years, and 31 states have experienced increases in those rates. In 2007, 64.6 percent of adults in North Carolina were overweight or obese, compared to the national average of 63 percent.⁴⁸ In 2007, North Carolina had the 16th highest level of adult obesity in the nation at 28.7 percent.⁴⁹

The Behavioral Risk Factor Surveillance System (BRFSS) was established in 1984 by the Centers for Disease Control and Prevention (CDC). BRFSS is a state-based system of health surveys that collects information on health risk behaviors, preventive health practices, and health care access primarily related to chronic disease and injury. Phone numbers are randomly selected throughout the state (business and nonworking numbers are omitted), and individuals age 18 years and older are randomly selected from each household called. Nationally, more than 350,000 adults are interviewed each year, making the BRFSS the largest telephone health survey in the world. States use BRFSS

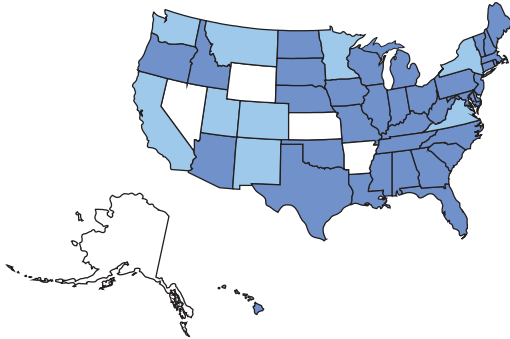
data to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs. Many states also use BRFSS data to support health-related legislative efforts.⁵⁰

*“Two-thirds
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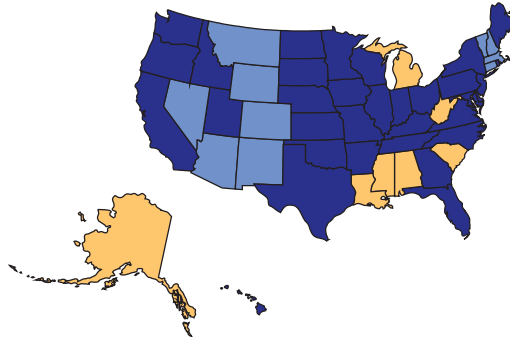
⁴⁷ Schiller J.S., Martinez M., Hao C, Barnes P. “Early release of selected estimates based on data from the January-September 2004 National Health Interview Survey,” National Center for Health Statistics. (March 2005) <www.cdc.gov/nchs/nhis.htm> 7 June 2005.

Obesity Trends Among U.S. Adults
BRFSS, 1990, 1998, 2006

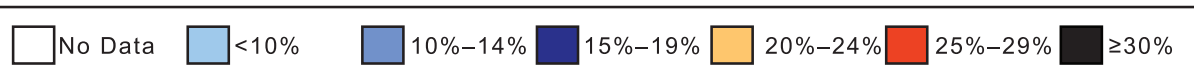
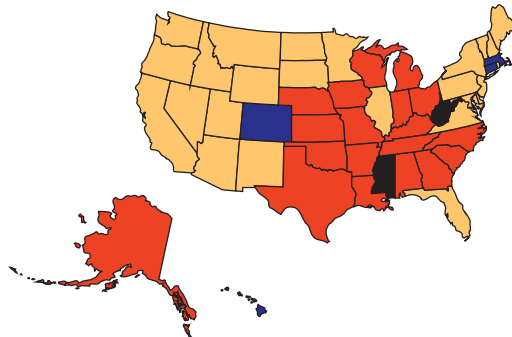
1990



1998



2006



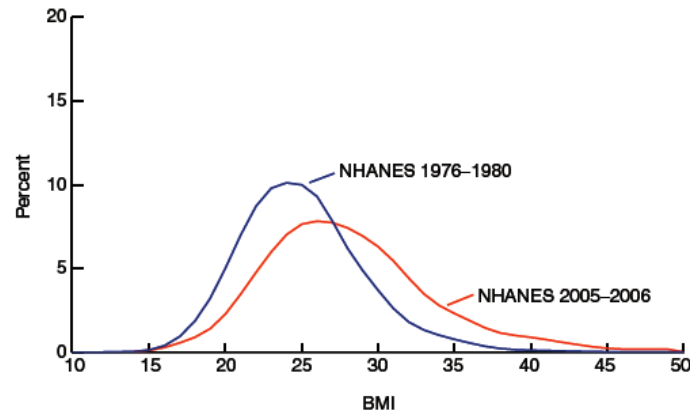
- **In 1990**, 10 states had a prevalence of obesity of under 10 percent, and no states had prevalence of 15 percent or more.

- **By 1998**, no state had an obesity prevalence under 10 percent, seven states had a prevalence of obesity between 20 and 24 percent, and no state had obesity prevalence of 25 percent or more.

- **In 2006**, only four states had a prevalence of obesity under 20 percent. Twenty-two states had prevalence equal or greater than 25 percent; two of these states (Mississippi and West Virginia) had a prevalence of obesity of 30 percent or more.

The National Health and Nutrition Examination Survey (NHANES) is designed to assess the health and nutritional status of adults and children in the United States by combining personal interviews and physical examinations. Findings from this survey are used to determine the prevalence of major diseases and risk factors for diseases. NHANES findings are also the basis for national standards for such measurements as height, weight and

Changes in the Distribution of BMI between 1976-1980 and 2005-2006, United States Adults Ages 20-74 Years



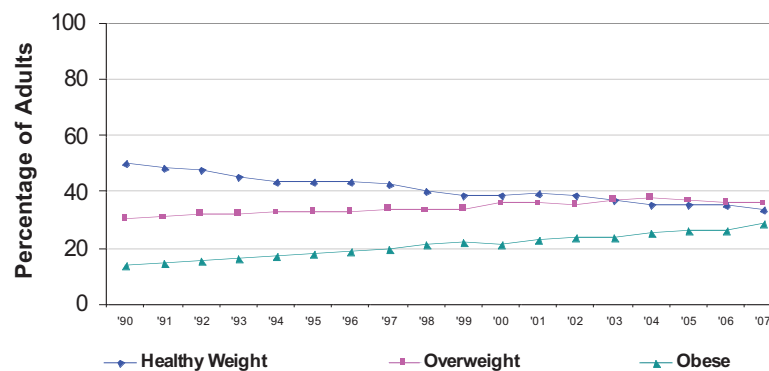
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey (NHANES).

blood pressure. Changes in the prevalence of obesity do not present a complete picture of the trends in weight BMI among U.S. adults. A more complete picture can be seen by comparing the distribution of BMI in 1976-1980 with the distribution in 2005-2006 for adults 20-74 years of age. Between 1976-1980 and 2005-2006, the distribution of BMI shifted to the right, but the shift was greatest at the upper percentiles of the distribution. This

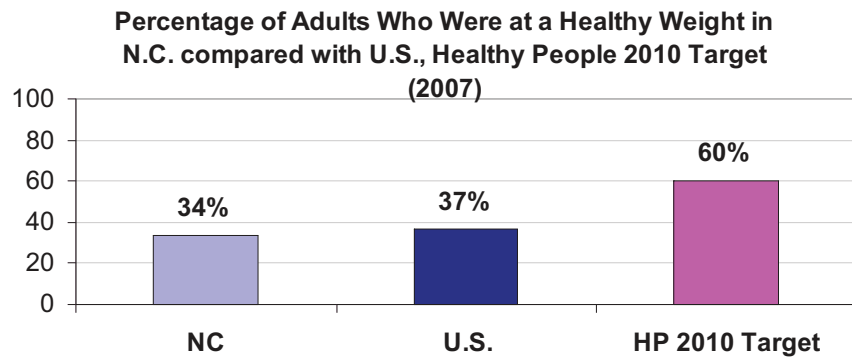
indicates that the entire adult population is heavier, and the heaviest have become much heavier since 1980.⁵¹

North Carolina's percentage of adults at a healthy weight declined only 14.2 percent between 1990 and 2000 (an average annual decline of 1.5 percent) and hardly declined at all in the late 1990s, but has since declined by 19.2 percent between 2000 and 2004, with an average annual decline of 5.2

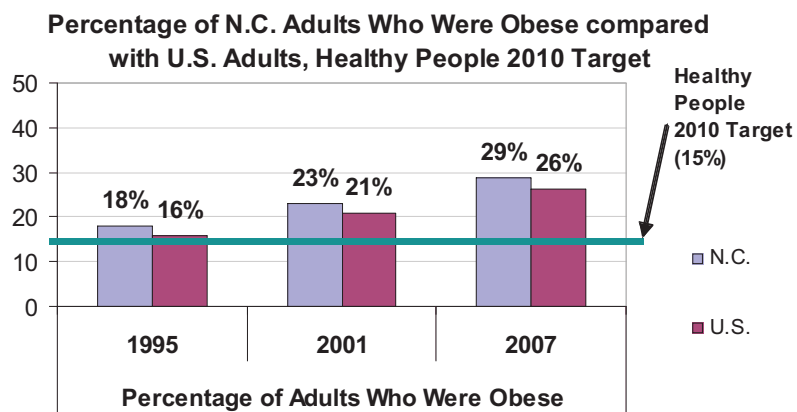
Trends in BMI Categories, N.C. Adults (1990-2007)



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, NC State Center for Health Statistics, NC Department of Health and Human Services, (1990-2007)



Healthy People 2010 Objective 19-1. Obesity. "By 2010, increase the percentage of adults who are at a healthy weight to 60%." Data Sources DATA2010, CDC, NCHS. Prevalence Data from the Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, [2007].



Healthy People 2010 Objective 19-2. Obesity. "By 2010, reduce the percentage of adults (20 years old or older) who are obese to 15%." Data Sources DATA2010, CDC, NCHS. Prevalence Data from the Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, [1995, 2001, 2007].

percent. Between 1990 and 2007, the percentage of N.C. adults at a healthy weight has declined by 16.2 percent. During that same time period, the percentage of overweight N.C. adults has increased by 5.2 percent and the percentage of obese N.C. adults has increased by 15.1 percent. ⁵²

In January 2000, the N.C. Department of Health and Human Services launched Healthy People 2010, a comprehensive, nationwide health promotion and disease prevention agenda. Healthy People 2010 contains 467 objectives designed to serve as a framework for improving the health of

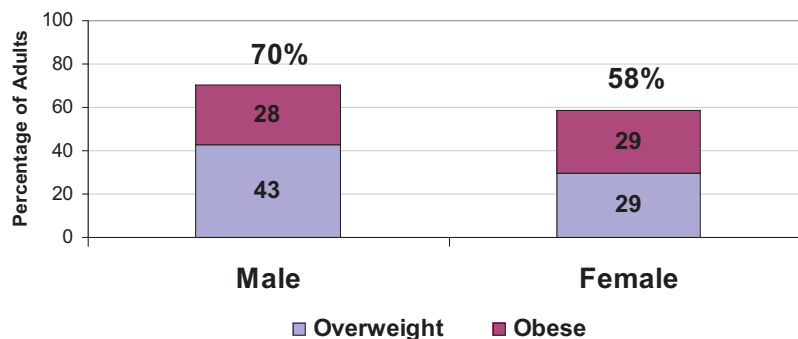
all people in the United States during the first decade of the 21st century. Healthy People 2010 builds on similar initiatives pursued over the preceding two decades. Two overarching goals—to increase quality and years of healthy life and to eliminate health disparities—served to guide the development of objectives that would be used to measure progress. Each objective has a target to be achieved by the year 2010. These objectives are organized into 28 focus areas, each representing an important public health area. A selected set of objectives, known as the Leading Health Indicators, was created to help identify sentinel measures of public health, and to encourage wide participation in improving health in the next decade. These indicators were chosen based on their ability to motivate action, the availability of data to measure their progress, and their relevance as broad public health issues.

The Healthy People 2010 goal illustrated in the accompanying graph is, “By 2010, increase the percentage of adults who are at a healthy weight to 60 percent.” In order to meet the goal of 60 percent of N.C. adults at a healthy weight, we need to increase the percentage of adults at a healthy weight by 25 percent.

The Healthy People 2010 goal for the graph below is, “By 2010, reduce the percentage of adults (20 years old or older) who are obese to 15 percent.” In order to meet the goal of 15 percent obesity, we need to decrease the percentage of obese adults by 12 percent.

In North Carolina, overweight and obesity are higher among men than among women. In 2007, the percentage of overweight or obese adults was 70 percent among men and 58 percent among women. In 2007, while 64 percent of all adults were overweight or

Percentage of N.C. Adults Who Were Overweight or Obese, by Gender (2007)

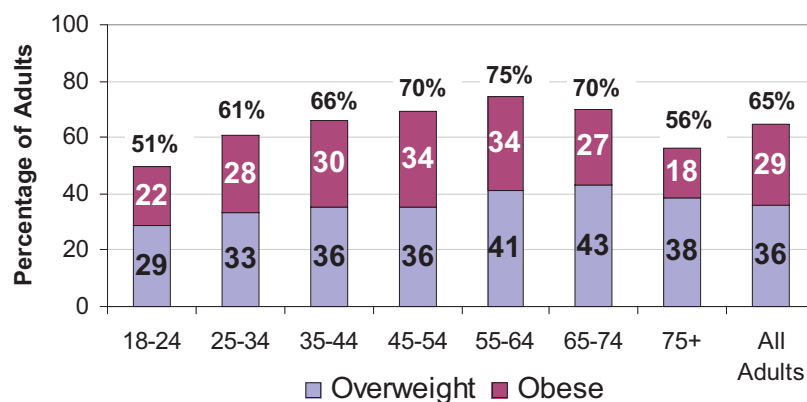


Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

obese, 74 percent of adults in the 55-64 age group were overweight or obese. Among N.C. adults, 75 percent of those in the 55-64 age group were overweight or obese, compared with only 51 percent in the 18-24 age group. It is surprising that only 56 percent of the age 75 and older age group were overweight or obese, while 70 percent of the 65-74 age group were overweight or obese. In 2003-2005, among North Carolina adults: 22.6 percent of white, non-Hispanic adults; 36.7 percent of African American, non-Hispanic adults; 33.5 percent of American Indian, non-Hispanic adult; 14.3

percent of other races, non-Hispanic adults of other races; and 22.1 percent of Latino/Hispanic adults were obese and 25.1 percent of the total adult population was obese.⁵³

Percentage of N.C. Adults Who Were Overweight or Obese, by Age Group (2007)



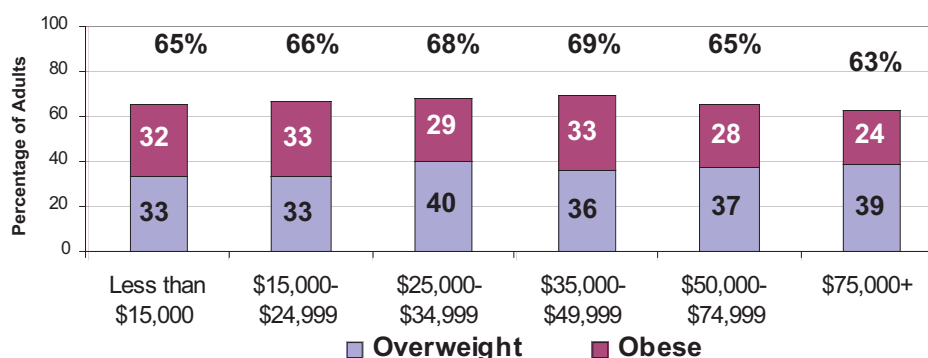
Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

**N.C. Risk Factor Percentages, by Race/Ethnicity;
Behavioral Risk Factors* (percentages) 2003-2005:**

	% White, Non- Hispanic	% African American, Non- Hispanic	% American Indian, Non- Hispanic	% Other Races, Non- Hispanic	% Latino/ Hispanic	% of TOTAL Population
Adults with high blood pressure	28.5	39.3	35.4	17.5	10.7	28.9
Adults who smoke	23.9	23.0	34.9	20.9	17.5	23.3
Adults who are obese	22.6	36.7	33.5	14.3	22.1	25.1
Adults with no leisure time physical activity	21.7	31.4	31.3	25.6	44.3	25.3
Percent of adults in fair/poor health	16.9	23.2	25.8	13.6	30.0	19.0

