Obesity-Related Data in Indiana

A Resource Guide

February 2007

Community Nutrition
Obesity Prevention Division
Indiana State Department of Health

Governor Mitch Daniels'
IN Shape Indiana

Indiana University
School of Medicine
Department of Family Medicine
Bowen Research Center

Mitchell E. Daniels, Jr.
Governor

Judith A. Monroe, M.D.
State Health Commissioner

Indiana State Department of Health

An Equal Opportunity Employer

May 21, 2007

Dear Fellow Hoosiers:

Eating better and moving more are two of the most important things we can do to get ourselves and the state back on the road to better health. Unfortunately, Indiana is ranked 10th in the nation for obesity, which puts Hoosiers at great risk for heart disease, diabetes, stroke, and other serious health problems.

Obesity also creates a great economic burden for us individually and as a state. Because so many of us are obese, we each have to pay higher health care costs and health insurance premiums. We also suffer lost wages and productivity due to the poor health brought on by being overweight or obese.

Thus, reducing obesity is one of the top priorities of the Indiana State Department of Health. It is our goal to reduce obesity in Indiana by supporting and partnering with local initiatives around our state to address this major problem.

This *Obesity Related Data in Indiana: A Resource Guide* is the first of a series of resources we are developing to provide tools communities can use to address obesity in our cities, towns and neighborhoods. This guide provides the latest data about overweight and obesity and its impacts in Indiana. I encourage you to use and share this guide with others to gain a better understanding of the obesity problem in Indiana and gather the support you need to start or expand programs to reduce overweight and obesity in our state.

Other guides in this series will provide tools to assist in developing programs and gather community level data to guide planning, assess progress, and improve existing projects.

We hope this information will be valuable to you. Please let us know if we can be of any assistance.

For a Healthier Tomorrow,

Judith A. Monroe MD

JUDITH A. MONROE, M.D.
STATE HEALTH COMMISSIONER

Obesity-Related Data in Indiana

A Resource Guide

February 2007

Terrell W. Zollinger, Dr.P.H.

Robert M. Saywell, Jr., Ph.D., M.P.H.

Jonathan C. Barclay, M.A.

Indiana University School of Medicine
Department of Family Medicine
Bowen Research Center

Acknowledgments

Preparing this resource guide required the assistance, cooperation, and effort of many talented and dedicated individuals.

The following people were instrumental in contributing to this effort:

Judith A. Monroe, MD,
State Health Commissioner

Mary Hill, JD,
Deputy Health Commissioner

Loren Robertson, LHE,
Assistant Commissioner,
Human Health Service Commission

COORDINATION

Weilin Long, MA, MPA,
Community Nutrition/Obesity Prevention Division (CNOP)

FACILITATION

Joe Hunt, MPH,
Public Health Surveillance and Preparedness

Acknowledgments

Obesity Data Assessment Committee since 2005

Edward Bloom, Maternal and Children's Special Health Services Division

*Elizabeth Hamilton-Byrd, MD, Epidemiology Resource Center

Joel Conner, Maternal and Children's Special Health Services Division

Suzanne Crouch, Coordinated School Health at the Indiana Department of Education

*Roland Gamache, PhD, MBA, Bioterrorism Preparedness

*Judith Ganser, MD, MPH, Maternal and Children's Special Health Services Division

Suzanne Hancock, MPH, Chronic Disease Program

*Joe Hunt, MPH, Public Health Surveillance and Preparedness

*Joseph Gibson, PhD, Marion County Health Department

*Shawn Grannis, MD, Regenstrief Institute

*Laura Heinrich, RD, Chronic Disease Program

*Lloyd J. Kolbe, PhD, Indiana University at Bloomington

Jon Lewis, PhD, Epidemiology Resource Center

*Weilin Long, MA, MPA, Community Nutrition/Obesity Prevention Division

Sue Moriarty, MD, Marion County Health Department

Eric Neuburger, MBA, MSA, Governor's Council for Fitness and Sports

*Tanya Parrish, MPH, LHE, INShape Indiana

Sue Percifield, RN, Chronic Disease Program

Dona Roberts, RN, Indiana State Department of Education

Calvin Roberson, MHA, MPH, Indiana Minority Health Coalition

Paula Parker-Sawyers, Office of Faith-Based and Community Initiatives

*Robert Saywell, PhD, MPH, Indiana University

*Linda Stemnock, Epidemiology Resource Center

*Robert Teclaw, DVM, PhD, Epidemiology Resource Center

*Patrice Wolfla, RD, Indiana WIC Program

*William Wishner, MD, Eli Lilly and Company

*Terrell Zollinger, DrPH, Indiana University

Other Expertise & Support

*Jonathan Barclay, MA, Indiana University

*Joanna Cornwell, Governor's Fellow with Community Nutrition/Obesity Prevention Division (CNOP)

*Jill Patterson, MPH intern at CNOP, Format Editor

Final Approval

Office of Public Affairs, ISDH

Funding

This publication is paid for in part through a grant from the Indiana State Department of Health Maternal and Children's Special Health Care Services Division and the Maternal and Child Health Bureau, Health Resources & Services Administration, U.S. Department of Health and Human Services under Title V of the Social Security Act of 1935.

** Contributors of data and other information to the Obesity-Related Data in Indiana: A Resource Guide.*

Contents

Acknowledgments **3**

Contents **6**

Preface **8**

Introduction **10**

Data Sources Used in this Resource Guide *10*

Behavioral Risk Factor Surveillance System 11

Youth Risk Behavior Survey 11

WIC Nutrition and Risk Data 12

Indiana School Weight and Height Collection Project 13

Other Data Sources *13*

Purpose of this Resource Guide *14*

References *15*

Chapter 1. Defining Obesity and Overweight **16**

Measuring Weight Status *16*

Measuring Body Fat *18*

References *19*

Chapter 2. Obesity and Risk Factor Profiles of Hoosiers **20**

National Statistics *20*

Trends in Obesity and Overweight in Indiana *22*

Findings from the 2005-2006 Indiana School Weight and Height Collection Program *25*

Demographic Characteristics of the Obese and Overweight *26*

Demographic Risk Factors Associated with Obesity *31*

Food Intake and Eating Patterns *33*

Physical Activity Patterns *41*

Weight Management *46*

References *50*

Chapter 3. Diseases and Other Health Problems Attributable to Obesity 51

Health Consequences of Overweight and Obesity 51

Hospital Discharge Data for Indiana, 2004 57

Self-reported Morbidity 58

References 61

Chapter 4. Economic Impact of Obesity 62

Introduction 62

Methods 62

National Health, Social, and Economic Costs of Obesity 63

Obesity Costs in Relation to Co-Morbidities 64

Likelihood of Morbidity Prevalence by Levels of Obesity 66

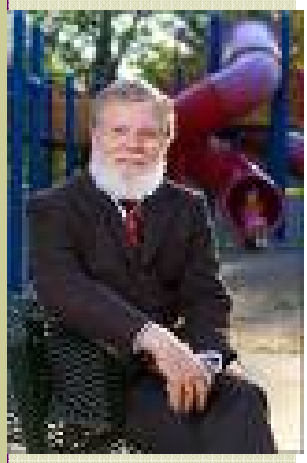
Medical Care Utilization and Costs 67

Non-Medical Expenses 68

Conclusions 69

References 70

Epilogue 72



Preface

More than 3.7 million Indiana adults are overweight or obese. The percentage of overweight or obese adults in Indiana increased from 46 percent in 1990 to 62 percent in 2005. About 30 percent of young people ages 6-19 in Indiana are overweight/obese. The percentage of Indiana high school students who are obese increased rapidly, by 30 percent between 2003 and 2005. Obesity and obesity-related diseases are far more common among the poor, African-Americans, Hispanics, and Native Americans.

Obesity contributes to earlier and more widespread disease, including diabetes, heart disease, some cancers, arthritis, problems in pregnancy and childbirth, physical disability, and many other serious health problems. Among those born in the United States in the year 2005, the lifetime risk of being diagnosed with type 2 diabetes is 30 percent among boys and 40 percent among girls, if obesity rates level off. Unless we do something about it, our children will be the first generation of Hoosiers who likely will live sicker and die younger than previous generations.

We all should be concerned about the growing obesity epidemic, even if we are not overweight or obese. Each one of us is paying the bill. Nationally, private health insurance spending for obesity-related diseases increased from $3.6 billion in 1987 to $36.5 billion in 2002. In 2000, Hoosiers spent $1.6 billion on obesity related diseases, of which $900 million was for Medicare and Medicaid. Personal health insurance premiums plus out-of-pocket health care costs are increasing markedly as a result of the epidemic, as is the tax obligation required to pay for Medicaid and Medicare programs for those who cannot afford to pay health insurance premiums. Each of us should be concerned about the consequent economic viability of the State in which we live and in which we would like our children to live.

As health insurance costs to treat medical conditions that result from obesity go up, so too do the costs of goods and services that all of our employers must pay. These costs may drive some employers under and encourage others to locate their businesses elsewhere. Furthermore, these costs may inhibit still other employers from locating in Indiana.

Continued...

We can reduce the obesity epidemic. We know what to do. We have a Governor, a State Health Commissioner, and many state leaders in the public and private sectors who are committed to do it; and a new State Plan to Reduce Obesity in Indiana. But stakeholders will need to work together toward the common goals of that Plan: health departments and health care providers; employers, health care purchasers, and health care payers; families and media; schools and the food, beverage, and physical activity industries; local, county, and state governments and colleges and universities. All of us will need to pull our fair share of the load.

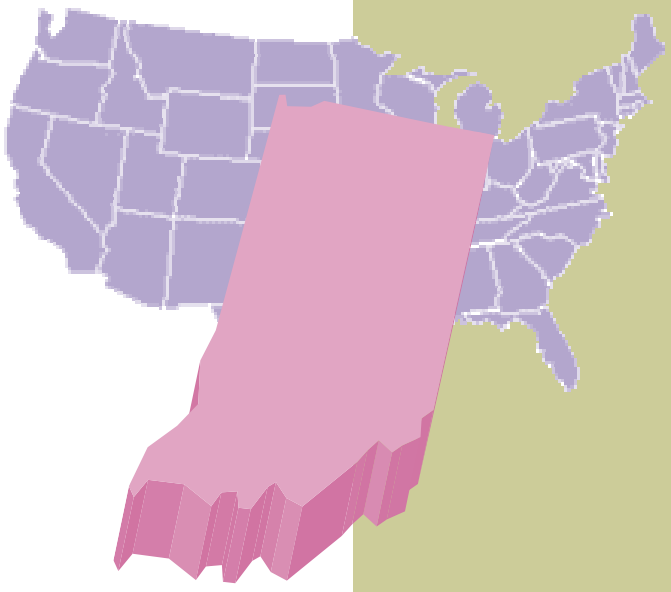
And, critically, we will need to measure our progress along the way to determine whether we are succeeding or failing; to determine how we might improve; to learn from stakeholders and counties that are making more or less progress; and to chart our way into the future. Without comparable process, outcome, and economic indicators, we will recognize neither the right direction toward our destination nor success when we achieve it. Without these indicators we may get lost, lose hope, and lose our will to carry on.

For all of these reasons, I commend to you highly *F as in Fat: How Obesity Policies are Failing in America*, a report released by Trust for America's Health in August 2006. That report and this resource guide figuratively and literally provide the foundation for all of our subsequent efforts to reduce obesity in our State. They provide the starting point for a long journey to improve the lives of our people. That journey must be successful. The stakes could not be higher.

Lloyd J. Kolbe, Ph.D.

Professor of Applied Health Science

Indiana University, Bloomington



Introduction

Indiana has been identified as tied for the **tenth most obese** state in the United States by the Trust for America's Health (TFAH) based on the state's average percent of obese adults from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System survey for 2003-2005.[1] *Overweight* and *obesity* are classifications for ranges of weight that are greater than what is generally considered healthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems.

It has been estimated that nearly **one-third of U.S. adults are obese**. Obesity is becoming a serious problem in many developing nations and thus, is no longer only a threat to the industrial world. World prevalence of obesity ranges from 5 percent in rural China to 75 percent in the adult population in urban Samoa. It has been estimated that by 2025, approximately 60 percent of deaths world-wide will be caused by circulatory diseases and cancers, for which those who are obese are at higher risk. Thus, the global obesity epidemic must be addressed.[2]

This Resource Guide presents available data related to obesity in the U.S. and Indiana. The material is divided into four major sections:

- Defining Obesity and Overweight
- Obesity and Risk Factor Profiles of Hoosiers
- Diseases and Other Health Problems Attributable to Obesity
- Economic Impact of Obesity

Data Sources Used in this Resource Guide

Limited epidemiological data related to obesity in Indiana are available from a variety of sources. Several of these sources provide valid and reliable data from questionnaires that survey a probability sample of the Indiana population. These questionnaires produce "self-reported" information. That is, the survey participants provide their weight and height when asked the questions by the interviewer, typically during a telephone interview. These answers are not verified by checking against objective measurements, so answers may be inaccurate for a variety of reasons.

For example, it is believed that respondents underestimate their actual weight, and the amount of this bias is likely related to the gender, age and race of the respondent. It is also believed that respondents slightly overestimate their actual height. However, the magnitude of this bias is likely stable over time, so a change in reported values most likely reflects a corresponding change in the actual measurements.

The following surveys are conducted in a systematic manner following protocols established by the Centers for Disease Control and Prevention (CDC) to provide state-level data on health behaviors and conditions. The results offer a valuable picture of the health choices that Hoosiers make and what they believe about their own health behaviors:

1. Behavioral Risk Factor Surveillance System;
2. Youth Risk Behavior Surveillance System; and
3. Special Supplemental Nutrition Program for Women, Infants, and Children participant nutrition risk factor data collection system.

Behavioral Risk Factor Surveillance System

Scientific research in the 1980s indicated that individual behaviors affect premature morbidity and mortality. In 1984, the CDC established the Behavioral Risk Factor Surveillance System (BRFSS) to examine health risks of adults, many of which are health behaviors. CDC developed a standard survey instrument and protocol so that results would be comparable among states. Fifteen states participated in the first survey in 1984, including Indiana. By 1994, all states were participating in the BRFSS. The BRFSS is an annual, random-digit dial telephone survey of non-institutionalized adults age 18 years and older. All data are self-reported. This survey collects annual state-level data on modifiable risk factors associated with premature death and disability. The BRFSS does not collect information on all risk factors or conditions each year. The BRFSS is administered and supported by the Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, CDC, and is an ongoing data collection program.

The 2005 Indiana Behavioral Risk Factor Surveillance Survey

Following the CDC protocol for this survey, 6,490 adults were interviewed throughout the calendar year 2005 for Indiana's BRFSS. The data from these respondents were weighted and analyzed and some of the results have been posted on the Indiana State Department of Health (ISDH) web site when the 2005 Indiana BRFSS report has been completed. This is an annual survey; however, the nutrition and physical activity modules of questions are often asked every other year. The data presented in this Resource Guide are the most currently available BRFSS data.

- For more information about the Indiana BRFSS, call ISDH at (800) 433-0746 or visit the ISDH web site:

  http://www.in.gov/isdh/dataandstats/brfss/brfss_index.htm

- Additional information about the BRFSS and national statistics can be found at the CDC web site:

  http://www.cdc.gov/brfss/index.htm

Youth Risk Behavior Survey

The Youth Risk Behavior Surveillance System (YRBSS) was established in 1990 to monitor priority health-risk behaviors that contribute substantially to the leading causes of death, disability, and social problems among youth and adults in the United States. The YRBSS comprises a series of biennial national, state, and local school surveys. These surveys poll representative samples of students in grades 9 through 12. The CDC conducts the national survey and departments of health, education, and local districts conduct the state and local surveys.

YRBS

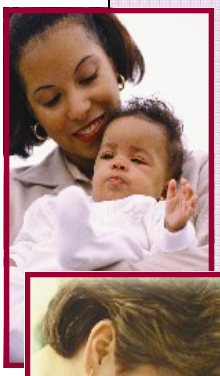
In addition to periodic surveys of special populations, the YRBSS incorporates the Youth Risk Behavior Survey (YRBS) as a regular part of this biennial national survey effort. The YRBS monitors health risks and behaviors in six categories, which are related to the leading causes of mortality and morbidity among both youth and adults. Data are collected every other year on behaviors that contribute to physical activity, nutrition, tobacco use, alcohol and other drug use, violence and injuries, and sexual behavior.

The 2005 Indiana Youth Risk Behavior Survey

During the spring of 2005, the ISDH conducted the YRBS in 53 public high schools. Weighted data were obtained from 1,528 students in grades 9 through 12. The survey participants included 797 (50.9%) males and 731 (49.1%) females. Because the survey employs a research-based method of random selection of subjects, survey results provide useful data that can be used to make important inferences about students in grades 9 through 12 statewide. Health officials can use YRBS data to monitor progress towards achieving the U.S. Department of Health and Human Services' *Healthy People 2010* objectives. YRBS data can also be used by those working with Indiana youth to establish priorities, seek grant funding, and evaluate health programs.

- For more information about the 2005 and the 2003 Indiana Youth Risk Behavior Survey results, call the Indiana State Department of Health at (800) 433-0746 or visit the ISDH web site: http://www.in.gov/isdh/dataandstats/yrbs
- Additional information about the YRBS and national statistics can be found at the CDC web site: http://www.cdc.gov/HealthyYouth/yrbs

WIC Nutrition and Risk Data



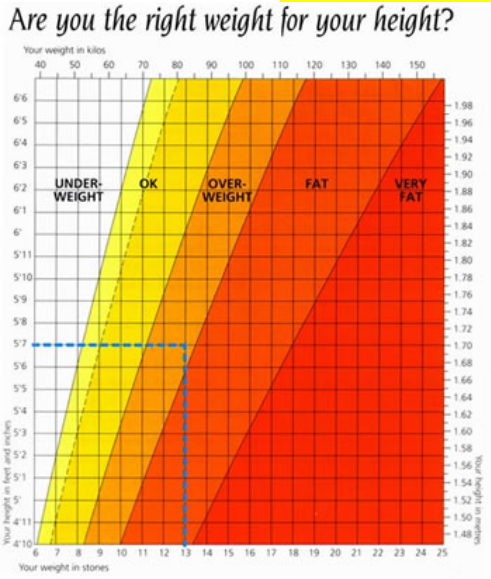
The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was established through the Child Nutrition Act of 1966. Congress funds the WIC Program through the U.S. Department of Agriculture, Food and Nutrition Services Division (USDA/FNS). These funds are distributed to states and territories based on the number of participants served. The Indiana State Department of Health receives funding to administer the WIC Program in Indiana to participants who meet certain location, income and nutritional risk criteria. Participants receive access to nutritious food, nutrition education, and referrals for medical and social services. As required by USDA/FNS, WIC collects standard data on all participants. These data include weight- and diet-related risk factors for poor birth outcomes on pregnant women, post-partum mothers, infants and young children. These data provide a profile of the obesity and overweight characteristics of this population.