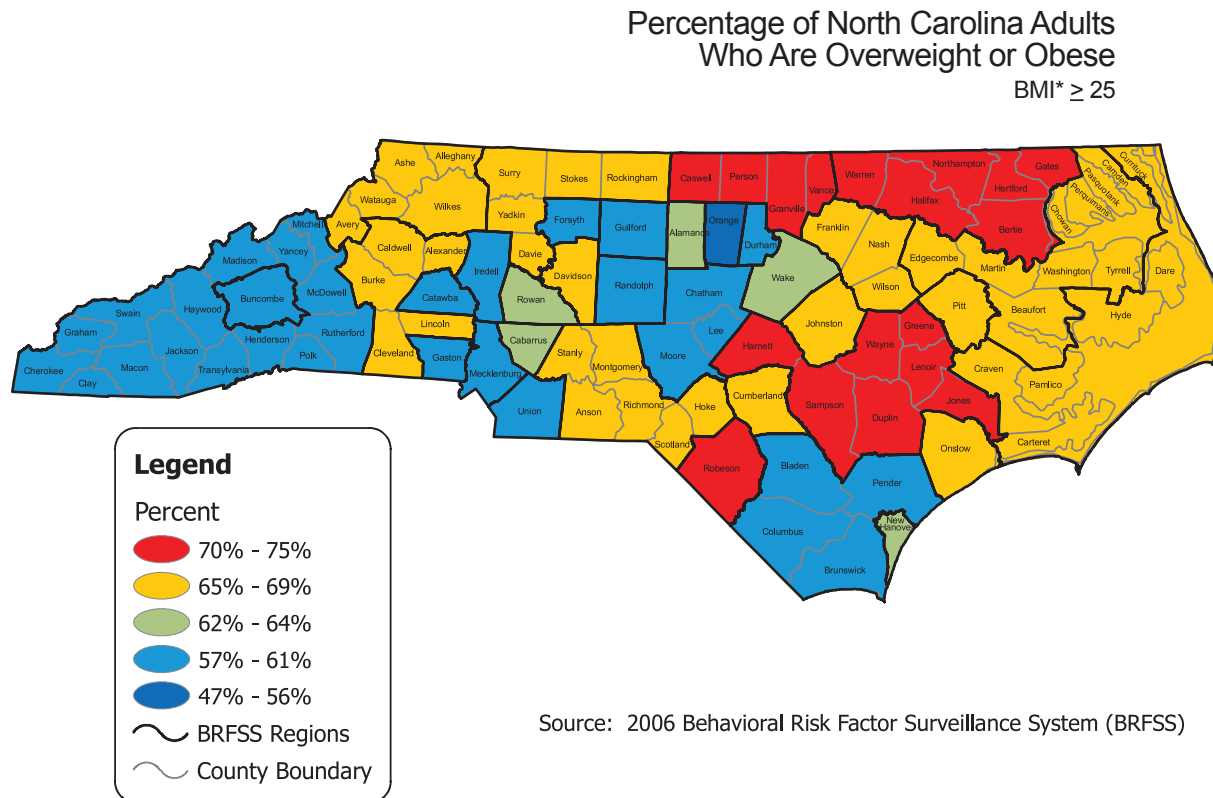
* N.C. Behavioral Risk Factor Surveillance System (BRFSS), State Center for Health Statistics. BRFSS is an ongoing, monthly telephone survey through which data are collected from randomly selected, non-institutionalized N.C. adults (age 18 and older) in households with telephones. Survey responses are weighted to represent the demographics of all adults in the state.

**Percentage of N.C. Adults Who Were Overweight or
Obese, by Household Income (2007)**



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

Among N.C. adults, the highest income group has the highest percentage of people at a healthy weight, and the lowest income bracket has the highest percentage of people who are obese. ⁵⁴



*Body mass index is computed as weight in kilograms divided by height in meters squared: (kg/m²).
BMI is an intermediate variable used in defining overweight and obesity. Underweight = BMI less than 18.5.
Recommended Range = BMI 18.5 to 24.9, Overweight = BMI 25.0 to 29.9 and Obese = BMI greater than 30.0


 North Carolina
 Public Health
 NC State Center for Health Statistics

- Among N.C. counties, the percentage of overweight adults ranged from a high of 41.9 percent in Franklin/Nash/Wilson counties to a low of 26.3 percent in Orange County.
- Among N.C. counties, the percentage of obesity ranged from a high of 33.5 percent in Robeson County to a low of 19.4 percent in Orange County.
- Among N.C. counties, the percentage of overweight and obesity combined ranged from a high of 74.9 percent in Caswell/Granville/Person/Vance counties to a low of 46.5 percent in Orange County. ⁵⁵

Special Populations in North Carolina

North Carolina has an increasingly diverse population. African Americans are the largest minority group, accounting for 21 percent of the population. Hispanics now comprise approximately seven percent of the population, six times the percentage in 1990. About one percent of North Carolinians are American Indian. While the life expectancy at birth for North Carolina's white population is 76.8 years, the life expectancy for minorities is 72.1 years, almost five years less. Minority males fare even worse; life expectancy is only 68 years for minority males, compared to 75.8 years for minority females.

Race/Ethnicity

In 2005, 21 percent of North Carolina's population was African American/black, compared with 12 percent nationally. In 2005, North Carolina had the eighth highest African American population in the nation. In 2005, African Americans in the state were more likely than whites to be obese, have high blood pressure, be physically inactive, and have inadequate fruit and vegetable consumption.⁵⁷ The rate of obesity among African Americans (38.1 percent) was also significantly higher than among whites (23.6 percent).

Since 2000, North Carolina's Hispanic population has increased 44 percent.⁵⁸

According to the Current Population Survey estimates from the U.S. Census Bureau, the total Hispanic population of North Carolina was 563,160 in 2005, approximately seven percent of the total population.⁵⁹

The leading causes of death among North Carolina Hispanics are consistent with the young age of the population. All types of cancer (83 deaths), homicide (63 deaths), and heart disease (60 deaths) were the second, third, and fourth leading causes of death, respectively, and comprised another 33 percent of all Hispanic deaths in 2005.⁶⁰

Among Hispanics, Spanish-speaking Hispanics in North Carolina may have elevated risks of poor health outcomes. N.C. BRFSS data reveal that North Carolina's Spanish-speaking Hispanics were more likely to report inadequate nutrition, physical inactivity, and a lack of health insurance than were English-speaking Hispanics.⁶¹ The persistence of these problems among Spanish-speakers could lead to an excess of burden of chronic disease, injury and morbidity as that population ages.⁶²

In North Carolina, 38.1 percent of American Indian and Alaskan Natives were obese.^{63, 64} Much of the poor health outcomes for this population are likely related to the fact that they have one of the highest poverty rates

(27 percent) of any racial group in the state, and a high rate of uninsured individuals (29.8 percent).^{65, 66} North Carolina BRFSS data for 2005 revealed that American Indians were more likely to report being in poor health (13.5 percent) and more likely to report being unable to see a doctor in the past year due to cost (27.5 percent) than were whites.⁶⁷

Older Adults

A recent 12-year study that investigated the relationship between fitness, weight and death in Americans over the age of 60 shows that physical activity prolongs life regardless of body fat.⁶⁸ Physical inactivity is recognized as a serious public health problem in the United States, largely because it contributes to the development of certain chronic conditions, such as cardiovascular disease, diabetes, obesity, some kinds of cancer, and osteoporosis and falls in older adults. The threat of premature mortality from inactivity-related health problems is most salient for people over

65 years of age, who constitute one of the fastest growing segments of the U.S. population and who experience chronic disease and disability at a higher rate than other Americans.⁶⁹ By contrast, physical activity can add years of independence to an older person's life, reduce that person's level of disability, and improve his or her quality of life.⁷⁰

In 2005, there were more than a million residents age 65 or older in North Carolina, 12 percent of the total population.⁷² North Carolina's popularity as a retirement destination and the aging of the state's population have resulted in an increase in adverse health conditions, particularly chronic diseases. There has also been an associated rise in deaths and medical care costs due to these conditions.⁷³ Risk factors for those aged 65 and above include overweight or obesity (60 percent) and no leisure-time physical activity (30 percent).⁷⁴

The State of Aging and Health in America⁷¹

Health Behaviors	Data	C.I.*	Year	Rank†
No Leisure-Time Physical Activity	30.4	(28.6 - 32.4)	2004	19
Eating ≥ 5 Fruits and Vegetables Daily	27.9	(25.3 - 30.7)	2003	37
Obesity	22.0	(20.3 - 23.8)	2004	37

*A confidence interval (CI) describes the level of uncertainty of an estimate and specifies the range in which the true value is likely to fall. The State of Aging and Health in America online report uses a 95 percent level of significance, which means that 95 percent of the time, the true value falls within these boundaries.

†Rankings are based on the relative numeric scores for each indicator, with a ranking of "1" indicating the highest rank.

Obesity, the overall health status, and the health practices of North Carolina's older population are troubling. Nearly 34 percent of adults age 65 or older rated their health as "poor" or "fair".⁷⁵ In 2005, the leading causes of death for North Carolinians age 65 or older were heart disease, cancer, cardiovascular diseases, chronic respiratory disease, Alzheimer's disease and diabetes.⁷⁶ In addition, 59.1 percent of older adults reported having hypertension; 26.8 percent reported a history of heart disease and stroke; 19.7 percent reported having diabetes – the highest amongst all age groups and markedly higher among minority populations; and 57.1 percent had arthritis. Overweight and obese postmenopausal women are at greater risk of developing breast cancer than are postmenopausal women at a healthy weight.

Educational and Socio-economic Disparities

A good understanding of the association between obesity and socioeconomic status (SES) has many important public health and policy implications, particularly for the prevention and management of obesity. In 2006, 19 percent of North Carolina children lived in poor families (defined as income below 100 percent of the federal poverty level), compared to the national average of 17 percent.⁷⁹

In 2006, in North Carolina, 54 percent (123,670) of children whose parents did not have a high school degree lived in poor families (defined as income below 100 percent of the federal poverty level) and 31 percent (175,042) of children whose parents had a high school degree, but no college education, lived in poor families. In contrast, 9 percent (118,986) of children whose parents had some college or more lived in poor families.⁸⁰

In general, among white children, obesity typically declines as income and parental education increase. Different patterns have been found for children from ethnic minority groups. For example, among twelve- to seventeen-year-old non-Hispanic white children, rates of obesity decline for both boys and girls as family income increases. By contrast, among African Americans and Hispanic Americans, girls' obesity rates increase with income; boys' rates show no consistent pattern.⁸¹ Another study found that although rates of obesity for white girls decrease as family income rises, rates for African American girls are higher in the lowest and highest income ranges than in the in-between bracket.⁸² Obesity rates decline with higher parental education.

A 2007 study found that low SES had significant correlations with obesity.⁸³ Ethnicity-SES-obesity differences were

greater among females than males. Given that obesity prevalence decreased with increasing SES among white females and remained elevated and even increased among higher SES African-American females, African-American/white disparity in obesity prevalence increased at the highest SES. Conversely, disparity was lessened at the highest SES for white, Hispanic and Asian females. Among males, disparity was lowest at the average SES level.⁸⁴

However, additional studies have set out to show SES impacts and have ended up with other health disparities playing a larger and clearer role. For example, a 2003 study found that keeping adolescents in their same environments and changing only family income and parental education had a limited effect on the disparities in obesity prevalence.⁸⁵ One cannot automatically assume that the benefits of increased SES found among white adults will transfer to other gender-age-ethnic groups. These findings suggest that efforts to reduce obesity disparities between ethnic groups must look beyond income and education and focus on other factors, such as environmental, contextual, biological and socio-cultural factors.⁸⁶

Economic constraints for some North Carolinians affect nutrition and create additional burdens related to obesity and overweight. Many low-income households lack food security, or access to enough

food to fully meet basic needs at all times. Such households face the fear of running out of food, and the result is a reduction in the quality of diet and reduction in the quantity of food consumed. Paradoxically, food insecurity and obesity are linked. The Brandeis University Center on Hunger has identified the following key factors linking obesity and food insecurity:

- Low-income families may consume lower-cost foods with relatively higher levels of calories per dollar,
- Families sacrifice food quality for food quantity to stretch limited resources,
- Mothers in particular sacrifice their own nutrition to feed their children, yet may overeat when food is available again, and
- The body may store fat more efficiently to conserve energy when there are periods of food deprivation.⁸⁷

In 2007, nearly 5 percent of N.C. primary caregivers cut the size of their child's meals because there was not enough money for food.

North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh, N.C.

Rural Areas

Traditionally, rural areas have experienced a lower incidence of overweight and obesity due to the higher physical demands characteristic of an agricultural lifestyle. In the United States, prior to 1980, obesity was more common in children and youth in large metropolitan areas.^{88, 89} However, this is no longer the case. Rural residents now experience an increased prevalence of obesity and overweight compared to their urban counterparts. Nationally, rural areas have higher self-reported rates of adult obesity than urban areas, but there is considerable variation among men and women across the region.⁹⁰

The Rural Healthy People 2010 survey found that prevalence of overweight ranked as a high priority among the Healthy People 2010 focus areas for rural areas.⁹¹ According to the Rural Healthy People 2010 Organization, there is evidence that rural life presents special challenges to maintaining a healthy weight. Among these are cultural and structural limitations in rural areas that may negatively affect both diet and exercise.

Rural residents may have a higher fat and calorie intake than the average U.S. resident.^{92, 93} In addition, overweight rural youth may watch more videos and/or play more on the computer than their

non-overweight peers.⁹⁴ Traditionally, rural adults exercised more than their urban counterparts due to the greater proportion of rural residents who were farmers. While farmers may get more exercise than non-farmers in rural areas,⁹⁵ fewer people are farming, and farming is becoming ever more mechanized.

Rural areas may also have difficulties attracting nutritionists.⁹⁶ This leaves to other health professionals the task of training rural residents in nutrition. Physicians may have little training in behavioral counseling and feel ill-prepared to provide diet therapy.^{97, 98, 99} They may believe that it is not their role to educate patients about resources in the community.¹⁰⁰ Rural areas may have fewer physical education classes in schools, fewer sidewalks, and fewer exercise facilities.¹⁰¹

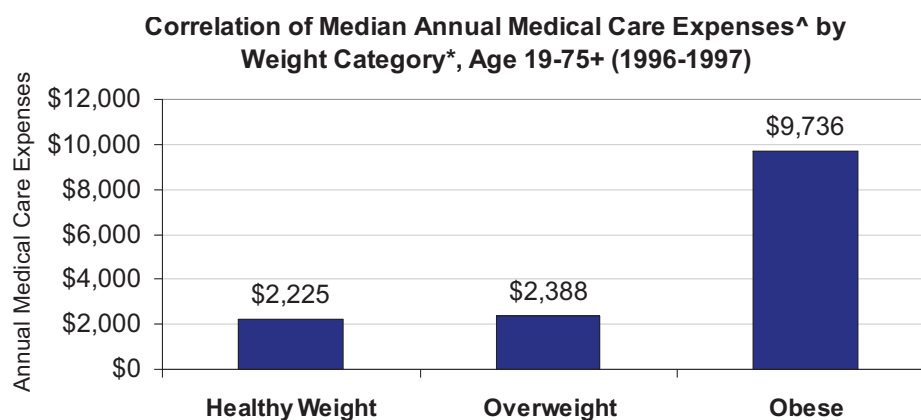
Nearly 14 percent of children and youth in rural North Carolina had three early risk factors for diabetes and heart disease and one out of four children in rural areas were overweight.¹⁰² In North Carolina, the odds of being obese were 50 percent higher for rural children and youth.¹⁰³

Costs of Obesity

In the U.S., over 5 percent of medical spending in adults is attributable to obesity. This estimate constitutes 9.1 percent of all medical spending among those who are overweight or obese.¹⁰⁴ Nationally, the direct medical costs of obesity have been estimated to be greater than \$92 billion a year, in 2002 dollars.¹⁰⁵ Individuals who are obese have annual medical costs 37.4 percent higher than their healthy-weight counterparts, representing an additional \$732 per obese person, per year. Nearly one half of overweight—and obesity-attributable medical spending—becomes the responsibility of the public sector (Medicaid and Medicare).¹⁰⁶ Maintaining a healthy weight may avoid substantial medical costs associated with obesity and related diseases.¹⁰⁷

Workplaces

Because many Americans receive health insurance through their workplaces, the health care costs of obesity are a significant concern for employers of working-age adults.¹⁰⁸ Increasing BMI is associated with greater costs to employee health plans; obese workers incur up to 21 percent higher health care costs compared with those of healthy weight.^{109, 110, 111} In 1994, the estimated cost of obesity to U.S. businesses was \$12.7 billion, including \$7.7 billion in health care costs.¹¹² A 2007 study using the Duke Health and Safety Surveillance System found that the effect of excess body mass on



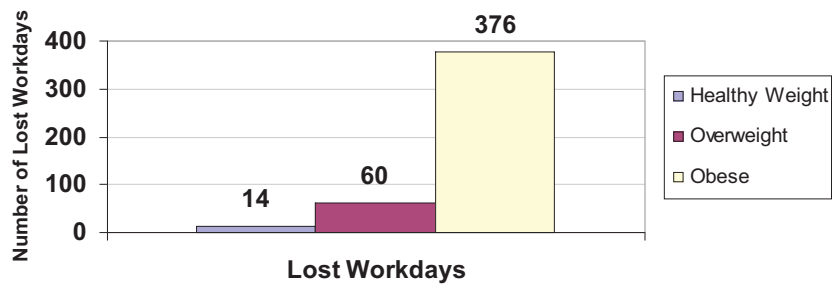
^Median medical costs, using Wilcoxon rank sum tests. *Based on the 1998 National Heart, Lung, and Blood Institute guidelines for BMI. Source: Edington, D. et al. "The Relationship Between National Heart, Lung, and Blood Institute Weight Guidelines and Concurrent Medical Costs in a Manufacturing Population." *American Journal of Health Promotion*, Jan/Feb 2003 [Sample of 177,781 employees, retirees, and adult dependents]

health care use extends into the workplace, including work illness and injury, as reflected in rates of workers' compensation claims. Because the number of lost workdays and the costs associated with each claim also increase rapidly with BMI, the adverse effects on these outcomes are even stronger.¹¹³ Median annual expenses for adults who are obese are more than four times higher than adults at a healthy weight.¹¹⁴

There is a clear linear relationship between BMI and rate of claims. The number of lost workdays for obese adults was almost 13 times higher than for those of healthy weight.

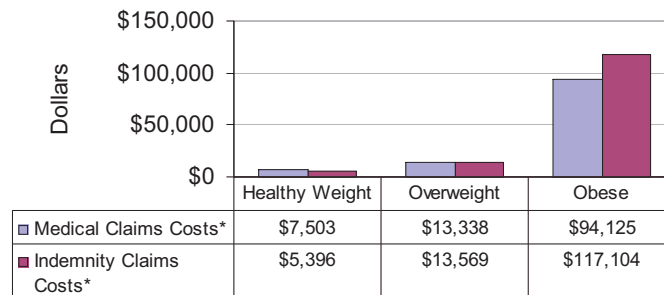
The cost of medical claims costs were 7 times higher, and indemnity claims costs were 11 times higher among obese employees than among those at a healthy weight. Therefore, maintaining a healthy weight is

Health Care and University Employees' Number of Lost Workdays*, by BMI, Duke Health and Safety Surveillance System (2007)



*Per 100 Full-Time Equivalents. Source: Østbye, T. et al. Obesity and Workers' Compensation: Results From the Duke Health and Safety Surveillance System, *Arch Intern Med*. 2007;167:766-773.

Health Care and University Employees' Medical Claims and Indemnity Costs, by BMI, Duke Health and Safety Surveillance System (2007)



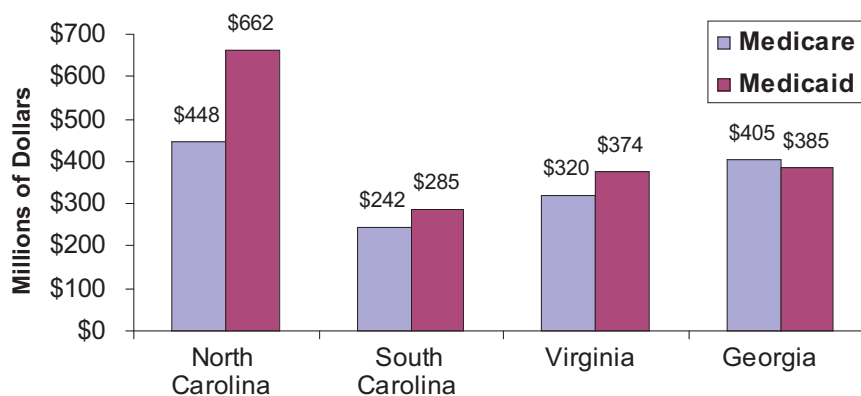
*Per 100 Full-Time Equivalents. Source: Østbye, T. et al. Obesity and Workers' Compensation: Results From the Duke Health and Safety Surveillance System, *Arch Intern Med*. 2007;167:766-773.

not only important to workers, but should also be a high priority for their employers. In North Carolina, overweight and obesity accounted for \$83 million in medical costs in 2003 among people with Blue Cross Blue Shield (N.C. BCBS) coverage.¹¹⁵ The N.C. BCBS customers who were obese had costs 32 percent higher than those with healthy weights.

The state's health expenditure costs for obesity in Medicaid and Medicare populations are estimated from a national model developed to estimate state-level costs.¹¹⁶ For North Carolina, 6 percent of the total adult population's medical expenditures were attributed to obesity in 2003, or over \$2 billion that year.¹¹⁷ When this estimate is broken

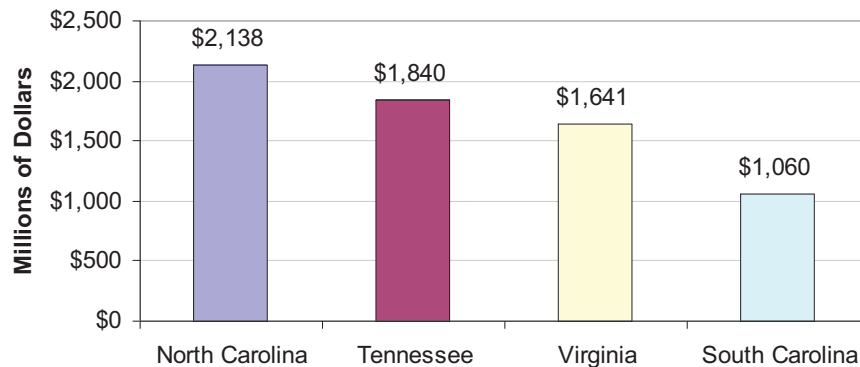
down by payer source, 7 percent of N.C. Medicare expenditures and 11.5 percent of N.C. Medicaid expenditures were attributed to obesity (\$448 million and \$662 million, respectively, in 2003).¹¹⁸ The table below shows North Carolina percentages and medical expenditures compared with neighboring Southeastern states. However, because the prevalence of obesity was estimated to be higher in the Medicaid population than in the state's general population, the percent of state Medicaid expenditures attributable to obesity was nearly twice as high as it was for adults at a healthy weight, and totaled \$662 million.¹¹⁹

Estimated Annual Obesity-Attributable Medical Expenditures for Adults



Finkelstein EA., Fiebelkorn IC, Wang G. State-level estimates of annual medical expenditures attributable to obesity. *Obes Res.* 2004; 12: 18-24.

Estimated Annual Obesity-Attributable Medical Expenditures for Adults (Total Population)

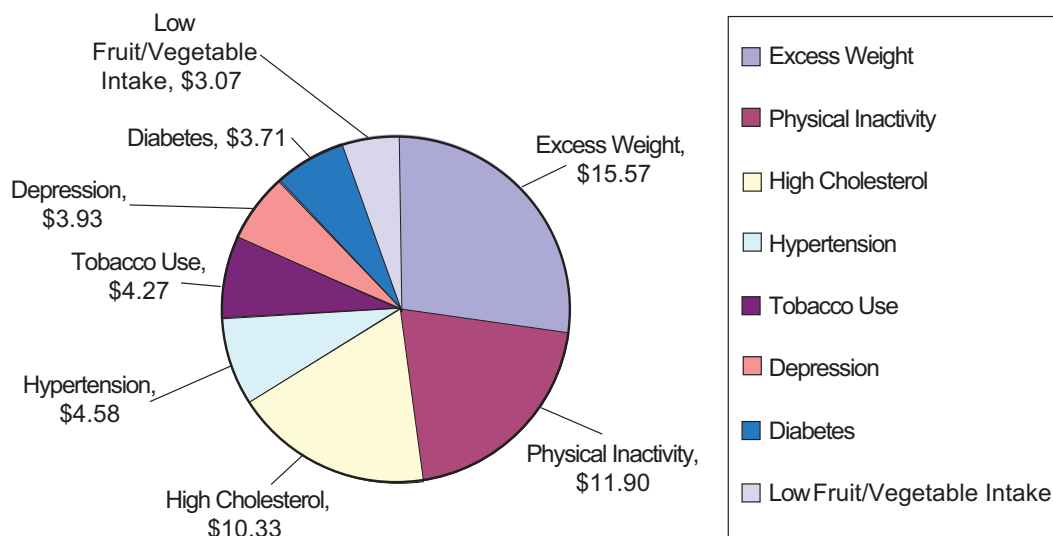


Finkelstein EA., Fiebelkorn IC, Wang G. State-level estimates of annual medical expenditures attributable to obesity. *Obes Res.* 2004; 12: 18-24.

A 2008 study estimated the total direct and indirect costs of eight risk factors (including excess weight, physical inactivity, type II diabetes, low fruit/vegetable intake, hypertension, high cholesterol, depression and tobacco use) for North Carolina adults was \$57.36 billion. The most expensive risk factor was excess weight—at \$15.57 billion. To put these figures in perspective, the entire annual budget for North Carolina in 2008 was over \$20 billion.¹²⁰ Of the \$57.36 billion, \$42.62 billion of expenses were accrued in lost productivity, \$10.52 billion in direct and indirect medical care, and \$4.22 in prescription costs. The study found that costs for youth total approximately \$105.13 million for the three risk factors of physical inactivity (\$41.million), excess weight (\$33.32 million), and type II diabetes (\$30.43 million).¹²¹

The Cost of Unhealthy Lifestyles in North Carolina

Total= \$57.36 billion



Source: Tipping the Scales: How Obesity and Unhealthy Lifestyles have become a Weighty Problem for the North Carolina Economy. Be Active North Carolina. Available at: www.beactive.org

Although the economic burden of obesity has mainly been studied in adults, recent work has been done to assess the economic burden in children and youth nationally. In a study of the impact of obesity on in-patient hospital charges, children and youth with a secondary diagnosis of obesity had mean charges that were significantly higher for all four of the most common pediatric conditions requiring hospitalization (asthma, pneumonia, affective disorders and appendicitis) than their healthy-weight counterparts. The mean increased charges ranged from \$523 to over \$3,000 per hospital stay, depending on the primary diagnosis. In a large national study of hospital costs associated with obesity in patients age 6-17, obesity-associated annual hospital costs

increased from \$35 million during 1979-1981 to \$127 million during 1997-1999.¹²³

A 2004 North Carolina study, using paid claims and enrollment records for adolescents age 12-18, found that the overweight group had Medicaid expenditures that were 33 percent higher than those for the healthy weight group, and the obese group had expenditures that were 25 percent higher.¹²⁴ The average expenditures for prescription drugs for obese adolescents were 42 percent higher than those for healthy weight adolescents, a statistically significant difference.¹²⁵ In addition, a significantly higher percentage of

obese adolescents had a claim for diabetes, asthma or other respiratory conditions than did the healthy weight group. As expected, obese adolescents were much more likely to have a medical claim paid by Medicaid for which the primary diagnosis was obesity.¹²⁶ In North Carolina, it is estimated that the direct and indirect costs of obesity in youth is nearly \$16 million per year (based on 2003 dollars).¹²⁷

Of note, the investigators exploring this topic stated that there is significant underreporting of obesity in the data sources used to estimate the costs and warn that the true costs are most likely significantly higher. Costs are expected to continue to increase as the numbers of Americans who become overweight and obese increase. Also, the total costs to society may include lost productivity and several other related costs not captured in some analyses.¹²⁸

Understanding Obesity

The transition from a hunter-gatherer society characterized by feast/famine cycles, to our current industrial society characterized by plentiful food, has been relatively rapid in evolutionary terms and may not have allowed sufficient time for biological adaptation.^{129, 130} Energy-dense, highly-refined food choices (i.e., soft drinks, fast food), dietary habits (i.e., grazing, night-eating, bingeing) and food insecurity have been identified as potential contributors to the obesity epidemic.^{131, 132, 133, 134, 135}

To meaningfully address the overweight crisis, we must examine trends in body weight along with cultural trends. Excessive weight gain in the American population has occurred over only the last two decades and appears largely due to many changes in our culture that negatively impact access to physical activity and healthy eating.

Physical Inactivity¹³⁶

Physical activity rates among U.S. children, youth, adults and older adults are at an all-time low. Many changes have contributed to this, including increase in sedentary activities and less focus on physical activity in schools. Nationally, more than 22 percent of adults said that they did not engage in any physical activity.¹³⁷ Physical activity for all ages has decreased, especially among the nation's youngest residents.

Lack of physical activity was shown to be one of the most evident causes of obesity, diabetes, and cardiovascular disease among children and youth.¹³⁸ Nearly half of American youths aged 12-21 years are not vigorously active on a regular basis.¹³⁹ Nearly 23 percent of children and youth and nearly 40 percent of adults get no leisure-time physical activity at all.¹⁴⁰ Routine physical activity is necessary to prevent premature death, unnecessary illness and disability; enhance physical and mental health; and help maintain a high quality of life for everyone.

In 2007, 56 percent of N.C. adults did not meet the recommendation for physical activity.^{*141} Less than half (44 percent) of the state's high school students and just over half (55 percent) of middle school students were physically active for a total of at least 60 minutes per day on five or more of the past seven days.¹⁴² Approximately 20 percent of children did not meet the physical activity recommendation of 60 minutes per day.¹⁴³

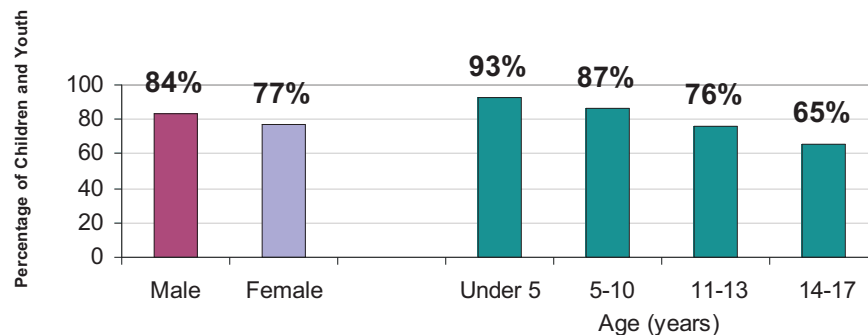
Among N.C. youth who met the recommendation of 60 minutes or more of physical activity on a typical day in 2007, males reported 7 percent more activity than females, and children younger than five were 28 percent more active than adolescents. Children and youth living in public housing or

Physical activity is any bodily movement produced by skeletal muscles that results in an expenditure of energy (such as walking, riding a bike, or going for a hike).