Indiana School Weight and Height Collection Project

In July 2005, Indiana Governor Mitch Daniels launched **INShape Indiana,** a statewide initiative to motivate Hoosiers to make healthy choices. An important element of ensuring the success of this initiative is to collect and monitor current data on the health of Indiana's children. Since obesity puts children at greater risk for health problems like diabetes, heart disease, and high blood pressure, Indiana health stakeholders must prioritize the collection of accurate statistics on children's height and weight in order to obtain an assessment of childhood overweight and obesity. Cross-sectional, longitudinal data collection is critical to track progress over time and assess the impact of interventions to reduce overweight and obesity.

To collect this data systematically, ISDH and the Indiana Department of Education request that Indiana schools collect height and weight measurements for each student enrolled. This baseline information will allow the state to target critical areas for education and intervention to control overweight and obesity. Ideally, every student should be measured. However, measuring a minimum of 85 percent of students enrolled in each school would provide an adequate sample to enable estimates to be made for all students with confidence.

Initial data collection took place from September 2005 to May 2006. Schools submitted data to the Indiana Department of Education by utilizing the detailed instructions in the *Guidelines for Measuring Height and Weight for School Children K-12.*[3] The Department of Education sent the submitted data to the ISDH for further analysis. Individual height and weight measurement will remain confidential. This project in 2005-2006 was the first of its kind in Indiana. While tremendous support was obtained from some schools, the majority of schools decided not to participate for a number of reasons. It is expected that the participation rate will improve in future years.



Other Data Sources

This Resource Guide also provides information gathered from several data sets maintained and reported by the National Center for Health Statistics and the ISDH. These data provide generally objective and standardized information about the effects of obesity and overweight. Information on causes of death (mortality) and disease (morbidity) collected by these agencies provide useful information related to the causes and effects of obesity and overweight among Americans and Hoosiers.

Researchers, program planners, and policy-makers often need to understand how a phenomenon in Indiana compares to that same phenomenon across the United States. For many of the Indiana data sources referred to in this Resource Guide, comparative data are also available for the nation. This Resource Guide cites national health data that are collected and reported by agencies such as the CDC, the Agency for Healthcare Research and Quality (AHRQ), and the National Center for Health Statistics.

Purpose of this Resource Guide

The purpose of this guide is to help individuals and groups better understand the nature of obesity, the terms used in its study, and the reasons we must address obesity in Indiana communities. In addition, this guide provides a rich list of current statistics related to obesity in our state. These data can be used to paint a picture of the nature of the obesity problem and provide a baseline against which future results can be compared as we seek progress toward our goal of improved health through better nutrition and increased physical activity.

The data presented in this resource guide provide a foundation, but there is clearly a need to collect more detailed data to identify useful baselines for nutrition, physical activity, obesity, and related chronic diseases, particularly at the community level in Indiana and for specific sub-populations at highest risk. Although varying amounts of self-reported data regarding these issues may be available in some communities, it would be most useful if communities would collect data on nutrition and physical activity using standard methods and instruments. Where available, these data provide information by age, gender, education level, race and ethnic group. Collecting such information is often challenging due to economic and technical limitations. In addition, to assess accurately an individual's overall fitness and nutrition, many factors, both qualitative and quantitative, need to be measured.

It is expected that additional resource material will be made available to individuals and working groups when they become available to assist them in their efforts to reduce obesity in their communities.

References

1. "F as in Fat, How Obesity Policies are Failing in America." Trust for America's Health. August 2006.
2. Rigby N. "The Global Challenge of Obesity and the International Obesity Task Force." International Union of Nutritional Sciences, www.iuns.org/features/obesity/obesity.htm, October 2002.
3. "Guidelines for Measuring Height and Weight for School Children K-12." Indiana State Department of Health and Indiana Department of Education, September 2005.

Chapter 1. Defining Obesity and Overweight

The National Institutes of Health describes obesity as a complex multifactorial chronic disease that develops from an interaction of genotype and the environment. While our understanding of how and why obesity develops is incomplete, it appears to involve the integration of social, behavioral, cultural, physiological, metabolic and genetic factors.

The World Health Organization also describes obesity as a complex, multifaceted disorder and adds to its description the fact that obesity is prevalent in both developing and industrialized nations; affects children and adolescents as well as adults; and is a major risk factor for non-communicable diseases.[1] In addition, it has been argued that obesity is the "last remaining socially acceptable form of prejudice." As a result of this discrimination, the health and social factors related to obesity often overshadow the concern for the economic impact of obesity both to society and the individual.[2]

Measuring Weight Status

What does it mean to be overweight or obese? Overweight refers to an excess of body weight compared to set standards. The excess weight may come from muscle, bone, fat, or body water. Obesity refers specifically to having an abnormally high proportion of body fat. A number of methods are used to determine if someone is overweight or obese. Some are based on the relation between height and weight; others are based on measurements of body fat.

The most commonly used method today is the body mass index (BMI), which is a tool for indicating weight status for all individuals except children younger than two. An expert panel convened by the National Heart, Lung, and Blood Institute and National Institute of Diabetes and Digestive and Kidney Diseases released a report in June 1998 that provided the current definitions for overweight and obesity, which were similar to those used by the World Health Organization. The panel identified overweight as a BMI equal to or greater than 25 but less than 30, and obesity as a BMI equal to or greater than 30. These definitions, widely used by U.S. health agencies and increasingly by the broader medical and scientific communities, are based on evidence that health risks increase more steeply in individuals with a BMI equal to or greater than 25.[3]

BMI CAN BE CALCULATED BY THE FOLLOWING FORMULA:

$$\frac{\text{Weight (lbs)}}{\text{Height (in)} \times \text{Height (in)}} \times 703 = \text{BMI}$$

TO INTERPRET AN *ADULT'S* BMI, USE THE FOLLOWING TABLE:

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 -39.9	Obese
40.0 and above	Extreme Obesity

Children and teen (ages 2 to 20) BMI calculated using the standard formula, but is interpreted by using gender and age growth charts. For children and teens, BMI category is determined from the following table:

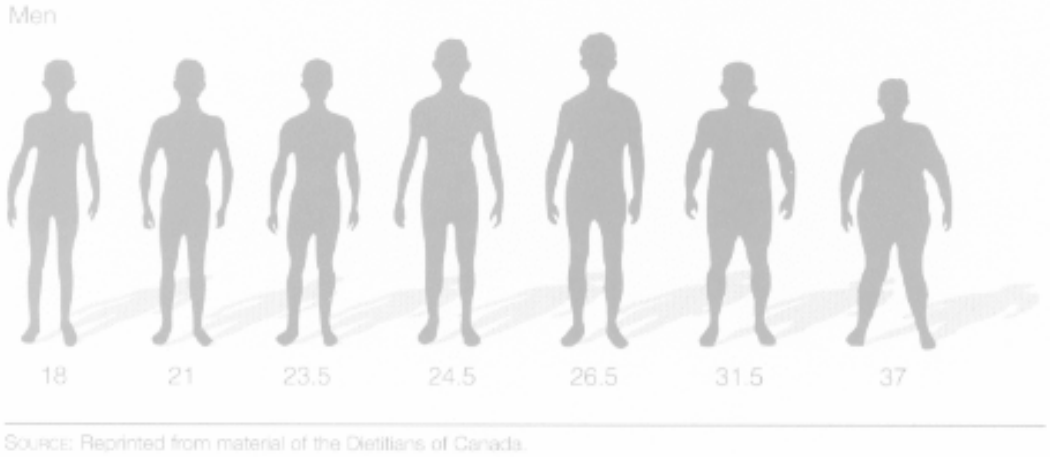
BMI	Weight Status
BMI-for-age/gender < 5th percentile	Underweight
5th percentile ≤ BMI-for-age/gender < 85th percentile	Normal
85th percentile ≤ BMI-for-age/gender < 95th percentile	At Risk of Overweight
BMI-for-age/gender ≥ 95th percentile	Overweight

Because BMI relies solely on the relation between body weight and height, it can be misleading in some cases. For example, muscle is typically denser and heavier than body fat. For those who have a higher amount of muscle mass in their body, as do many athletes, it is possible to be considered healthy and have a high BMI. In addition, women tend to have more body fat than men for the same BMI value, and older people tend to have more body fat than younger adults for the same BMI value.

Despite these inaccuracies, BMI is one of several methods traditionally endorsed for determining an individual's weight status because it is quick, easy to implement, and inexpensive to calculate. The American Academy of Pediatrics and the American Academy of Family Physicians endorse using the BMI for this type of screening.

A second common measure of weight status is waist circumference. Although it does not account for height or other physiological characteristics, it is a quick and easy measurement, useful for identifying those who may be at risk of health consequences due to being overweight or obese:

Waist Circumference	Risk Status
Men: 40 inches or less Women: 35 inches or less	Low risk
Men: more than 40 inches Women: more than 35 inches	High risk



Source: Reprinted from material of the Dietitians of Canada.

Measuring Body Fat

Methods other than BMI and waist circumference estimate more directly the amount of body fat and body fat distribution in a person's body. For these reasons, most of the methods listed below more accurately report a person's body composition. However, these tests are often expensive and not practical for determining the weight status of large populations.

Bioelectrical impedance. The body's resistance to an electrical signal is measured and analyzed to determine the amount of body fat. This method may overestimate fat in people who are dehydrated.