- *Moderate physical activity refers to a level of effort in which a person should experience some increase in breathing or heart rate.*
- *Vigorous physical activity refers to a level of effort that may be intense enough to represent a substantial challenge to an individual and a large increase in breathing or heart rate.*

Physical Education is a course, taught by a certified physical education teacher, that provides the environment where students learn, practice, and receive assessment on developmentally appropriate motor skills, social skills and knowledge as defined in the North Carolina Healthful Living Standards Course of Study. (HSP-S-000)

Percentage of N.C. Children (Age 2-17) Who Met the Recommendation of 60 Minutes of Physical Activity on a Typical Day, by Gender and Age Group (2007)



Data Source: North Carolina Child Health Assessment and Monitoring Program (CHAMP) Survey Data (2007): State Center for Health Statistics, Raleigh NC.

apartments, and children and youth living in unsafe areas or areas that lacked parks and playgrounds, were at increased risk of not getting enough physical activity.¹⁴⁴

Physical activity opportunities during the school day have decreased or have been eliminated. Physical education and recess can help students meet physical activity recommendations without compromising academic performance.¹⁴⁵

Physical Education

Nationally, the percent of students attending a daily physical education class dropped from 42 percent in 1991 to 28 percent in 2003.¹⁴⁶ The percentage of schools requiring physical education in each grade declined from about 50 percent in grades one through five to 25 percent in grade eight, and to only 5 percent in grade 12.¹⁴⁷ According to the CDC, only 4 percent of elementary schools, 8 percent of middle schools, and 2 percent of high schools provided daily physical education or its equivalent for the entire school year for students in all grades.¹⁴⁸ Overall, 22 percent of schools did not require students to take any physical education.¹⁴⁹

Recess

Recess is part of a child's physical, social and academic development.¹⁵⁰ One survey of public schools found that 7 to 13 percent of elementary schools in the U.S. had no scheduled recess,¹⁵¹ and opportunities for daily recess continue to decrease.^{152, 153}

The National Association of Sports and Physical Education (NASPE) recommends that: 1) all elementary school children get at least one 20-minute recess period daily, 2) schools provide 150 minutes of physical education for elementary school children, and 3) schools provide 225 minutes of physical education for middle and high school students weekly. The N.C. healthy active children policy requires that all schools provide all K-8 students a minimum of 30 minutes of moderate to vigorous daily physical activity, including regular physical education class and/or through activities such as recess, dance, classroom energizers or other curriculum-based physical education activity programs. It also states that elementary schools should consider the benefits of and move toward having 150 minutes per week with a certified physical education teacher throughout the 180-day school year. Middle schools should consider the benefits of and move toward having 225 minutes per week of Healthful

N.C. Healthy Active Children Policy*:

- *30 minutes of physical activity per day in K-8 through:*
 - *Regular physical education class*
 - *Recess,*
 - *Dance,*
 - *Classroom energizers, and Curriculum-based physical education activity programs.*
- *Recess shall not be taken away from students as a form of punishment.*
- *Severe and/or inappropriate exercise may not be used as a form of punishment for students.*

*Healthful living is 1/2 health education, 1/2 physical education. Available at- www.nchealthyschools.org/components/healthy-activechildrenpolicy .

Living Education* with certified health and physical education teachers throughout the 180-day school year.

According to statistics from the National Household Travel Survey, in 1969 approximately half of all students in the United States walked or bicycled to school, and 87 percent of children and youth who lived within one mile of school traveled to or from school on foot or by bicycle. But by 2001, the situation had changed dramatically, with only 18 percent of U.S. students making the trip to school by walking or bicycling.¹⁵⁴

Trends toward a more dispersed and segregated landscape reinforce a growing automobile dependency that reduces opportunities for regular physical activity during daily routines. Automobile dependency is increased when communities develop with homes built away from city centers and/or when there are no destination points that people can walk to, such as libraries and the grocery store. Public health practice has demonstrated that integrating physical activity into daily routines may be a more effective public health strategy than structured exercise programs. More supportive land use

How Much Physical Activity Do Children Need?

Children and adolescents should do 60 minutes (1 hour) or more of physical activity each day.

*1. **Aerobic Activity** should make up most of your child's 60 or more minutes of physical activity each day. This can include either moderate-intensity aerobic activity such as brisk walking, or vigorous-intensity activity such as running. Be sure to include vigorous-intensity aerobic activity on at least 3 days per week.*

*2. **Muscle Strengthening activities**, such as gymnastics or push-ups, at least 3 days per week as part of your child's 60 or more minutes.*

*3. **Bone Strengthening activities**, such as jumping rope or running, at least 3 days per week as part of your child's 60 or more minutes.*

Visit the CDC website:
www.cdc.gov/physicalactivity/everyone/guidelines/index.html

* Healthful living is 1/2 health education, 1/2 physical education.
Available at- www.nchealthyschools.org/components/healthyactivechildrenpolicy .

patterns are vital to motivate larger numbers of people to lead more active lifestyles.

Active Living by Design* has found that current trends indicate a strong association between our transportation infrastructure, the level of routine physical activity among Americans, and their health. Transportation determines not only how people move from place to place, but also the fundamental character of communities and the choices and opportunities people are provided. There is growing evidence that current transportation and land use patterns promote automobile dependency, adversely affect air quality and safety, and discourage physical activity.¹⁵⁵ A more balanced transportation system that offers more choices and encourages walking and biking would remove barriers to activity for everyone and make healthy levels of physical activity attainable for large numbers of people during their daily routine.

Current transportation trends indicate that Americans are making walking, biking and transit less practical, convenient, safe and pleasant. Recent U.S. Census figures show that Americans are enduring longer commutes, and fewer of them are able to use transit, walking, biking or other means to avoid the drive.¹⁵⁶ Between 1977 and 1995, trips made by walking

declined by 40 percent for both children, youth and adults, while driving trips increased to almost 90 percent of the total.¹⁵⁷ One-fourth of all trips people make are one mile or less, yet three-fourths of these short trips are made by car.¹⁵⁸ Although more than 60 percent of all trips are 5 miles or less, a convenient distance for a bicycle, fewer than 1 percent are actually made by bicycle.¹⁵⁹

Children's and youth's walking trips to school declined by 60 percent between 1977 and 1995, and children and youth between the ages of 5 and 15 now make only 13 percent of their school trips by walking or riding their bicycles. Children's and youth's school trips by bicycle declined from 4.3 percent in 1995 to 2.7 percent in 2001. A 2006 survey of North Carolina parents found that 17 percent of children and youth ages five years old and older lived between zero and two miles from school, yet only 6 percent reported that their child walked or rode a bicycle to school one or more days per week.¹⁶⁰ Since 2001, the habit of driving kids to school is so pervasive that, in some communities, parents driving their

* Active Living by Design is a national program of The Robert Wood Johnson Foundation and was established to create and promote environments that make it safe and convenient for people to be more physically active. www.activelivingbydesign.org.

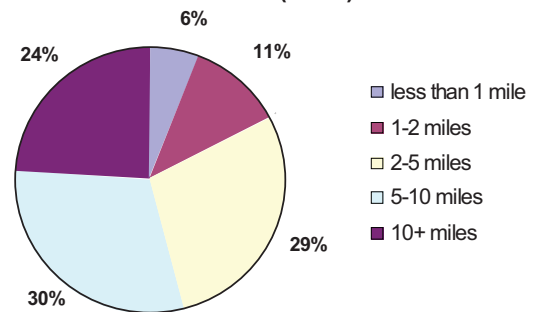
children and youth to school represent between 20 and 30 percent of peak-hour morning traffic.¹⁶¹

Almost 70 percent of all children and youth's trips were by car.¹⁶² During 1998-2001, the average annual amount spent on pedestrian/bike projects was 87 cents per person, while the average annual amount spent for roads and bridges was more than \$50 per person.¹⁶³ In 1980, there were just over 161 million vehicles on the road in the U.S. In 2001, there were well over 225 million.¹⁶⁴ According to the National Personal Transportation Survey, 25 percent of trips in America were less than one mile in length, yet 75 percent of those trips were done by car.¹⁶⁵

In an attempt to make our lives easier, we have removed many of the daily opportunities to move our bodies, ultimately contributing to weight gain. The use of labor-saving machinery has reduced physical activity at home and in the workplace enough to reduce people's energy expenditure by 11 calories a day, or the equivalent of 11 pounds per year.¹⁶⁶

Sedentary living has been an official health hazard and a major risk factor for coronary

"How far does your child live from school*?" (2006)



*These data are for children 5 years old or older and enrolled in public or private school. Source: North Carolina Child Health Assessment and Monitoring Program Data and North Carolina Behavioral Risk Factor Surveillance System Survey, North Carolina Center for Health Statistics. (2006).

heart disease.¹⁶⁷ Indeed, coronary heart disease is more often caused by a sedentary lifestyle than by smoking, hypertension and hyperlipidemia* combined.¹⁶⁸ Women who were overweight but active had a decreased risk of dying prematurely than overweight, sedentary women. Women who were lean and active had the least risk of dying prematurely. This significant difference demonstrates how far physical activity can go toward reducing risk.¹⁶⁹

In 2007, the percentage of N.C. adults who did not get any leisure time physical activity was 7 percent higher for females (28 percent) than males (21 percent). Additionally, in 2007, the rate of physical inactivity increased with age, with 18 percent of the 18-24 age group and 34 percent of the 75+ age group not getting any physical activity, a

* Hyperlipidemia is an elevation of lipids (fats) in the bloodstream. These lipids include cholesterol, cholesterol esters (compounds), phospholipids and triglycerides. They're transported in the blood as part of large molecules called lipoproteins.

16 percent difference between these age groups. In 2007, the percentage of N.C. adults who did not get any leisure time physical activity was 31 percent higher for individuals with less than high school education (43 percent) than for college graduates (12 percent). In fact, the rate of physical inactivity decreased with increasing income, with 45 percent of individuals making less than \$15,000 not getting any physical activity and 11 percent of individuals making \$75,000 or more not getting any physical activity.

These trends indicate a growing automobile dependency that reduces opportunities for routine physical activity. Recent research and decades of public health practice have demonstrated that integrating physical activity into daily routines may be a more effective public health strategy than structured exercise programs.¹⁷⁰ A more supportive transportation

system is vital to motivate larger numbers of people to lead more active lifestyles.

Physical activity, such as walking to the store or biking to work, has been engineered out of communities in America. As good community design is replaced with sprawl, people are forced to drive more, and opportunities to walk and bike decline. Active Living by Design reports that:

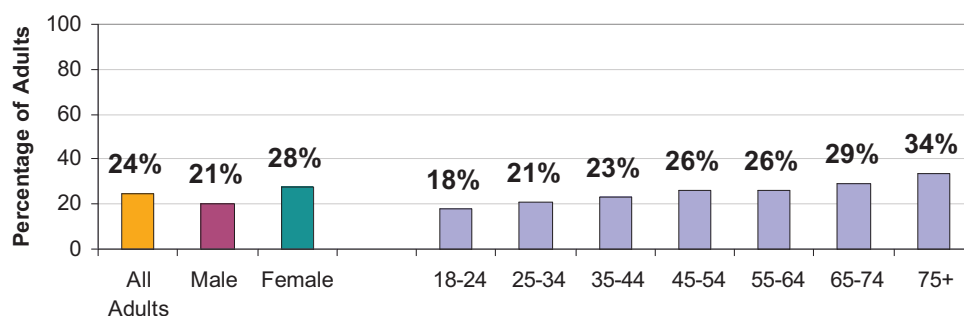
- Americans spend an average of 443 hours behind the wheel per year.
- The number of cars on the road is growing five times faster than the population.
- Between 1983 and 1990, vehicle miles traveled in the U.S. grew 42 percent.
- Pedestrian trips represent 5.4 percent of all trips and 0.6 percent of federal transportation funding.

What is the Recommended Amount of Physical Activity for Adults?

Recommendation = Moderate physical activity for 30 or more minutes per day, five or more days per week OR vigorous physical activity for 20 or more minutes per day, three or more days per week.

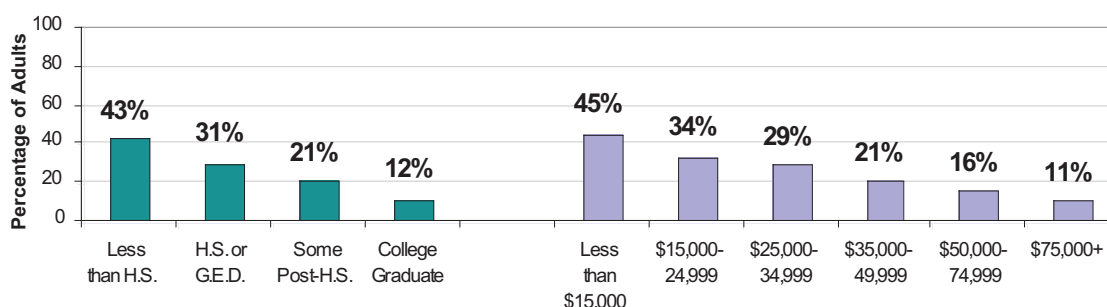
Visit the CDC website:
www.cdc.gov/physicalactivity/everyone/guidelines

Percentage of N.C. Adults Who Did NOT Get Any Leisure Time Physical Activity, by Gender and Age (2007)



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

Percentage of N.C. Adults Who Did NOT Get Any Leisure Time Physical Activity, by Education and Income (2007)



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

Most communities are designed to favor one mode of travel, the automobile. Building roads, schools, shopping centers and other places of interest only for convenient access by cars often keeps people from safely walking or biking around town. This is one important reason why people in the United States are not as active on a daily basis as they could be. Averaging across 11 studies,

residents of high-walkability neighborhoods reported more than twice as many walking trips per week as residents of low-walkability neighborhoods (3.1 daily trips vs. 1.4).¹⁷¹ Residents in a high-walkability neighborhood engaged in about 70 more minutes per week of moderate and vigorous physical activity than residents in a low-walkability neighborhood.¹⁷² Forty-three percent of people with safe places to walk

within ten minutes of home met recommended activity levels, while just 27 percent of those without safe places to walk were active enough to benefit their health.¹⁷³

People are more likely to commute to work on foot or via bicycle if they live in a city center or have good access to public transportation.

¹⁷⁴ An 11-year study that followed residents in Seattle as they moved from one residence to another found that people increased trips by transit, bicycling and walking as a result of moving into more walkable neighborhoods.¹⁷⁵

A national study of 448 metropolitan counties found that people living in sprawling, low-density counties walk less, weigh more and are more likely to be obese or have hypertension than people living in more compact counties.¹⁷⁶

Current land use trends increase automobile dependency, and make walking, biking and transit less practical, less convenient, less safe and less pleasant. Between 1982 and 1997, urban land density in the U.S. dropped by more than 20 percent, requiring increased reliance on automobiles for travel. Population grew 17 percent, while the amount of urbanized land increased 47 percent and vehicle miles traveled increased 55 percent – more than triple the rate of population growth.¹⁷⁷

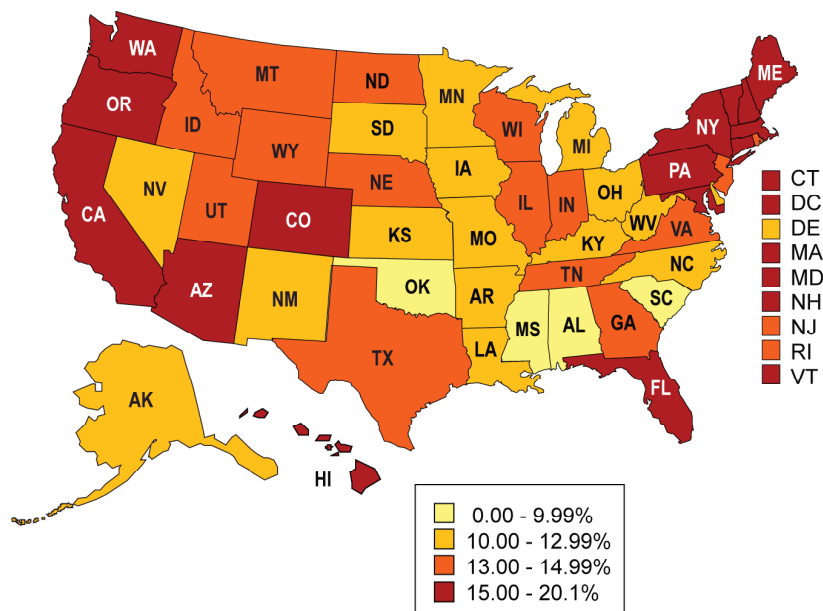
Average urban land densities are roughly one-tenth what they were before motorized transportation.¹⁷⁸ From 1960 through 1990, the percentage of workers with jobs outside their counties of residence tripled, while the proportion of workers commuting within their counties of residence declined. The share of work trips by walking declined from 10.3 percent in 1960 to 2.9 percent in 2000.^{179, 180}

Unhealthy Eating

The number of fast-food outlets serving low-cost food with high fat content and relatively low nutrient density has dramatically increased over the past two decades.¹⁸¹ In addition, increased time spent behind the wheel of a car, due to urban sprawl, has made fast-food outlets convenient. Every day, one in four Americans eats a fast-food meal,¹⁸² which is not surprising since the number of fast-food establishments in the country has increased from 70,000 in 1970 to almost 200,000 in 2002.¹⁸³

French fries are one of the three most commonly consumed vegetables among infants 9 to 11 months of age and have become the most common vegetable for toddlers 15 months and older.¹⁸⁴ Only 31 percent and 21 percent of the children below 9 years of age meet, but do not exceed, the current dietary recommendations for intake of total and saturated fats respectively.¹⁸⁵

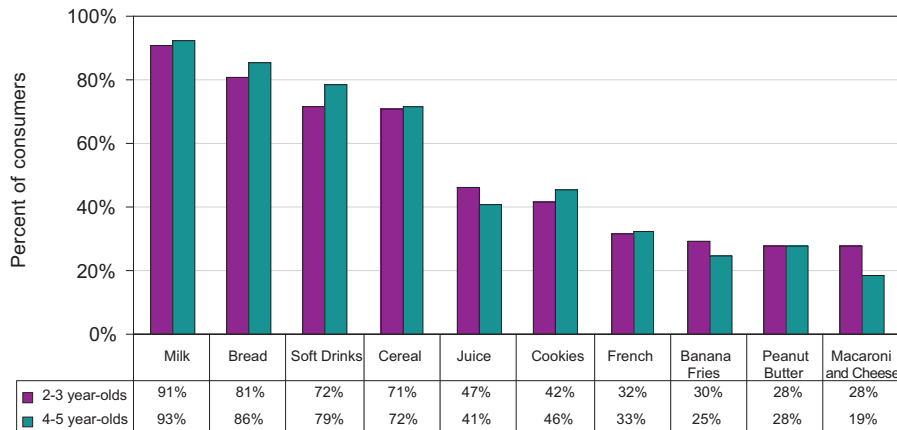
In 2004, soft drinks were the 3rd most commonly consumed food among American children ages 2-5, with cookies and french fries ranking 6th and 7th respectively.



U.S. Adults Who Consumed ≥ 2 Fruits & ≥ 3 Vegetables a Day (2007)

Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

**Percentage of Most Commonly Consumed Foods Among Children,
Age 2-5 years old (2004)**



McConahy, K.L., Smicklas-Wright, H., Mitchell, D.C., and M.F. Picciano. (2004). 'Portion Size of Common Foods Predicts Energy Intake among Preschool-Aged Children.' *American Dietetic Association* 104: 975-979.

Access to a good quantity and variety of fruits and vegetables at school, home and in the community is critical. This is especially true for school-age children and youth, given that poor dietary habits can linger or worsen into the high school years and adulthood.¹⁸⁶ Establishing the habit of eating plenty of fruits and vegetables at an early age provides children and youth with a foundation for life-long healthy eating habits and reduces the risk of diet-related chronic diseases.

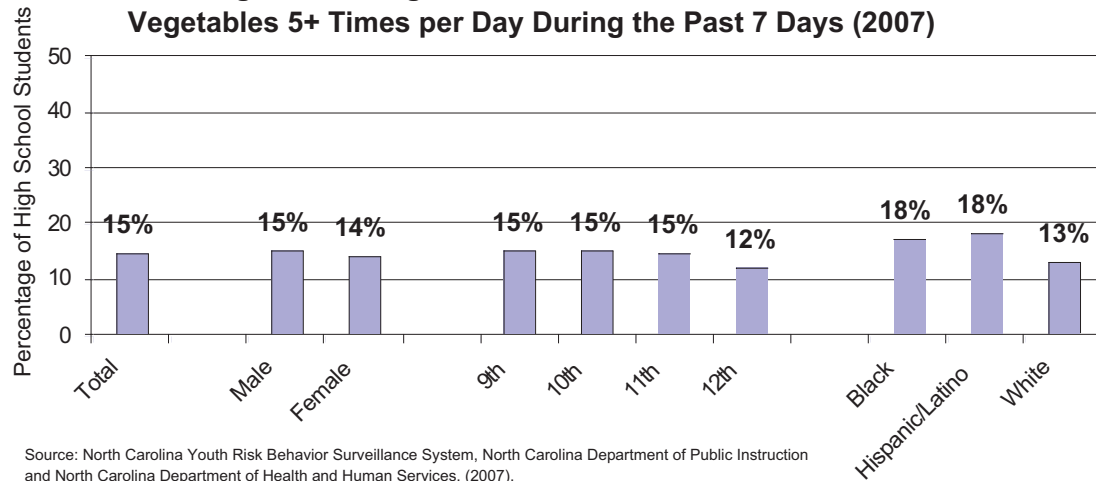
In North Carolina, 86 percent of high school students reported eating fewer than five servings of fruits and vegetables daily in the seven days prior to the survey.¹⁸⁷ These data continue to put North Carolina high school students below the national average for both boys and girls and students of all racial groups.

¹⁸⁸

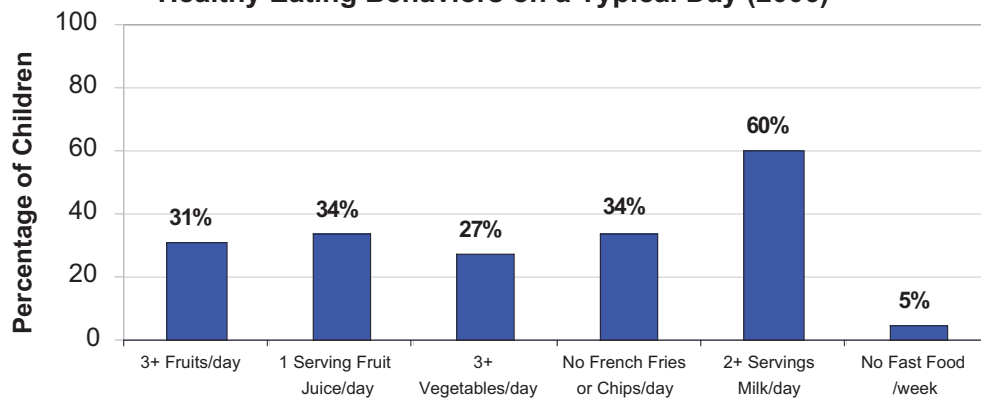
In 2005, 75 percent of N.C. children ages 5-17 years ate less than the recommended minimum of three servings of vegetables on a typical day. Forty-three percent ate less than the recommended two servings of fruit.¹⁸⁹

The Dietary Guidelines for Americans 2005 state that most of us should eat between 2½ and 6½ cups of fruits and vegetables each day, depending upon the total number of calories needed based on age, sex and activity level.¹⁹⁰ Only five percent of N.C. children do not eat fast food during a typical week, and only 34 percent do not eat french fries or chips during a typical day.

Percentage of N.C. High School Students Who Ate Fruits and Vegetables 5+ Times per Day During the Past 7 Days (2007)



Percentage of N.C. Children and Youth Who Engage in Healthy Eating Behaviors on a Typical Day (2006)



Source: North Carolina Child Health Assessment and Monitoring Program Data, North Carolina Center for Health

How much is enough for school-age children?

- *Boys and girls ages 4-8 need 3 to 4 cups of fruits and vegetables a day, with 1½ cups coming from fruit and the rest from vegetables.*
- *Girls ages 9-13 need 3½ to 4 cups of fruits and vegetables a day, with 1½ cups coming from fruits and the rest from vegetables.*
- *Boys ages 9-13 require more calories each day. They need 4 to 4½ cups of fruits and vegetables a day, with 1½ to 2 cups coming from fruits and the rest from vegetables.*

Centers for Disease Control and Prevention. How many fruits and vegetables do you need? Available at www.fruitsandvegetablesmatter.gov.

National and state survey results (based on recommendations and serving sizes that were different prior to 2005) show that school-age children are not eating the amount and variety of fruits and vegetables recommended. On average, children ages 6-11 ate a combined average of less than 3½ servings of vegetables and fruits daily. Overall, only one in five children surveyed met the recommended minimum goal of five servings (based on recommendations prior to 2005) of fruits and vegetables per day.¹⁹¹

In 2005, children ages 6-11 ate two vegetable servings per day; only 5 percent were dark green vegetables, 5 percent were deep yellow vegetables, and 23 percent were tomatoes. In contrast, white potatoes made up almost

half (43 percent) of their total daily vegetable servings.¹⁹² To meet current recommendations, children's intakes of dark green and orange vegetables should almost triple and their potato consumption should be cut in half.

People who eat more fruits and vegetables have reduced risk of chronic diseases, including stroke, diabetes, and some types of cancer. Research also suggests that fruits and vegetables may help in preventing and treating heart disease and high blood pressure.¹⁹³ Replacing high-fat foods with fruits and vegetables may also make it easier to control weight and provide vitamins, minerals, and fiber.¹⁹⁴

Eating fruits and vegetables is critical for children because poor dietary habits may continue into adulthood.¹⁹⁵ Establishing the habit of eating plenty of fruits and vegetables at an early age provides children and youth with a foundation for life-long healthy eating habits and reduces the risk of diet-related chronic diseases.

Meals Eaten Away from Home

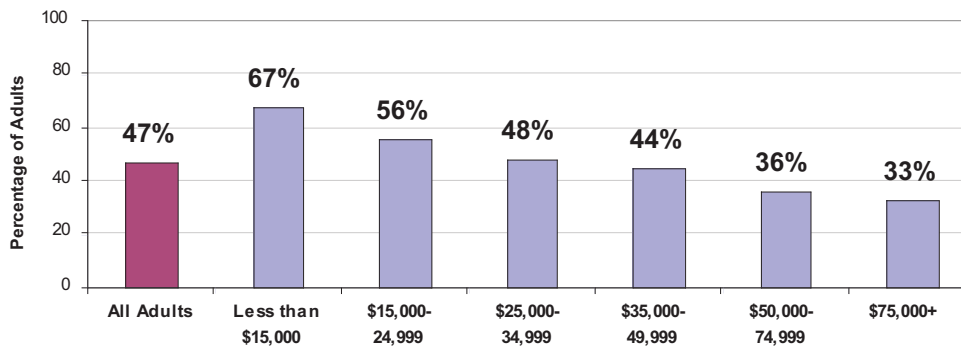
According to the USDA Economic Research Service, Americans spent nearly 50 cents of every food dollar eating out in 2000, compared to 34 cents of every dollar in 1970.¹⁹⁶ The percentage of total calories from foods eaten away from home increased from 18 percent in the 1970s to 32 percent in the 1990s.^{197, 198} Additionally, the total number of calories consumed per person per day in the United States climbed in the same time period by more than 500 calories. At least some of these additional calories may be associated with eating out.¹⁹⁹

Meals eaten away from home are higher in total calories, fat and saturated fat, and lower in calcium, fiber and iron.²⁰⁰ Conversely, adults and children who prepare and eat simple meals at home have healthier diets than those who eat out. Families who eat home-prepared meals together eat more fruits and vegetables,

drink more milk, and eat less fat and fewer calories than those who eat out.^{201, 202} Since school meals are required to meet the Dietary Guidelines for Americans 2005, they are likely to be of an appropriate portion size for the child's or teen's age and activity level. According to the USDA, school-age children and youth get an average of 19 percent of their total daily intake from school meals.²⁰³



Percentage of N.C. Adults Who Ate a Main Meal Prepared at Home 7 Days per Week, by Income (2007)



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistic
N.C. Department of Health and Human Services, (2007).

North Carolina has improved upon the requirements of the School Meals Initiative (SMI) by instituting greater accountability than that required by USDA. School systems are required to analyze their menus for compliance to the SMI guidelines twice a year and report to the N.C. Department of Public Instruction. In addition, the State Board of Education adopted the N.C. Nutrition Standards for Elementary Schools in October 2006. Mandatory implementation of these more stringent standards is required for all elementary schools by the end of the 2008-09 school year. These standards apply to à la carte foods, school meals, and after-school snacks. They are designed to promote gradual change to increase fruits, vegetables and whole-grain products, and to decrease foods high in total fat, trans fat, saturated fat, cholesterol and sugar.

Nationally, 77 percent of high schools sell soda or fruit drinks that are not 100 percent juice, and 61 percent sell salty snacks that are not low in fat in their vending machines or school stores. In 2007, the percentage of N.C. students who bought food or drinks from vending machines at school one or more times during the past seven days had a range between 36 percent and 53 percent, for 6th graders and 9th graders respectively.

Teens who ate fast food more often ate more calories and fat, and drank more soft drinks. They also drank less milk, and ate fewer fruits and vegetables.²⁰⁴ A number of studies have linked frequent restaurant meal consumption to excess calorie and fat intake, higher body weights, and higher body fats in both adults and children.²⁰⁵

In schools, high-fat, high-sugar foods are sold to children and youth in competition with the healthy school lunch. Self-regulation of food intake may not be operational among older children and youth who become responsive to external food intake cues unrelated to energy needs, such as availability of highly palatable foods,²⁰⁶ increased opportunities to snack²⁰⁷, and the “super-sized” quantities of foods.²⁰⁸

Portion Sizes

The trend of large portion sizes applies to beverages as well as foods. In 1916, a bottle of Coke® was 6 fluid ounces.²⁰⁹ By the mid 1970s, the average portion size of sweetened drinks (soft drinks and fruit drinks) among Americans was 13.6 ounces. By 1996, it had increased to 21 ounces.²¹⁰ People commonly portion out more than one serving to eat or drink at a time. For example, a serving of soda is 8 fluid ounces. Sixteen-fluid-ounce bottles of soda are common, and many people choose to drink 16 fluid ounces in one sitting. Even though a 16-fluid-ounce bottle is commonly viewed as one “portion,” it is actually two servings.

Americans may buy and consume larger portions under the premise that they are getting a good value. For 50 cents or less, a person can add up to 400 calories to a fast-food meal.²¹¹

The trend toward larger portion sizes is most evident in restaurants and fast-food outlets, but is also significant in homes.²¹² Identical recipes for cookies and desserts in old and new editions of classic cookbooks such as Joy of Cooking yield fewer servings in new editions when compared to old recipes. Recipes that have been used for decades produce fewer portions today because portion sizes are larger.²¹³

Portion sizes in restaurants, grocery stores and homes continue to increase.

- *In the 1950s, a Burger King® hamburger was 2.8 ounces and 202 calories.*
- *In 2006, a Burger King® hamburger was 4.3 ounces and 310 calories.*
- *In the 1950s, McDonald's® offered only one size of fries, a 2.4-ounce portion with 210 calories.*
- *In 2006, fries came in orders as large as seven ounces with 610 calories.*

* Ello-Martin JA, Ledikwe JH, Rolls BJ. The influence of portion size and energy density on energy intake: implications for weight management. *American Journal of Clinical Nutrition*. 2005; 82(suppl):236S-41S.

* North Carolina's Expanded Food and Nutrition Education Program curriculum, 2006.