DEXA, Dual Energy X-Ray Absorptiometry. Low dosage x-rays of the body identify fat distribution. This method is reliable, accurate and expensive.

Girth measurement. The circumference of different parts of the body is measured, such as the right calf, the buttocks, the abdomen, or the right forearm. The exact method varies by age and gender. Measurements are entered into a formula to determine body fat.

Near Infrared Interactance. A beam of light near the infrared portion of the spectrum is sent into a bicep, and a detector measures how much light was absorbed and how much was reflected. The amount of body fat is determined by analyzing the amount of light absorption. This method was first adopted for measuring livestock and has not been fully validated for humans.

Skin fold measurements. Calipers are used to measure pinches of skin at various parts of the body. These measurements are entered into a formula to calculate body fat. This method is cheap, but research has not yet demonstrated that the amount of fat under the skin is proportional to total body fat.

Underwater weighing. A formula uses body density—measured by water displacement—to calculate body fat. The equation for determining body fat is based on Caucasians and may not be accurate for individuals of other ethnicities.

Air displacement (BOD POD). This system for measuring body fat and lean mass functions much like the underwater weighing, but uses air displacement rather than water displacement. Thus, it is generally more convenient and pleasant for the individual being measured.

References

1. World Health Organization, "Obesity, An Epidemic." www.emro.who.int/nutrition/pdf/obesity_epidemic.pdf. Geneva, 2000.

2. Stunkard AJ, Sobal J. "Psychological Consequences of Obesity" In: Eating Disorders and Obesity: A Comprehensive Handbook. Editors: Brownell KD, Fairburn CG. The Guildford Press, New York, 1995, p. 417.

3. WIN Weight-control Information Network. "Statistics Related to Overweight and Obesity." http://win.niddk.nih.gov/statistics/index/htm, October 2004.

Chapter 2. Obesity and Risk Factor Profiles of Hoosiers

National Statistics

The best available national overweight and obesity data come from the National Health and Nutrition Examination Survey (NHANES), which collects physical measurements of the heights and weights of a representative sample of Americans.[1]

From the first efforts to measure obesity at the national level in the 1960s to the most recent NHANES findings, the prevalence of overweight and obesity has steadily increased for both genders, all age groups, all racial/ethnic groups, all educational levels, and all smoking levels (Table 2.1):

- The prevalence of **overweight** and **obesity** (BMI equal to or greater than 25) increased from 44.8 (in the 1960s) to 66.2 percent in U.S. adults aged 20 to 74; and,
- The prevalence of **obesity** (BMI equal to or greater than 30) increased from 13.3 (in the 1960s) to 32.9 percent.

Table 2.1. Age-adjusted* prevalence of overweight and obesity among U.S. adults, age 20-74 years.**

Source: Prevalence of Overweight and Obesity Among Adults: United States, 2003-2004

http://www.cdc.gov/nchs/products/pubs/pubd/hestats/obese03_04/overwght_adult_03.htm#Table%201

	NHANES II (1976-80) (n = 11,207)	NHANES III (1988-94) (n = 14,468)	NHANES (1999-2000) (n = 3,603)	NHANES (2001-02) (n = 3,916)	NHANES (2003-04) (n = 3,756)
Overweight or obese (BMI equal to or greater than 25.0)	47.0	55.9	64.5	65.7	66.2
Obese (BMI equal to or greater than 30.0)	15.0	23.2	30.9	31.3	32.9

*Age-adjusted to the year 2000 U.S. Bureau of the Census estimates using the age groups 20-39, 40-59, and 60-74 years.

**NHANES II did not include individuals over 74 years of age, thus trend estimates are based on age 20-74 years.

From the 2003-2004 NHANES results, 17.1 percent of U.S. children and adolescents (age 2 to 19) were found to be overweight. Significant increases were seen for both male and female children and adolescents, from 13.8 percent in 1999-2000 to 16.0 percent in 2003-2004 for females and from 14.0 percent to 18.2 percent for males. Noteworthy increases were also found in the obesity rate for adult men, (27.5 percent to 31.1 percent) for the same time period. The prevalence of extreme obesity (BMI equal to or greater than 40) in 2003-2004 was 2.8 percent in men and 6.9 percent in women. Although the rate of obesity was higher for adult women, there was not a significant change in obesity rates in the 2003-2004 dataset compared to 1999-2000 (33.4 percent to 33.2 percent). These estimates suggest that the increases in body weight are continuing for men and young people while they may be leveling off for women.

In the 2003-2004 NHANES data, significant differences in obesity prevalence were observed by race/ethnicity and by age. Approximately 30.0 percent of non-Hispanic white adults were obese, as were 45.0 percent of non-Hispanic black adults and 36.8 percent of Mexican -Americans. Among adults aged 20 to 39 years, 28.5 percent were obese while 36.8 percent of adults aged 40 to 59 years and 31.0 percent of those aged 60 years or older were obese in 2003-2004.[2]

The Microsoft Network web site (MSN.com) developed an interactive map that illustrates the trend in obesity in the United States from 1985 to 2004:

http://health.msn.com/reports/obesity

The information shown on the map is based on BRFSS data. By 2004, all of the 50 states and the District of Columbia reporting BRFSS data had obesity rates of 15 percent or more, 43 of the 50 states had obesity rates of 20 percent or more, and nine states had obesity rates of 25 percent or more.

Trends in Obesity and Overweight in Indiana

Obesity in Indiana has been increasing at an alarming rate. Since 1990, the prevalence of obesity for adult Hoosiers has nearly doubled, from 14.5 percent to 27.2 percent in 2005 (Table 2.2, Figure 2.1). In the same period, the percent of Indiana adults considered overweight increased from 31.7 percent to 35.1 percent in 2005 (Table 2.3). The increase in obesity among Indiana adults is significant from any perspective. In 2005, approximately two thirds of Indiana adults were either overweight or obese. The 2005 BRFSS data indicate that the percent of Hoosiers who were obese increased nearly two percentage points over the previous year, while the percent who were overweight declined slightly from 36.6 percent in 2004 to 35.1 percent in 2005; however, neither change was statistically significant.

Table 2.2. Percentage of Indiana Adults with BMI equal to or greater than 30.0 (obese)

Year	%	CI
1990	14.5%	12.9-16.1
1991	15.3%	13.7-16.9
1992	14.8%	13.2-16.4
1993	17.0%	15.2-18.8
1994	17.8%	16.0-19.6
1995	18.3%	18.3-21.9
1996	18.6%	16.8-20.4
1997	21.2%	19.2-23.2
1998	19.9%	18.1-21.7
1999	19.9%	17.3-22.4
2000	21.8%	20.0-23.5
2001	24.5%	22.9-26.0
2002	24.1%	22.7-25.4
2003	26.0%	24.6-27.3
2004	25.5%	24.2-26.7
2005	27.2%	25.8-28.6

Source: CDC, BRFSS. CI = confidence interval.

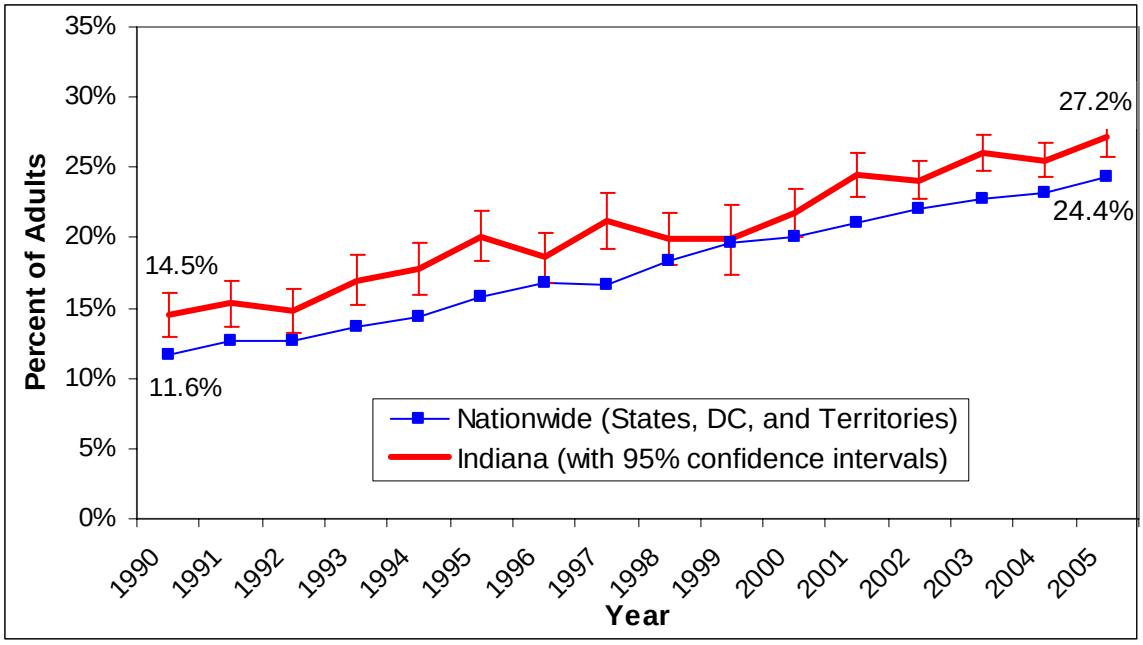
Table 2.3. Percentage of Indiana Adults with BMI equal to or greater than 25.0 and < 30.0 (overweight)

Year	%	CI
1990	31.7%	29.7-33.7
1991	34.0%	31.6-36.4
1992	35.8%	33.6-38.0
1993	34.4%	32.2-36.6
1994	36.1%	33.9-38.3
1995	36.1%	33.9-38.3
1996	36.3%	34.1-38.5
1997	35.1%	32.9-37.3
1998	36.3%	34.1-38.5
1999	36.9%	33.5-40.2
2000	36.5%	34.5-38.4
2001	35.5%	33.9-37.0
2002	37.2%	35.6-38.7
2003	35.7%	34.2-37.2
2004	36.6%	35.2-38.0
2005	35.1%	33.6-36.6

Source: CDC, BRFSS. CI = confidence interval.