Many à la carte foods, produced and packaged by manufacturers, come in larger portion sizes. Not only are these items often excessive in size, but they also tend to be lower in nutritional quality.²¹⁴ One study gave people a bag of potato chips for a snack and a subsequent meal each day for several days. The package size of the potato chips varied each day, and people ate more chips when the package size was larger. Additionally, when the people ate more chips as a snack, they did not eat less at mealtime.²¹⁵

Soft Drink Consumption

Americans are drinking more soft drinks and other sweetened beverages, and less milk.²¹⁶ According to the U.S. Department of Agriculture (USDA), per capita soft-drink consumption has increased almost 500 percent over the past 50 years.²¹⁷ The most popular American beverage is the carbonated soft drink, which accounts for 28 percent of total beverage consumption. That is more than twice the next-closest, non-alcoholic beverage – milk – at about 11 percent.²¹⁸

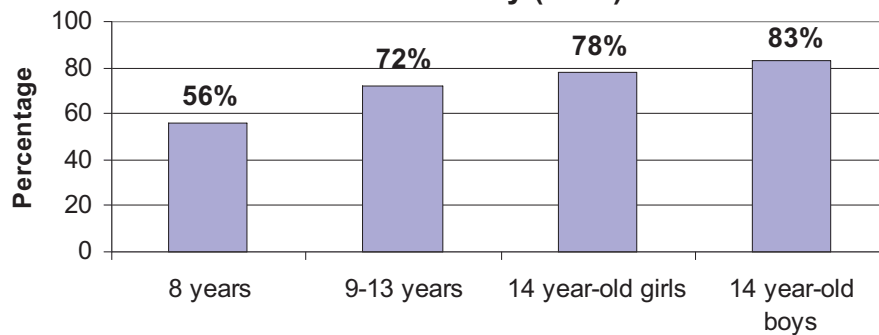
Enough regular soda is produced to supply every American with more than 14 ounces of soda every day.²¹⁹ Children start drinking soda at a remarkably young age, and consumption increases through young adulthood.^{220, 221} More than half (56 percent) of 8-year-olds drink soft drinks daily.²²²

Portion = the amount of food or beverage a person chooses to eat or drink.

Serving = a standard amount established by the U.S. Food and Drug Administration.

Soft drinks are defined as any non-alcoholic beverage containing natural or artificial sweeteners. Examples include soda, tea, lemonade, fruit drinks (containing less than 50 percent juice), energy drinks and sports drinks.

Percentage of Children and Youth Who Consume Soft Drinks Daily (2001)



Squires S. Soft drinks, hard facts: research suggests kids who drink a lot of soft drinks risk becoming fat, weak-boned, cavity-prone and caffeine addicted. Washington Post; February 27, 2001, p.HE10.

Nationally in 2001, 83 percent of 14-year-old boys drank soft drinks daily, compared with 78 percent of 14-year-old girls, 72 percent of 9- to 13-year-old children, and 56 percent of 8-year-old children. Most adolescents (65 percent of girls and 74 percent of boys), drink soft drinks daily²²³ - most of which are sugar-sweetened.²²⁴

Soda is the most common soft drink.

²²⁵ The term soda includes carbonated beverages containing artificial or natural sweeteners.²²⁶ People who drink soft drinks take in more calories than those who do not.²²⁷ Sugar supplies the calories in soft drinks. Non-diet soft drinks account for almost half of total sugar in the diet.²²⁸²¹¹ Sweetened drinks are the primary source of added sugar for children and youth and, on

Between 1970 and 1997, yearly per capita consumption of non-diet soft drinks rose 86 percent in the United States. The prevalence of obesity increased 112 percent during that same time.

* Putnam JJ, Allshouse JE. Food Consumption, Prices and Expenditures, 1970-1997. Washington, DC: Economic Research Service, U.S. Dept of Agriculture; 1999.

* Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among U.S. adults, 1999-2000. JAMA. 2002; 288:1723-1727.

average, adolescents get 15 teaspoons of sugar from soft drinks daily.^{229, 230} Intake of sugar-sweetened beverages has been associated with weight gain, overweight, obesity and type II diabetes.^{231, 232}

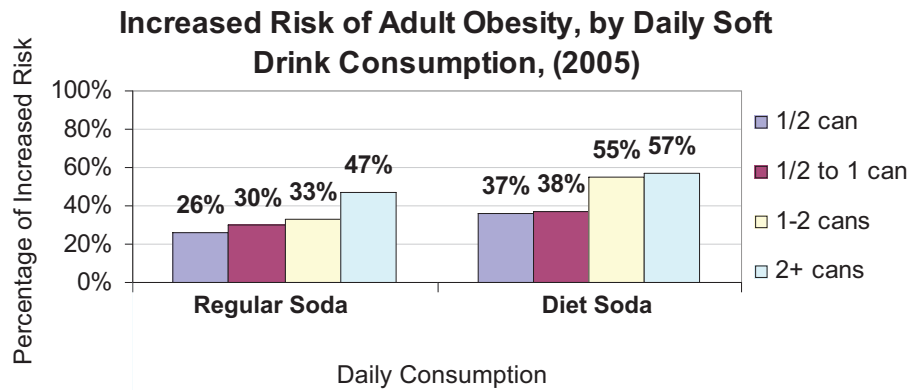
High-fructose corn syrup (HFCS) is a sweetener developed from processing corn.²³³ HFCS was added to many processed foods (breads, cereals, condiments, etc.) and soft drinks in the United States between 1975 and 1985. Since then, HFCS has begun to replace sugar in various processed foods in the U.S.²³⁴ Intake of high-fructose corn syrup, the primary sweetener for soft drinks, increased 1,000 percent between 1970 and 1990.²³⁵ A recent study of 12-year-olds found that for each additional sugar-sweetened drink consumed daily, both BMI and frequency of overweight increased by 60 percent.²³⁶

Not only are soft drinks adding major amounts of calories and sugar to the diets of children and adolescents, they are also replacing milk and other more nutritious beverages.²³⁷ In fact, teenage boys and girls are drinking twice as much soda as milk. When children and adolescents replace low-fat milk and 100 percent fruit or vegetable juice with soft drinks, they lose out on valuable nutrients, like protein, calcium and vitamins, needed for normal growth and development. Only three in ten (36 percent) boys and less than two in ten (14 percent) girls are getting enough calcium. Teens

A 12-ounce can of soda has 150 calories and 10 teaspoons of sugar in the form of high-fructose corn syrup. If these high-fructose corn syrup calories are added to the typical diet without cutting back on something else, one soda a day could lead to a weight gain of 15 pounds in one year.

*Apovian CM. Sugar-sweetened soft drinks, obesity and Type II diabetes. JAMA 2004; 27:205-10.

who consume more soft drinks also get less magnesium, vitamin A, vitamin C and riboflavin, and more calories, fat and carbohydrates.²³⁹



Source: Fowler, S.P. 65th Annual Scientific Sessions, American Diabetes Association, San Diego, June 10-14, 2005; Abstract 1058-P. Sharon P. Fowler, MPH, University of Texas Health Science Center School of Medicine, San Antonio.

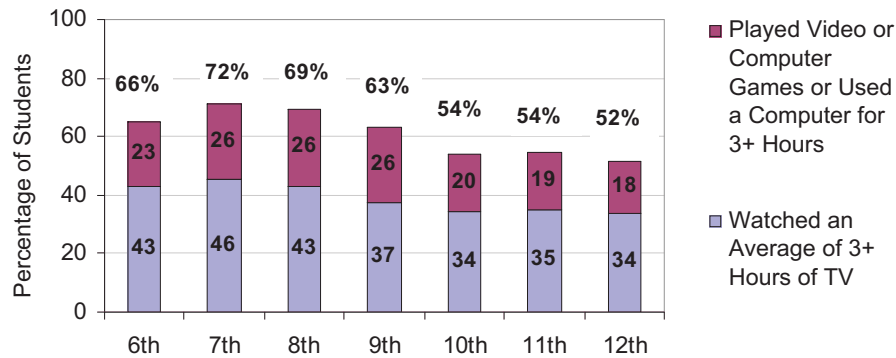
A 2005 study showed that even people who drink diet soft drinks don't lose weight; instead they gain weight.²⁴⁰ Surprisingly, the risk of obesity in people only drinking diet soft drinks was even higher than regular soda. There was a 41 percent increase in risk of being overweight for every can or bottle of diet soft drink a person consumes each day.²⁴¹ Although this study does not prove that diet soda causes obesity, it shows that something linked to diet soda drinking is also linked to obesity. One theory is that when you offer your body something that tastes like a lot of calories, but it isn't there, your body is alerted to the possibility that there is something there and it will search for the calories promised but not delivered.²⁴²

Screen Time

In 2006, virtually all U.S. households had at least one TV, with nearly 80 percent having multiple sets.²⁴³ Preschool children and youth with a TV in their bedroom are more likely to be overweight and spend more time watching television.²⁴⁴

The television is not the only screen in the house that has changed. In recent years, electronic games, home computers and the Internet have assumed an important place in our lives. In 2001, almost eight out of every ten early-school-age children lived in homes with a computer, and about 69 percent had Internet access.²⁴⁵ Children, on average, spent up to five or six hours a day involved in sedentary activities, including excessive time watching television, using the computer, and playing video games.²⁴⁶

Percentage of N.C. Students Who Watched 3+ Hours of TV or Played 3+ Hours of Video or Computer Games on an Average School Day (2007)

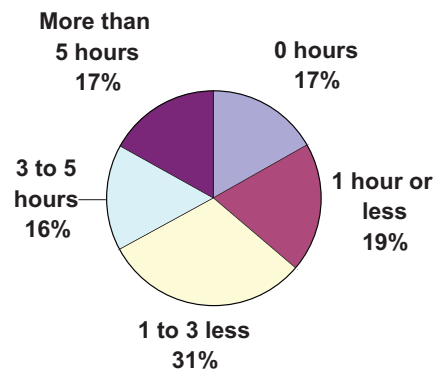


Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2007).

The video game industry has grown to a \$6.3 billion industry, with more than two-thirds of households with children owning video and computer games.²⁴⁷ Ninety-two percent of children and adolescents ages 2-17 play video games.²⁴⁸ On any given day, 30 percent of all children ages 2-18 will play a video game; those who play spend an average of more than an hour playing.²⁴⁹

In 2007, 34-36 percent of N.C. middle (grades 6-8) and high school (grades 9-12) students watched an average of 3+ hours of TV on an average school day. In 2007, 18-26 percent of N.C. middle and high school students played video or computer games or used a computer for 3+ hours on an average school day.

Percentage of Children Who Watch TV on a Typical Day (1999)



Source: Kids & Media at the New Millennium, Kaiser Family Foundation, November 1999.

The number of hours of television watched is positively associated with increased BMI.²⁵⁰ The average time spent with various media (television, computer, video games) is more than five hours per day.²⁵¹ Even the very youngest children, preschoolers ages 6 and younger, spend as much time with screen media (TVs, video games and computers) as they do playing outside.²⁵² Approximately 33 percent of children watch more than three hours of TV on a typical day.²⁵³ About 43 percent of N.C. children watch an average of two to four hours of television a day.²⁵⁴

Food ads account for more than 50 percent of all ads targeting children and youth.²⁵⁵ Food manufacturers spend almost \$7 billion annually on advertising, and 75 percent of this is allocated to television.²⁵⁶ Even brief exposures (10 to 30 seconds) to food advertisements embedded within children's and youth's programs can influence preschool children's food preferences and lead them to choose the advertised brand of food over a similar unadvertised product.²⁵⁷

Fast-food restaurants alone spend over \$3 billion a year in television ads targeted to children.²⁵⁸ There is strong evidence that television advertising also influences the foods and beverage preferences of children ages 2-11. Television advertising influences

Patterns of TV and Media Use

- 43% of children, age 2 or younger, watch TV every day.
- 41% of children 2-3 years old and 43% of children 4-6 years use screen media for more than 2 hours per day.
- Children ages 8-18 watch an average of 3 hours of TV per day.
- The average family owns 4 TV sets.

Source: Jordan A and Robinson T 2008; Kaiser Family Foundation 2006.



children to prefer and request high-calorie foods and beverages.²⁵⁹ Most of the food products targeted to children are for candy (34 percent), cereal (28 percent), and fast food (10 percent), while only 4 percent are for dairy products, 1 percent for fruit juices and none for fruits and vegetables.²⁶⁰ Studies have found that from a very young age, children influence their parent's purchases at the supermarket.^{261, 262}

Studies have shown that an increase in screen time is also contributing to a decrease in physical activity and an increase in unhealthy eating for children and youth. Television watching can cause obesity in four ways: youth who watch television may snack more while watching; they may watch more commercials for high calorie and/or high-fat foods and select these over more nutritious foods;²⁶³ they may have a lower metabolic rate because of television watching,²⁶⁴ and they may substitute television watching for more energy-consuming activities. The last of these is viewed by some as the strongest contributor to obesity.²⁶⁵

A significant proportion of children's and youth's daily energy intake is consumed during television viewing. When children and youth consistently view television during meals, it may distract them from normal cues of fullness and lead to overeating.²⁶⁶ Furthermore, children who live in families in which television viewing is a normal part of the

meal routine eat fewer fruits and vegetables and more pizzas, snack foods and sodas.²⁶⁷



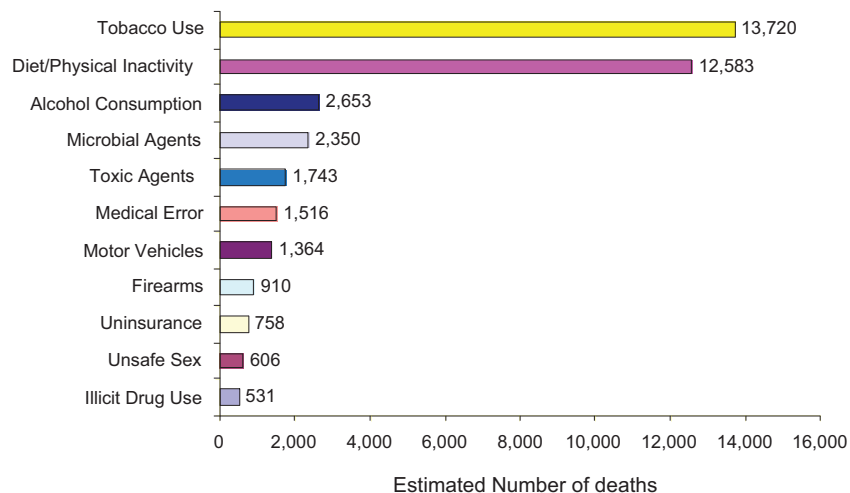
Obesity-Related Chronic Diseases

Overweight and obesity pose significant health issues for both children and adults. Excess weight is not only a risk factor for several serious conditions, but also exacerbates existing conditions.²⁶⁸ Heart disease, cancer, stroke and chronic lung disease are the leading causes of death in North Carolina. These chronic diseases account for 58 percent of all deaths in the state.²⁶⁹ There have been dramatic increases in diabetes and obesity in the past decade; these conditions exacerbate many other health problems. According to a recent study, more than half (53%) of all deaths of North Carolinians are preventable.²⁷⁰

In 2006, the two most common estimated preventable causes of death among N.C.

adults were tobacco (37 percent) and diet/physical inactivity (35 percent). Together these causes of death make up 72 percent of the state's preventable causes of death – a larger percentage than alcohol, microbial and toxic agents, motor vehicles, firearms, sexual behavior, and illicit drug use combined. Additionally, inadequate fruit and vegetable consumption and no leisure time physical activity often lead to obesity and overweight. These four risk factors (inadequate fruits and vegetables, no leisure time physical activity, obesity, and overweight) make up 80 percent of North Carolina's risk factors or behaviors. Overweight and obesity are significantly associated with diabetes, high blood pressure, high cholesterol, asthma, arthritis and poor health status.

Preventable Causes of Death in North Carolina (2007)



Diabetes and Pre-diabetes

In 2007, nearly one in ten (9.1 percent) North Carolina adults reported having been diagnosed with diabetes, higher than the 8.1 percent among U.S. adults.²⁷¹ Diabetes prevalence in North Carolina has more than doubled from 1995 to 2007. More than 1.2 million North Carolinians have pre-diabetes or diabetes, and many are unaware of their condition.

Diabetes or hyperglycemia is a chronic disorder characterized with abnormally high concentration of glucose in the blood. It is caused by insulin deficiency and/or ineffective insulin action in the cells. Diabetes affects all the major organs in the body and causes many complications including heart disease, stroke, peripheral vascular disease, neuropathy, lower extremity amputations, blindness and kidney failure. Tight glucose control in people with diabetes helps to prevent or delay these complications.

There are three types of diabetes:

1. Type 1 diabetes, also known as juvenile diabetes, is abrupt in onset and generally develops in children and young people. There are no known preventive measures to prevent type 1 diabetes, and lifestyle interventions cannot be used to reverse or prevent diabetes. Type 1 diabetes comprises about 10 percent of the total diabetes cases in North America, regardless of weight.

2. Type II diabetes, also known as maturity-onset diabetes, is progressive and usually occurs after the age of 30. However, more young children are now being diagnosed with type II diabetes. People with type II diabetes are generally obese and have a family history of diabetes. The other factor for type II diabetes is aging. Ninety percent of adults with diabetes have type II diabetes.

3. Gestational diabetes occurs only during pregnancy and affects two to four percent of all pregnant women. Obesity is a major risk factor for the development of gestational diabetes. Women who develop gestational diabetes are also at higher risk of developing type II diabetes.

Pre-diabetes

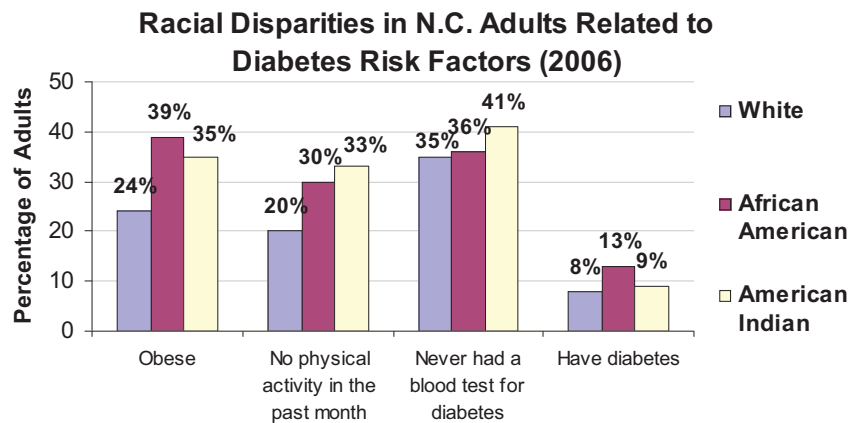
Pre-diabetes (where blood sugar levels are higher than normal, but not enough to make the diagnosis of diabetes) is a precursor of type II diabetes. According to the American Diabetes Association (ADA), there are 57 million people in the United States who have pre-diabetes. The majority of people with pre-diabetes will develop type II diabetes within 10 years unless preventive measures are taken. Research has shown that diabetes is preventable in 58 percent

of people with pre-diabetes.²⁷² Lifestyle changes (i.e., five to 10 percent weight reduction in overweight/obese people and an increase in physical activity) in people with pre-diabetes can prevent or delay type II diabetes. Screening overweight and obese adults aged 45-74 for signs of pre-diabetes and using a lifestyle intervention program to treat those who have the condition would improve quality of life and be cost-effective.²⁷³

There were an estimated 608,000 adults with diagnosed diabetes in North Carolina in 2007. All socio-demographic groups have contributed to the overall increase in diabetes prevalence. African Americans and Native Americans had the highest prevalence of diabetes and obesity, while Hispanics and Asians had the lowest prevalence. The Asian and Hispanic groups also reported the lowest proportion of people who ever had a blood test for diabetes, which may have contributed to an artificially lower prevalence rate in those groups. The Hispanic group had the highest proportion of people without health insurance, which may have contributed to the lower screening rate.

Studies show that obesity is the main factor associated with the increase in type II diabetes. Since 1995, the prevalence of obesity in North Carolina increased by about 70 percent. Today, one in every

four adults in North Carolina is obese, and the link between obesity and diabetes is so strong that some health experts have coined a new term, Diabetesity®, to reflect the association. Eight-seven percent of adults with diabetes are overweight or obese in North Carolina. A weight gain of 11 to 18 pounds increases a person's risk of developing type II diabetes to twice that of individuals who have not gained weight, and a weight gain of 44 pounds quadruples the risk of developing type II diabetes over a 10-year period.²⁷⁴ Overweight individuals are more than twice as likely to develop diabetes as healthy-weight individuals. Among the obese, the risk is three times greater, and is six times greater for the morbidly obese.



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2006).

Prevalence of Screening

Early detection and appropriate treatment can reduce diabetes complications. The decision for diabetes screening in asymptomatic patients is based on clinical judgment and should be carried out in the clinical setting with proper counseling. In North Carolina, 38.1 percent of adults reported never having had a diabetes screening test in 2006. Males had a lower proportion of screening than females (43.3 percent vs. 33.1 percent). The racial/ethnic groups with the highest incidence of non-screening of diabetes were Hispanics (54.3 percent), followed by Asians (47.8 percent) and American Indians (41.6 percent).

Diabetes-related hospitalizations

Diabetes accounts for a large burden of morbidity and mortality through micro-and macro-vascular complications that affect mainly the heart, brain, eyes, kidneys, and

lower extremities. People with diabetes also suffer crises of severe hypoglycemia and hyperglycemia, which may require emergency care or hospitalizations. In 2006, 16,219 North Carolinians were discharged from the hospital after receiving care for diabetes as the primary admitting diagnosis. Hospitalization costs associated with the principal diagnosis of diabetes reached \$257 million in 2006²⁷⁵. Continued improvements in strategies for prevention and primary/secondary care of diabetes are needed to help decrease the rates and costs of hospitalization due to diabetes.

Diabetes Mortality

Diabetes ranked as the 7th leading cause of death in North Carolina in 2006. African-Americans, American

Indians and females were identified as the demographic populations who had the highest incidence of diabetes. Diabetes was the 4th leading cause of death among African Americans in North Carolina and 3rd among American Indians. Diabetes prevalence increases with age, affecting nearly one in every 10 adults over 35 years old in 2007 in North Carolina. Adults age 65 to 74 had the highest diabetes prevalence, 21.2 percent in 2007. The mortality rate for adults with diabetes peaked for older adults who are 85 and older.

The 2008 ADA Clinical Practice Recommendations²⁷⁶ advises the following criteria for testing for pre-diabetes and diabetes in otherwise healthy adults:

1. Testing should be considered in all adults who are overweight (BMI ≥ 25 kg/m²) and have additional risk factors:
 - physical inactivity
 - family history of diabetes
 - members of a high-risk ethnic population (e.g., African American, Latino, Native American, Asian American, and Pacific Islanders)
 - women who delivered a baby over 9 lbs. or were diagnosed with gestational diabetes
 - hypertension ($\geq 140/90$ mmHg or on therapy for hypertension)
 - HDL cholesterol level of <35 mg/dl and/or triglyceride level >250

- women with polycystic ovarian syndrome (PCOS)
- previous history of IGT or IFG
- having signs or conditions associated with insulin resistance
- history of cardiovascular disease

2. Without the above risk factors, testing for pre-diabetes and diabetes should begin at age 45 years.

3. If results are normal, testing should be repeated at least 3-year intervals, with consideration of more frequent testing depending on initial results and risk status.

Diabetes in Children

Several national studies have reported increases in prevalence and incidence of type II diabetes in children and youth, with one of the key links being obesity and resulting insulin resistance.^{277, 278, 279, 280, 281} Obesity and family history are related to those increases.^{282, 283} Type 1 diabetes is the most frequently occurring type of diabetes in children. Type II diabetes in children was rare prior to 1980, accounting for only one to two percent of diabetes cases in children in the United States. Several national studies have reported increases in prevalence and incidence of type II diabetes in children, with one of the key links being obesity and resulting insulin resistance.

The NHANES III study (1988-94) found the prevalence of diabetes in children to be 4.1 cases per 1,000 children. The Child Health Assessment and Monitoring (CHAMP) survey in North Carolina in 2006 found that the mean prevalence rate for diabetes was 4 cases per 1,000 children. In the same year, the CHAMP survey found that the mean prevalence for pre-diabetes was also 4 cases per 1,000 children. The state's Annual School Health Services Reports for public schools reported that 4,437 public school students in North Carolina had diabetes in 2005-2006; 3,419 monitored blood glucose at school; 1,918 received insulin injections at school; and 1,414 had insulin pumps. Positive management of diabetes through acquiring healthy lifestyle skill sets is the key to the health and well-being of these children as they grow into adulthood. Efforts need be ongoing to prevent children from being overweight and obese.

Heart Disease and Stroke

Excess weight in the form of body fat puts a strain on the entire circulatory system. People who are overweight or obese are more likely to develop heart disease and stroke even if they have no other risk factors. Obesity also makes people more likely to have other risk factors such as high cholesterol, high blood pressure, and diabetes. For approximately 20 years, research has indicated that a sedentary lifestyle is a major risk factor for coronary heart disease.²⁸⁴ Indeed, coronary heart disease is more often caused by a sedentary lifestyle than by the other three risk factors combined (smoking, hypertension, and hyperlipidemia**).²⁸⁵

High blood pressure among children is a serious and emerging public health issue.^{286, 287, 288} High blood pressure in children is strongly correlated with being overweight, and the percentage of children with high blood pressure in the U.S. appears to be increasing as the percentage of overweight children and youth increases as a result of the obesity epidemic.^{289, 290, 291} In 2006, the prevalence of high blood pressure among N.C. children ages 3-17 years was estimated at 0.7 percent, similar to the estimated prevalence of diabetes among N.C. children (0.4 percent) from

the same survey.²⁹² This data is based upon parental report and is likely to be an underestimate of the true prevalence of high blood pressure among N.C. children.

From 1980 through 2000, the age-adjusted death rate for coronary heart disease fell from 542.9 to 266.8 deaths per 100,000 population among men and from 263.3 to 134.4 deaths per 100,000 population among women, resulting in 341,745 fewer deaths from coronary heart disease in 2000.²⁹³ Approximately 44 percent of the decrease was attributed to changes in risk factors, including reductions in total cholesterol (24 percent), systolic blood pressure (20 percent), smoking prevalence (12 percent), and physical inactivity (5 percent), although these reductions were partially offset by increases in the body-mass index and the prevalence of diabetes, which accounted for an increased number of deaths (8 percent and 10 percent, respectively).²⁹⁴ The obesity epidemic may be related to these increases.

- The incidence of heart disease (heart attack, congestive heart failure, sudden cardiac death, angina or chest pain, and abnormal heart rhythm) is increased in persons who are overweight or obese (BMI > 25).²⁹⁵

- High blood pressure is twice as common in adults who are obese than in those who are at a healthy weight.²⁹⁶
- Obesity is associated with elevated triglycerides (blood fat) and decreased HDL cholesterol (“good cholesterol”).²⁹⁷
- Overweight individuals are nearly 40 percent more likely to develop heart disease than healthy weight individuals; the rate increases to 50 percent for obese individuals. Morbidly obese persons have an elevated risk of nearly 70 percent.

Kidney Disease

Traditional risk factors for end-stage renal disease are high blood pressure and diabetes, but obesity is functionally tied to renal disease associated with hypertension and type II diabetes.²⁹⁸ In January 2006, researchers at the University of California, San Francisco, determined that there was a strong relationship between being obese and developing end-stage renal disease, or kidney failure.²⁹⁹ The long-range study found that individuals who are obese have up to a seven times greater risk of kidney failure than healthy-weight people (even after adjustment for blood pressure and diabetes status), suggesting that obesity should be considered a risk factor for the condition, and that kidney failure is yet

another consequence of obesity. Research findings showed that being even moderately overweight nearly doubles the risk of developing kidney failure, which is a complete failure of the kidneys to process waste so that dialysis or transplantation become necessary. Results suggest that even a mildly overweight person is roughly 90 percent more likely to develop end-stage renal failure, with the risk reaching over 700 percent greater for the morbidly obese.³⁰⁰

In June 2006, a study in the *Journal of the American Society of Nephrology* found that obesity is also a strong risk factor for Chronic Renal Failure (CRF).³⁰¹ Subjects who met the definition of obesity at any age were three to four times more likely to develop CRF. For women, morbid obesity (BMI 35 or higher) was also a risk factor for CRF. Risk was also increased for people who fell short of the study definition of obesity but were still overweight. Risk of CRF was tripled for both men and women who were overweight at age 20 or later. This study found that the link between obesity and CRF was strongest for diabetes-related kidney disease. However, obesity doubled or tripled the risk of CRF. Even for people who had neither high blood pressure nor diabetes – both risk factors for kidney disease – being overweight at age 20 or older tripled the risk of CRF.

Cancer

About 41,000 new cases of cancer in 2002 in the United States were estimated to be due to obesity. Overweight and obesity are associated with an increased risk for cancer including endometrial (cancer of the lining of the uterus), colon, gall bladder, prostate, kidney, and postmenopausal breast cancer. Fourteen percent of cancer deaths among men and 20 percent of cancer deaths among women may be due to overweight and obesity. Women gaining more than 20 pounds from age 18 to midlife double their risk of postmenopausal breast cancer, compared to women whose weight remains stable

Asthma and Other Breathing Problems

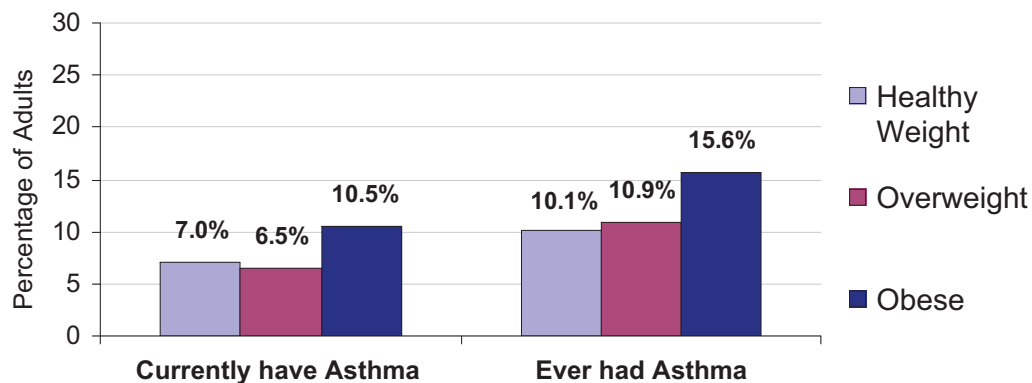
Obesity is associated with a higher prevalence of asthma.³⁰⁷ Obese people with asthma have to use prescription asthma inhalers more often than non-obese asthmatics. In addition, obese asthmatics have more asthma episodes/attacks and make more ER visits. Obesity was significantly related to use of prescription asthma inhalers, asthma episodes/attacks, and ER visits, even after controlling for race, gender and income status.³⁰⁸

- In 2007, 15.6 percent of adults in North Carolina who reported having ever had asthma were obese, compared to 10.9 percent of those who were overweight and 10.1 percent of those who had BMIs in the healthy range.³⁰⁹

- In 2007, 10.5 percent of adults in North Carolina who reported they currently had asthma were obese, compared to 6.5 percent of those who were overweight and 7.0 percent of those who had BMIs in the healthy range.³¹⁰

Sleep apnea (interrupted breathing while sleeping) is more common in obese persons.³¹¹ Obese children have a higher risk of obstructive sleep apnea than children with a normal body weight.³¹² Obstructive sleep apnea is also more prevalent in obese adults, especially men and postmenopausal women.³¹³

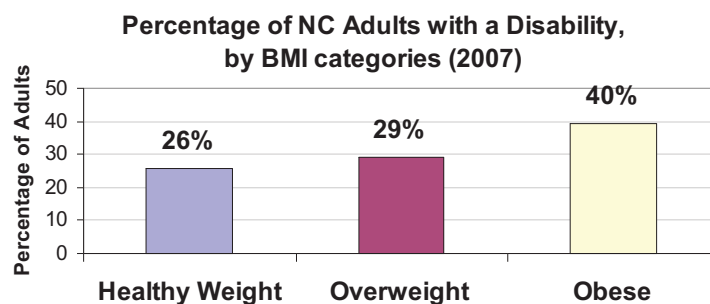
Percentage of N.C. Adults Who Currently Have or Have Ever Had Asthma, by BMI (2007)



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, 2007.