Figure 2.1. Percent of Adults who are Obese (BMI equal to or greater than 30.0), Indiana 1990-2005.

Source: CDC, BRFSS Data for Indiana, 1990-2005.



According to the 2005 Indiana YRBS, 15.0 percent of students in grades 9 through 12 were overweight, a significant increase from the 2003 YRBS results of 11.5 percent, as shown in Figure 2.2 (page 24). Additionally, 2005 YRBS data indicate that another 14.3 percent of Indiana students are at risk for becoming overweight—that is, their BMI was at or above the 85th percentile and below the 95th percentile, by age and sex.

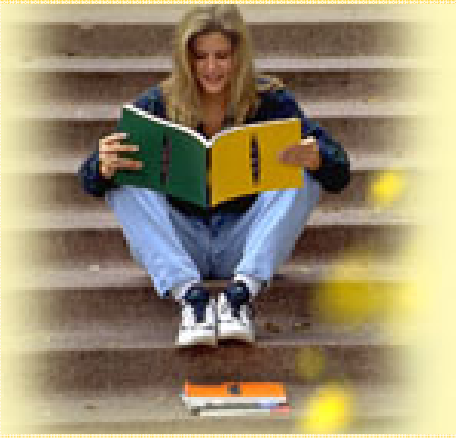
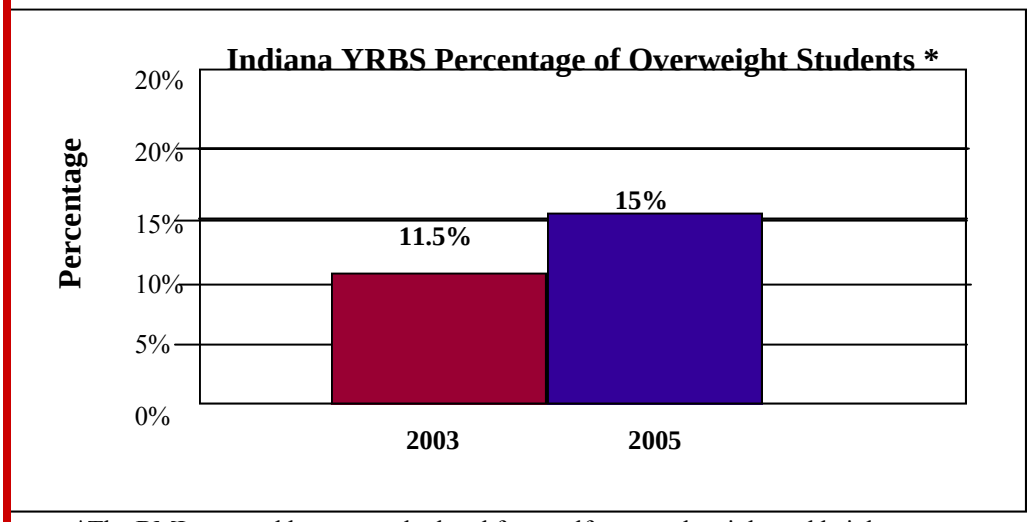
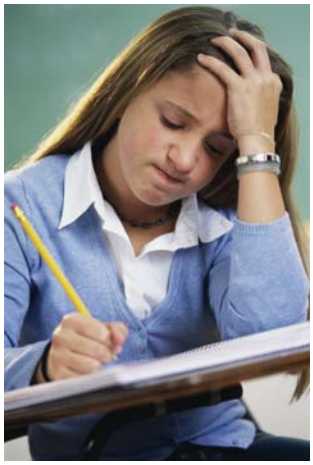


Figure 2.2. Percent of Students who are Overweight, Indiana 2003 and 2005.

Source: Indiana State Department of Health, YRBS 2003, 2005.



*The BMI reported here are calculated from self-reported weight and height data. For children, overweight is BMI at or above the 95th percentile on the growth charts, by age and sex.



YRBS results can also be used to identify trends over time. These trends are both significant and relevant to better understand obesity in Indiana from the 2003 to the 2005 Indiana YRBS. For example:

An *increase* from 11.5 percent to 15.0 percent in the proportion of students who are overweight;

A *decrease* from 20.3 percent to 15.5 percent in the proportion of students who ate five or more servings per day of fruits and vegetables during the past seven days;

A *decrease* from 21.1 percent to 16.2 percent in the proportion of students who drank three or more glasses per day of milk during the past seven days;

A *decrease* from 10.1 percent to 6.8 percent in the proportion of students who took diet pills, powders or liquids without a doctor's advice to lose weight or to keep from gaining weight during the last 30 days; and

An *increase* from 7.3 percent to 12.1 percent in the proportion of female students who did not participate in any vigorous or moderate physical activity during the past seven days.

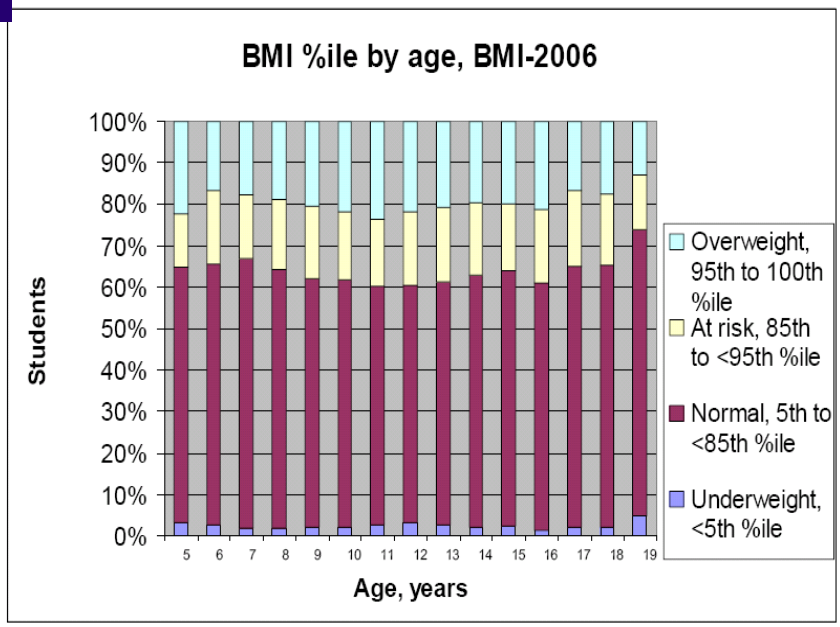
Findings from the 2005-2006 Indiana School Weight and Height Collection Program

During the 2005-2006 school year, 27 Indiana school districts outside Marion County provided weight and height data on a total of 19,109 students. Of those students measured, 2.3 percent were underweight, 60.8 percent were normal weight, 17 percent were at risk of overweight, and 19.9 percent were overweight. The *number* of students in each of the four weight classifications for each age group is shown in Table 2.4. These categories include underweight (less than 5th percentile), normal (5th to 84th percentile), at risk of overweight (85th to 94th percentile), overweight (at or above 95th percentile). The *percentage* of students in each of the four weight classifications is fairly consistent across age groups (Figure 2.3). Eleven-year-old students had the highest proportion that was overweight.

Table 2.4. Number of Students in Each BMI Classification by Age, n = 19,109.

Age (years)	Underweight (<5th percentile)	Normal (5th-84th percentile)	At Risk of Overweight (85th-94th percentile)	Overweight (95th-100th percentile)
5	3	58	12	21
6	43	1014	286	270
7	34	1132	270	309
8	33	1137	305	343
9	40	1075	317	367
10	43	1122	310	413
11	51	1067	301	438
12	52	922	286	352
13	36	801	245	282
14	26	728	210	237
15	27	678	176	220
16	13	588	172	210
17	20	617	179	163
18	19	563	153	156
19	7	101	19	19
Total	447	11,603	3,241	3,800
%	2.3%	60.8%	17.0%	19.9%

Figure 2.3 Percent of Children in Each BMI Classification by Age, n = 19,109.



Source: Indiana School Weight and Height Collection Project, 2005-06.

The findings of this project indicate that the prevalence of overweight identified through actual school weight and height measurements (19.9%) was 4.9 percent higher than the self-reported YRBS rate in 2005 (15.0%). However, due to the low school participation rate in this initial year, the findings of the Indiana School Weight and Height Collection Project may not be representative of all Hoosier youth and should be interpreted with caution.

Demographic Characteristics of the Obese and Overweight

Overweight and obesity affects all Indiana adults, regardless of race, ethnicity, income level or education. In 2005, the rate of obesity was highest for Blacks (Figure 2.4). From 2000 to 2005, the percent of adults considered obese increased for all races and ethnicities, with Hispanics experiencing the greatest increase (Figure 2.5).

Figure 2.4. Percent Overweight and Obese in Indiana by Race/Ethnicity, 2005.

Source: CDC, BRFSS Data for Indiana, 2005.