In a 2004 study, obesity at ages 30 to 49 years was associated with a 2-fold increase in the odds of disability.³¹⁴ Obesity before middle age is associated with an increased risk of future disability and mortality, and a sizable decrease in disability-free life expectancy.³¹⁵

In 2007, among North Carolina adults who had a disability, those at a healthy weight and those who were overweight had a similar prevalence of disability (26 percent and 29 percent, respectively), while the percentage of obese adults who had a disability was approximately 10 percent higher, at 40 percent. Also in 2007, among N.C. adults who described themselves as being limited in their activities, the percentage who were at a healthy weight and overweight were



Source: North Carolina Behavioral Risk Factor Surveillance System Survey, N.C. State Center for Health Statistics, N.C. Department of Health and Human Services, (2007).

similar (15 percent and 18 percent, respectively), while 27 percent were obese. In 2007, among N.C. adults who required special equipment, 5 percent were at a healthy weight and 6 percent were overweight; 11 percent were obese.

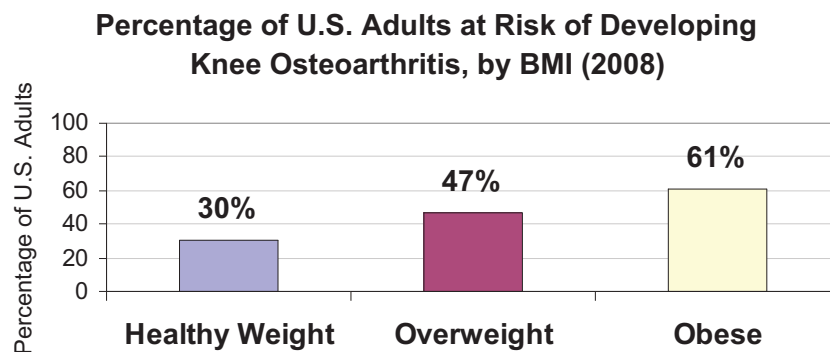
Arthritis

Arthritis affects people of all ages and is the leading cause of disability and work-related disability in our country. About one-half of all North Carolinians age 55-65 have been diagnosed with some form of arthritis by their doctor, and this number increases with age ³¹⁶. People with arthritis experience joint pain, stiffness and sometimes loss of immobility in their joints, affecting the quality of their lives.

The prevalence of arthritis increases with increasing weight. ³¹⁷ For every two-pound increase in weight, the risk of developing arthritis increases by 9 to 13 percent. ³¹⁸ Obesity is a known risk factor for the development and progression of knee osteoarthritis and possibly osteoarthritis of other joints. Thirty percent of individuals at a healthy weight are at risk of developing knee osteoarthritis with symptoms, compared with 46.9 percent for overweight individuals and 60.5 percent for obese

individuals. ³¹⁹ Therefore, obese adults are twice as likely to develop knee osteoarthritis as are adults of healthy weight.

Maintaining a healthy weight reduces the risk of developing arthritis and may decrease disease progression. CDC states that a loss of just 11 pounds can decrease the occurrence (incidence) of new knee osteoarthritis. ³²⁰ Symptoms of arthritis can improve with weight loss. ³²¹ Regular physical activities such as walking, bicycling and swimming have been shown to have significant benefits for people with arthritis, including reducing pain and improving physical function, mental health and quality of life ³²². Among older adults with knee osteoarthritis, engaging in moderate physical activity at least three times per week can reduce the risk of arthritis-related disability by 47 percent. ³²³



Source: Murphy, L. Arthritis & Rheumatism, vol 59: pp 1207-1213.s, (2008).

- In 2006, there was a significant difference among the three weight categories in the percentage of adults to whom it had been suggested that they should lose weight to help their arthritis: adults at a healthy weight (10%), adults who were overweight (33%), and adults who were obese (61%).
- In 2006, there was also a significant difference between the three weight categories in the percentage of adults who had been told to increase physical activity or exercise help their arthritis: adults at a healthy weight (54%), adults who were overweight (61%), and adults who were obese (80%).

More than half of adults with either diabetes or heart disease also have arthritis. Physical activity is a crucial element of managing these chronic conditions, but having arthritis presents barriers to increasing physical activity.³²⁴ Research shows that pain, fear of pain, and lack of information on how to exercise safely prevents people with arthritis from exercising, although physical activity decreases pain, improves function, and delays disability.

Mental Health

Obesity is the most common chronic physical illness in modern society, while depression is the most prevalent psychological condition.^{325, 326}

Despite the high prevalence of these conditions, few studies have explored the associations between these conditions, and the nature of the relationship between obesity and depressive illness or impaired psychological function is unclear. Recent information regarding obesity and its association with psychological functioning suggests minimal impairment in psychological functioning among unselected populations of both obese adults and children.^{327, 328} However, sub-populations of obese patients do appear to be at risk for marked impairment. These include the severely obese^{329, 330}, those with chronic medical conditions or pain³³¹, those with high levels of body image dissatisfaction, and those with repetitive binge-eating behaviors.³³²

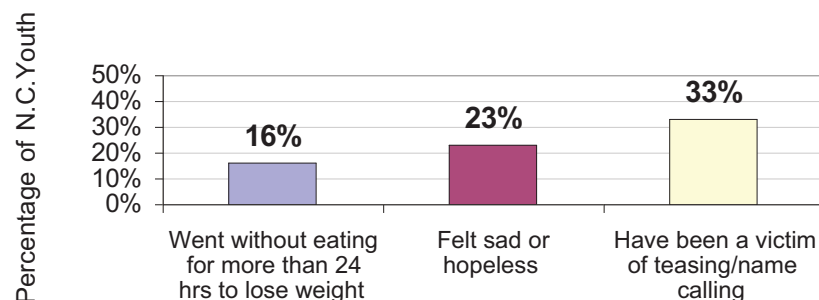
The mechanisms underlying an association between obesity and psychological state include effects of stigmatization, discrimination, and thoughts of hopelessness, poor self-esteem and guilt related to failed attempts at weight loss.³³³ Hence, the

psychological state may follow the physical state, or the opposite sequence may be important as well. Obesity may follow intervals of reduced interest in physical activity or even result from a change in diet that is overly energy-rich.³³⁴

Obesity in childhood also leads to many dangerous psychosocial consequences.³³⁵ A North Carolina study found that children's risk for depression and mental health disorders increases the longer they are overweight.³³⁶ Depression is not the only problem for these kids. Obese kids were almost six times more likely to have an impaired quality of life than healthy kids; equal to that of kids undergoing treatment for cancer.³³⁷ Overweight children are rejected by their peers more than any other handicap.³³⁸ They have a greater risk for developing dissatisfaction with their bodies³³⁹ and lower self-esteem^{340, 341}, and are teased more than their normal-weight peers.³⁴²

Obesity among children and youth is a growing health concern across the United States because of related diseases that shorten the lifespan, increase medical expenses, decrease work productivity, and contribute to immense psychological and social issues.³⁴³ Youth obesity has been associated with negative psychological conditions and stressors, including alienation and isolation. These conditions can have a negative effect on self-esteem, which can lead to depression and other negative health outcomes.³⁴⁴ The most immediate consequence of overweight, as perceived by children and youth themselves, is social discrimination.³⁴⁵ Among N.C. middle school students in 2007, 16 percent went without eating for more than 24 hours to lose weight, 23 percent felt sad or hopeless, and 33 percent had been a victim of teasing or name calling.

Percentage of N.C. Middle School Students Who Experience Dangerous Behaviors (2007)



Source: North Carolina Youth Risk Behavior Surveillance System, North Carolina Department of Public Instruction and North Carolina Department of Health and Human Services. (2007).

Despite the lack of clear associations of obesity and psychological state, physical activity appears to help in managing mild to moderate depression.³⁴⁶ Cross-sectional and prospective studies generally demonstrate that higher levels of occupational and leisure time physical activity are associated with reduced symptoms of depression.³⁴⁷ This may be related to beneficial effects of physiologic and psychological factors such as endorphins, distraction, and feelings of self-efficacy. To date, evidence from randomized controlled trials suggests that aerobic or resistance-training exercise can reduce symptoms of depression.³⁴⁸

Oral Health

Periodontitis (gum disease) occurs more frequently in obese individuals than in those at a healthy weight. In the U.S., 30 percent of adults with periodontitis were obese, compared with 12 percent of the periodontally healthy individuals.³⁴⁹ Obese individuals also exhibited a significantly higher percentage of sites exhibiting visible plaque.³⁵⁰ Periodontitis was found 76 percent more frequently in obese adults aged 18 to 34 years than in age-matched adults with a healthy weight.

Dental caries (cavities) is the most prevalent chronic disease of childhood, affecting 58.6 percent of children aged 5–17 years.³⁵¹ In 2004, an association between dental caries and obesity in childhood was found, suggesting that obese children are at an increased risk for dental caries.^{352, 353, 354}

Sugars, modified starches and starches are all subject to fermentation; sugared soft drinks, confections and starches baked with sugars are considered highly cariogenic**.^{355, 356, 357, 358, 359} Frequent consumption of sugars increases this risk. Children at highest risk for dental

**Cariogenic=causing tooth decay

caries are disproportionately from minority households and/or live in poverty. Both the prevalence of decay and the lack of dental treatment increase with minority status and decreasing resources.³⁶² Public health measures designed to improve both dietary education and access to appropriate foodstuffs could decrease both childhood caries and childhood obesity.³⁶³

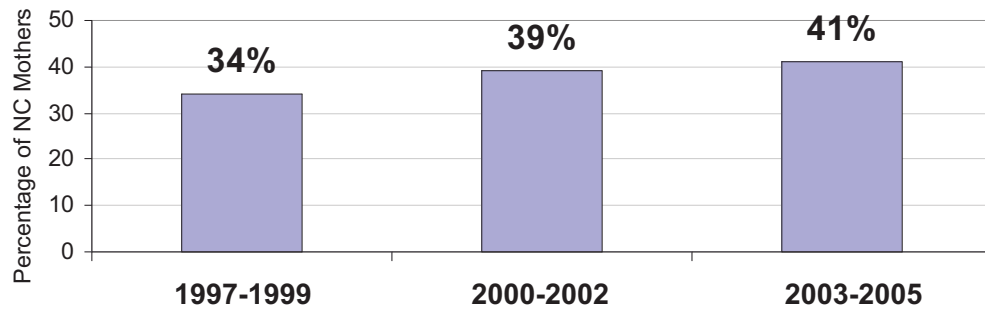
In North Carolina, approximately 32 percent of adults reported not having visited a dentist within the last year.³⁶⁴ According to 2005 data, one in four North Carolina children (25.5 percent) did not have a dentist or dental clinic they went to regularly.³⁶⁵ The lack of dental care is especially acute among North Carolina's poor and minority populations. Thirty-nine percent of Native Americans and 42 percent of African Americans reported that they had not visited the dentist in the past year. More than half (56 percent) of Hispanics reported that they did not visit the dentist in the past year and one in five Hispanics (22 percent) reported that it had been five or more years since their last dental visit. Nearly one in ten Hispanics reported that they had never visited the dentist, and this figure was slightly higher for Spanish-speaking Hispanics (13.4 percent).

Reproductive Complications

Babies born to overweight mothers are more likely to become obese adults. The likelihood that overweight children will become obese adults is almost nine times higher than the risk for children who are not overweight.³⁶⁶ A woman who is obese during pregnancy has an increased risk of serious complications for herself and her child. Obesity is associated with risks specific to women's health and pregnancy complications. There is evidence linking obesity to early pregnancy and recurrent pregnancy loss.³⁶⁷ Among obese pregnant women, the risk of developing pregnancy-related hypertension and diabetes is significantly greater than among those with lower BMIs.^{368, 369}

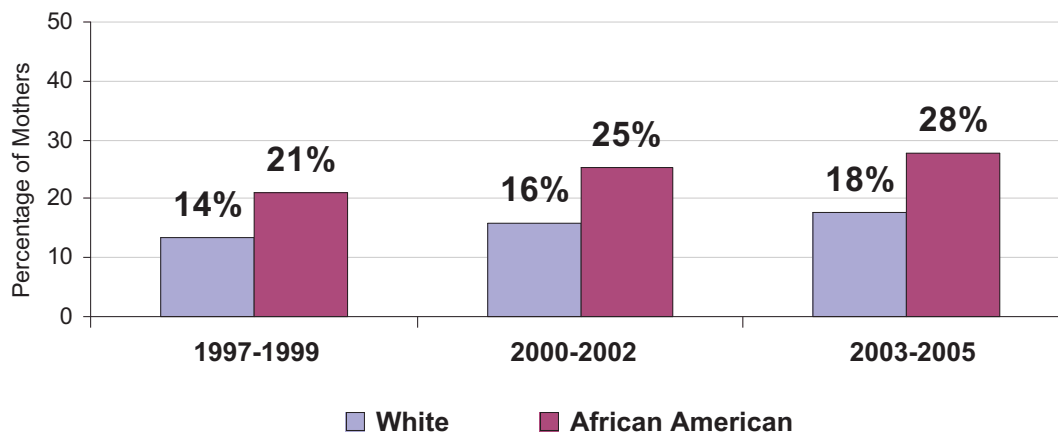
The percentage of obese African American mothers in North Carolina is shown below in relation to whites. Over time, both groups have increasing percentages of mothers who are obese, with consistently higher percentages seen in African American mothers. The percentage of overweight and obese mothers in the state has increased steadily over time, with approximately 34 percent of women having BMIs in the overweight or obese category between 1997 and 1999, then increasing to 39 percent and 41 percent in the subsequent time intervals.

Trends in the Percentage of N.C. Mothers Who Were Overweight or Obese (1997-2005)



Source: North Carolina Pregnancy Risk Assessment Monitoring System Survey Data. N.C. State Center for Health Statistics (1997-1999, 2000-2002, 2003-2005)

Trends in the Percentage of N.C. Mothers Who Were Overweight or Obese, by Race (1997-2005)



Source: North Carolina Pregnancy Risk Assessment Monitoring System Survey Data. N.C. State Center for Health Statistics (1997-1999, 2000-2002, 2003-2005)

A 2004 study found that obese women were more likely to become diabetic, hypertensive, and develop pre-eclampsia during their pregnancies. In the morbidly obese group, there was an elevated risk of delivering a premature infant. The obese pregnant women more commonly required cesarean sections, which in other studies have been associated with higher risks of post operative infections, blood loss, and difficulties with anesthesia.

The offspring of infants of obese mothers also are at higher risk. Infants of obese women are at elevated risk of neural tube defects such as spina bifida and other fetal abnormalities³⁷³ as well as stillbirth and neonatal death.³⁷⁴ Infants born to obese mothers are also not only at risk of being of high birth weight (>9.9 lbs), but also are at higher risk of developing metabolic syndrome as children (metabolic syndrome defined as obesity, hypertension, dyslipidemia and glucose intolerance).³⁷⁵

Beyond the pregnancy complications, obese women have cancer risks specific to their gender and weight category. Obesity places women at 2-5 times the risk of uterine cancer³⁷⁶ which affects even women in their 20s.³⁷⁷ Obese women are at significantly increased risk of death from uterine and breast cancers. The risk increases as BMI increases.

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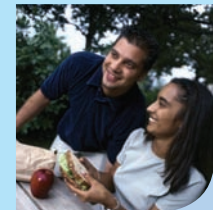
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