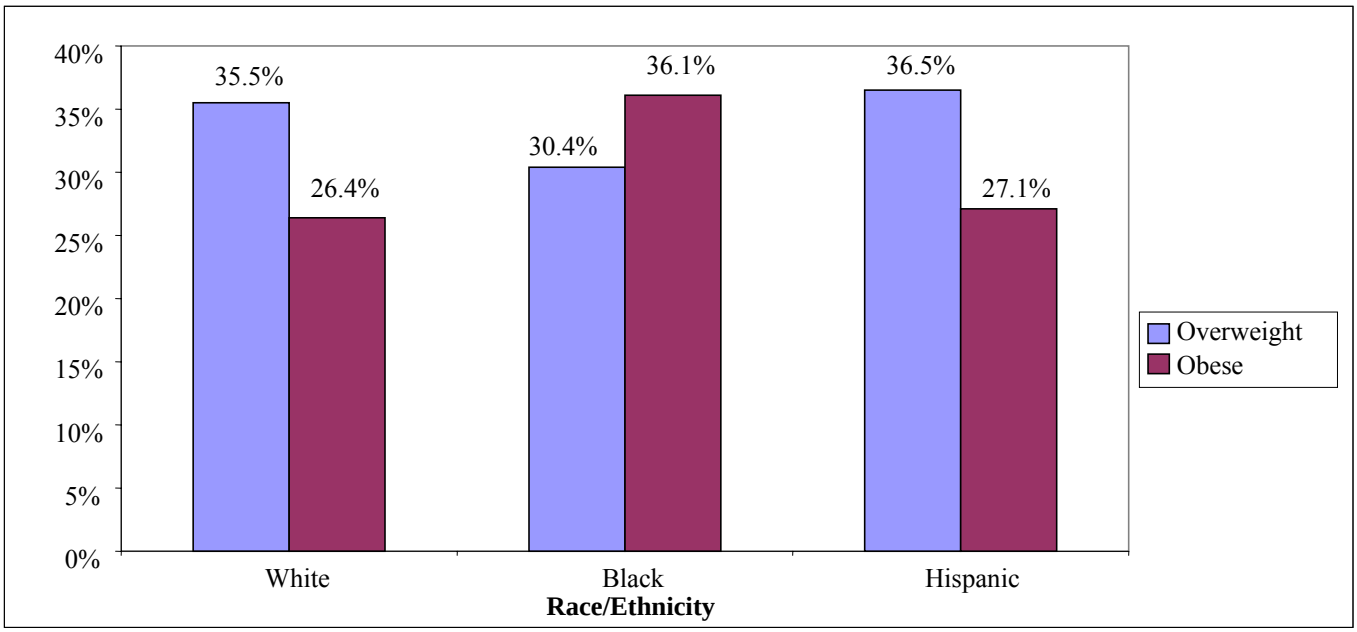
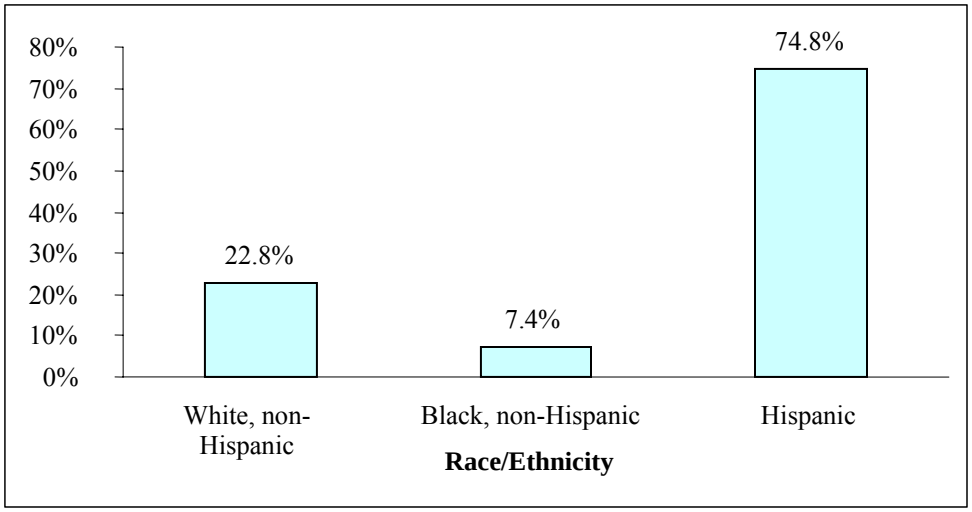


Figure 2.5. Percent Obese in Indiana: Increase from 2000-2005 by Race/Ethnicity.

Source: CDC, BRFSS Data for Indiana, 2000-2005.



In 2005, obesity and overweight was highest among those of middle age (Figure 2.6). From 2000 to 2005, the percent of adults considered obese increased for all age groups. Figure 2.7 shows the highest percent increase was for those aged 35-44, at 41.1 percent.

Figure 2.6. Percent Overweight and Obese in Indiana by Age Group, 2005.

Source: CDC, BRFSS Data for Indiana, 2005.

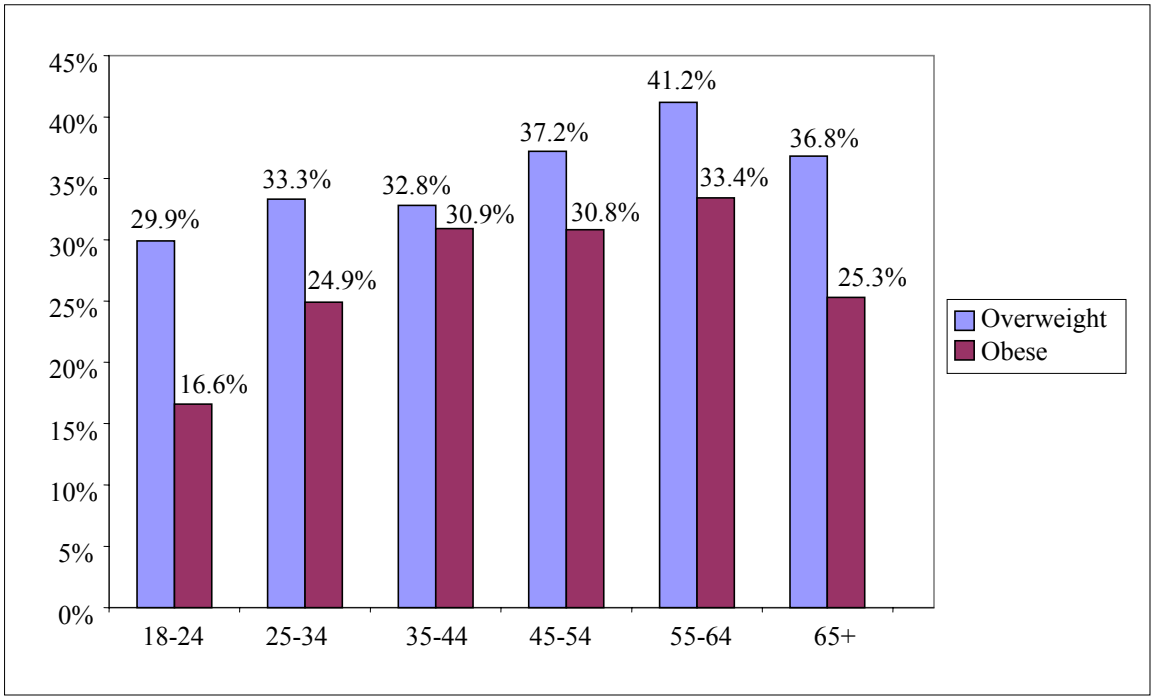
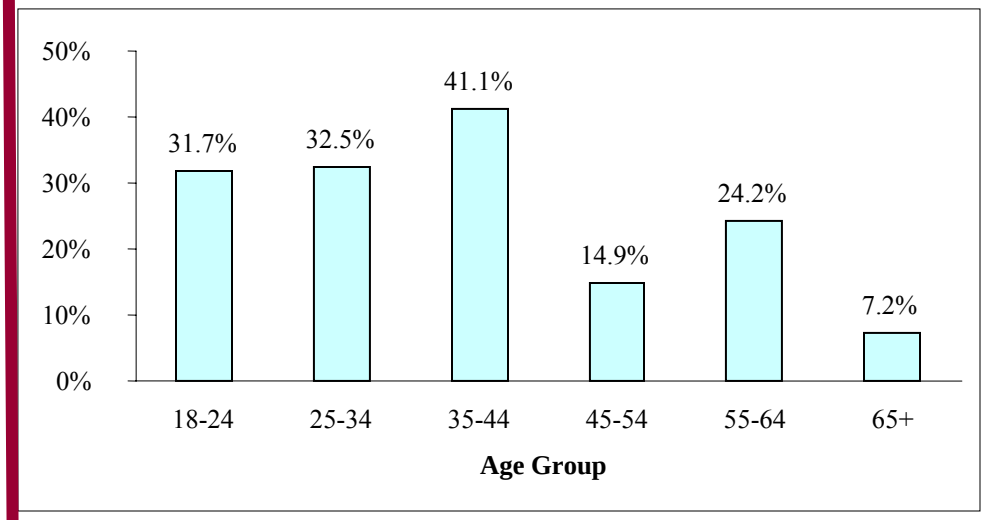


Figure 2.7. Percent Obese: Change from 2000 to 2005 by Age Group.

Source: CDC, BRFSS Data for Indiana, 2000-2005.



There was some variation in the percent of adults who were obese within income groups in 2005, from 25.6 percent ($50,000 +) to 33.0 percent ($15,000-$24,999) as shown in Figure 2.8. Those with annual incomes of $50,000 or more demonstrated the largest increase in percent who were obese, from 13.4 percent in 2000 to 25.6 percent in 2005, a 52.4 percent increase (Figure 2.9).

Figure 2.8. Percent Overweight and Obese in Indiana by Income Level, 2005.

Source: CDC, BRFSS Data for Indiana, 2005.

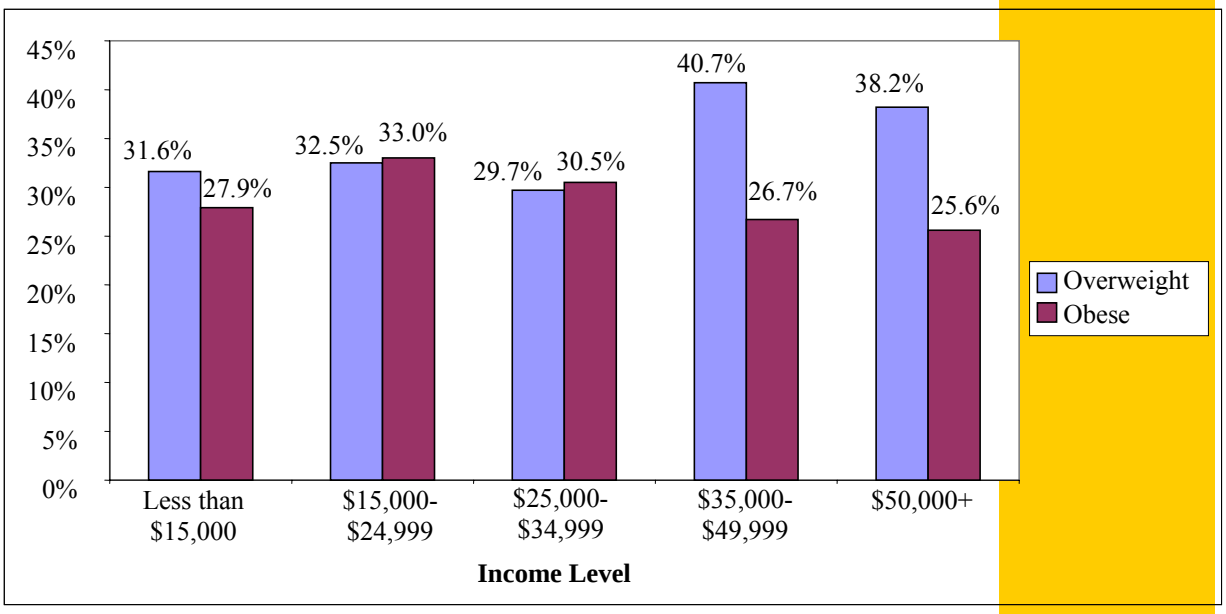
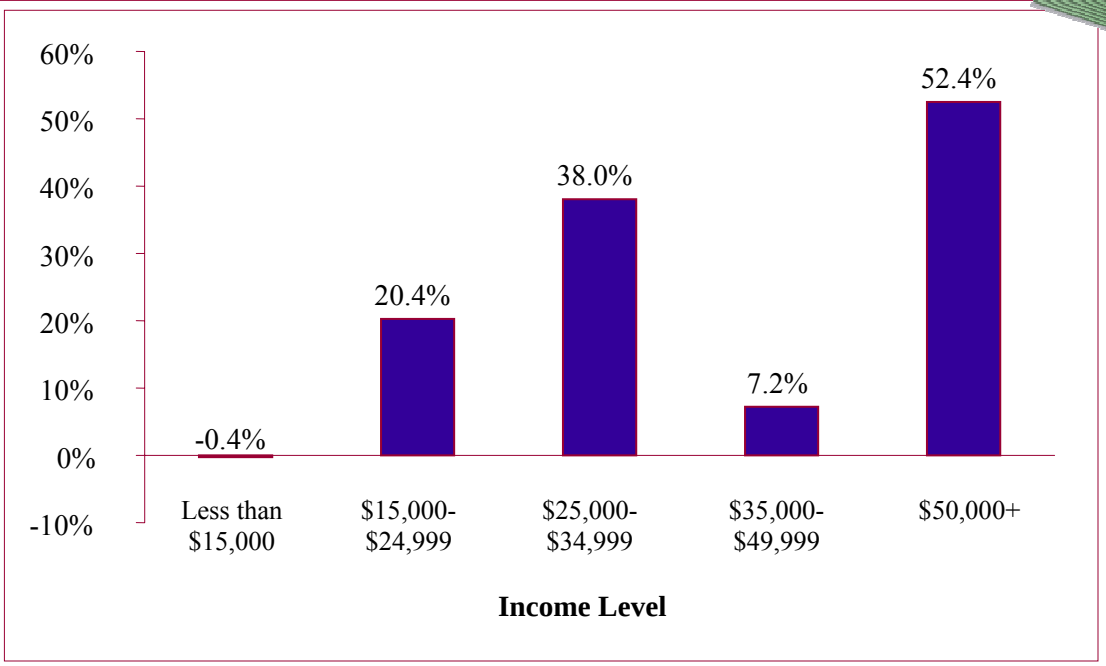


Figure 2.9. Percent Obese: Change from 2000 to 2005 by Income Level.

Source: CDC, BRFSS Data for Indiana, 2000-2005.



There was a significant difference in the percent obese among education levels in 2005, with college graduates having a significantly lower prevalence of obesity (21.8%) compared to those with lower education attainment (range of 28.8% to 30.9%) as shown in Figure 2.10. Those adults with some college or those that completed high school or their GED had the largest increases in percent obese from 2000 to 2005 (34.6 % and 27.6 %, respectively), as shown in Figure 2.11.

Figure 2.10. Percent Overweight and Obese in Indiana by Education Level, 2005.

Source: CDC, BRFSS Data for Indiana, 2005.

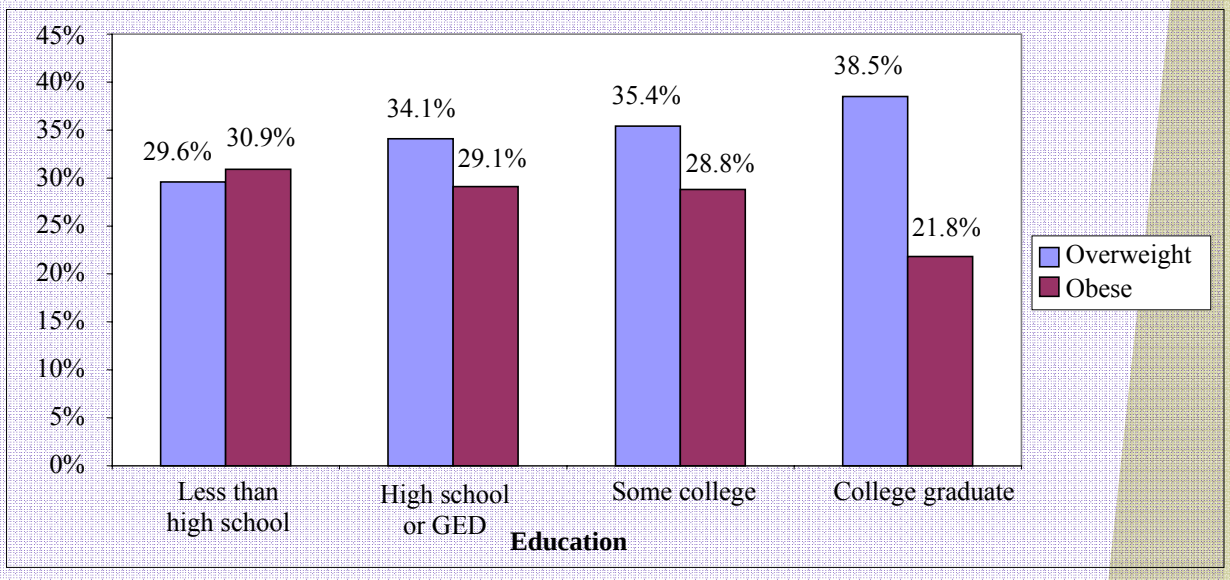
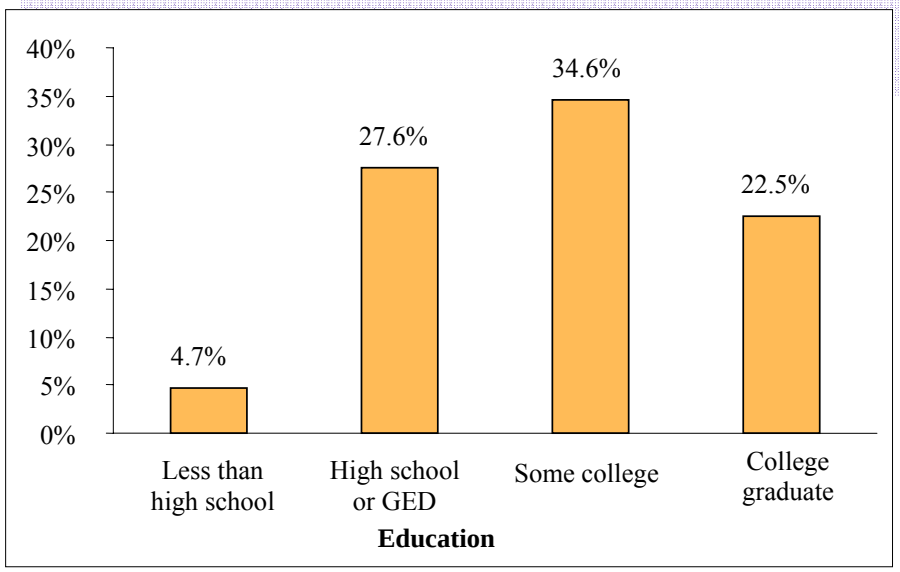


Figure 2.11. Percent Obese: Change from 2000 to 2005 by Education Level.



Source: CDC, BRFSS Data for Indiana, 2000-2005.

Demographic Risk Factors Associated with Obesity

The evidence is overwhelming that obesity is associated with debilitating and life-threatening health conditions. The questions remaining pertain to the magnitude of the effects, how the effects are produced, and which populations are most at risk. This section summarizes what is known about populations at highest risk for obesity-related health problems.

Researchers are only beginning to understand which groups are most at risk for obesity-related health problems. However, available information is often confusing and contradicting. For example, heightened risk for one factor might be seen in one gender but not in the other. For most, the risks described below are best understood as a dose-response continuum: as the magnitude of risk increases, so does the probability that the person will be overweight or obese.

It is also important to remember that belonging to one of the high-risk groups listed below does not mean that a particular individual will become obese. It means only that this individual has characteristics that increase that person's *risk* of obesity. Given the current state of knowledge about obesity, no person's real risk can be determined accurately. But for those in one or more of the high-risk groups, it would be prudent to try even harder to control weight in order to minimize risk for adverse health effects.

Genetics

It is clear from both human and animal studies that BMI is at least partially determined by a person's genetic makeup. In humans, research suggests that from 25 to 40 percent of individual differences in obesity is a result of genetics. There is currently no test to determine whether an individual has genes that predispose that person to obesity. As with most genetically linked traits, the environment plays a significant role in how a genetic predisposition to obesity is expressed, or affects an individual's life and lifestyle choices.

The genetic makeup of a population changes very slowly. Thus, environmental causes are the most likely explanation for the fast, dramatic increase in obesity over the past few decades in the United States and Indiana. Thus, even if all of your relatives are heavy, you may be able to maintain a healthy weight with good fitness and nutrition choices. Even the loss of a few pounds increases longevity, reduces adverse health risks, and improves the quality of life.

Gender

Men and women are not at equal risk of being overweight or obese. Men are more likely than women to be overweight, and women are more likely than men to be obese. What these statements mean is that a greater proportion of women than men have a "healthy" weight, but when women do exceed a BMI of 25, they tend to be obese. Men with a BMI above 25 tend to be simply overweight. Currently, there is no consensus on the cause of this disparity.

Race and Ethnicity

There are marked differences among races and ethnicities in the proportion of the population that is overweight or obese. However, these differences are not consistent when gender is considered. White females are more likely to be of healthy weight than either Black or Hispanic females. White males, on the other hand, are less likely to be of healthy weight than Black males, but more likely to be of healthy weight than Hispanic males. American Indians and Pacific-Islander Americans also tend to have higher BMIs than Whites, while Asian-Americans have on average lower BMI than the general population.

Age

The proportion of the population that is overweight or obese increases with advancing age until about the age of 75, when it begins to reverse and weight starts to drop. It is not yet clear if the increased proportion of healthy-weight persons over 75 is due to a higher death rate before age 75 in the overweight and obese subpopulation or to a change in weight status of the total elderly population.

Socioeconomic Status

Women of low educational attainment and/or income are more likely to be overweight or obese than other women. For men a similar, but weaker association has been observed between low socioeconomic status and high BMI.

Culture

Although there have been only a few studies published, it is increasingly apparent that culture influences food intake, eating patterns, and perception of ideal weight, which can affect the likelihood that someone will become overweight or obese. For some people, providing or eating food is intimately associated with expressing love or is a response to anxiety or sadness. Others grow up in cultures without role models of physical activity. Although the effects of these negative influences can be overcome, they account for at least some of the difficulty people may experience in losing weight.

A CDC focus group study conducted among 98 eighth- and ninth-grade students highlights cultural practices and beliefs that may pose barriers to achieving healthy BMI among racial and ethnic minorities:

- Mexican -American young people noted that healthy eating was not part of their culture and it was not a message they hear at home. They enjoyed eating traditional Mexican food, which is typically high in fat and high in starch. Fast food was frequently eaten because their parents worked late.
- African-American girls reported that being attractive to boys is a motivating factor in determining the weight they seek to reach.
- African-Americans and Mexican-Americans reported that being a few pounds overweight is healthy and normal. Having “meat” on their bodies and “curves” was considered normal.
- Particularly among African-American girls, having a high self-esteem was more important than optimal BMI.
- White participants perceived health as being fit and not overweight.

Overweight as a Child

Overweight children are at much higher risk of becoming overweight and obese adults. In one study, 77 percent of overweight children were obese in adulthood. The rapidly increasing prevalence of American children being overweight is thus an alarming development. Results from the 1999-2002 National Health and Nutrition Examination Survey, using measured heights and weights, indicate that an estimated 16 percent of children and adolescents ages 6-19 years were overweight. This represents a 45 percent increase from the overweight estimates of 11 percent obtained from the 1988-94 survey. Even more concerning is the 300-400 percent increase from the first survey in the 1960s where only 4 percent of 6-11 year olds and 5 percent of the 12-19 year olds were overweight.[3]

Food Intake and Eating Patterns

5-A-Day for Better Health is a national program sponsored by the CDC that recommends the consumption of at least five servings of fruit and vegetables per day. Eating less than five servings of fruits and vegetables per day is a risk factor for poor health. The 2005 Indiana BRFSS included several questions regarding fruit and vegetable consumption to provide the following information:

1. Consumption of five or more servings per day of fruit and vegetables
2. Average frequency of fruit and vegetable consumption per day

Only 22 percent of adults in Indiana are consuming the recommended daily servings of fruits and vegetables as shown in Table 2.5. Fruits and vegetables provide essential vitamins and minerals, including antioxidants that are protective against many unwanted health conditions. In addition, fruits and vegetables are naturally low in calories and fat.

Table 2.5. Percent Consuming five or More Servings per Day of Fruit and Vegetables, Indiana 2005.

	Consume 5 or More Servings per Day	Consume Less Than 5 Servings Per Day
%	22.0	78.0
CI	20.7-23.3	76.7-79.3

Source: CDC, BRFSS Data for Indiana 2005.

Based on answers to the questions regarding the frequency and type of eating fruits and vegetables, only one out of five adults is eating the recommended five or more servings of fruits and vegetables. A detailed breakdown of the responses is shown in Table 2.6.

Table 2.6. Average Fruit and Vegetable Servings per Day, Indiana 2005.

	5 or more a day	3 or 4 a day	1 or 2 a day	Never or seldom
%	22.0%	33.4%	37.6%	7.0%
CI	20.7-23.3	31.9-34.9	36.1-39.2	6.1-7.9

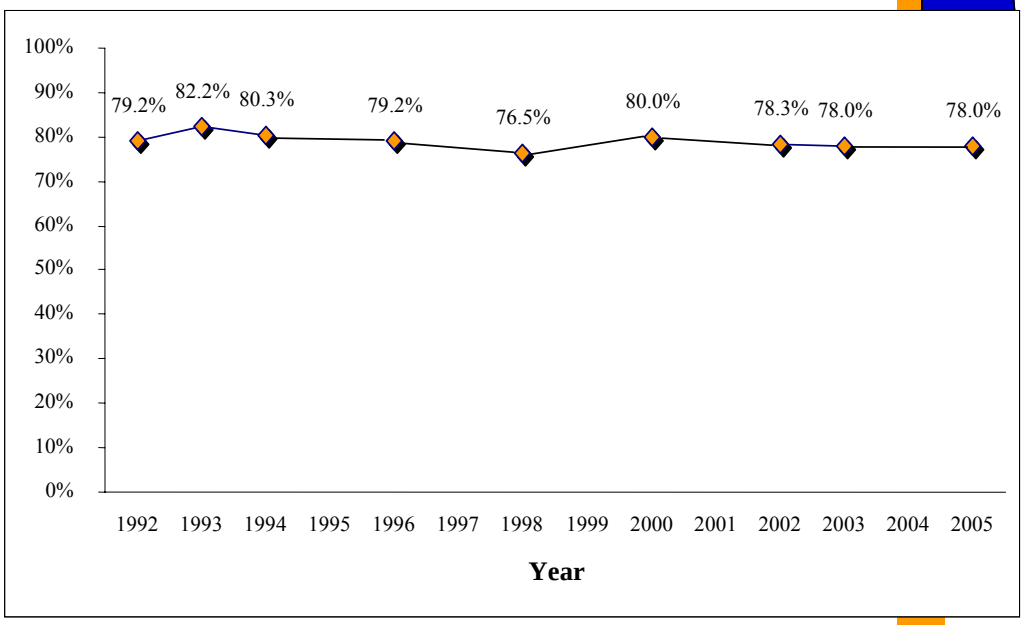
Source: CDC, BRFSS Data for Indiana 2005. CI = confidence interval.

In the Indiana BRFSS, the responses to the daily fruit and vegetable consumption question have been relatively steady from 1992 to 2005 (Table 2.7, Figure 2.12). Typically more than three of four individuals are not consuming the recommended five fruit and vegetable servings per day.

Table 2.7. Percent Consuming *Less* than five Servings of Fruits and Vegetables per Day, Indiana 1992-2005.

Year	%	CI
1992	79.2%	77.4-81.0
1993	82.2%	80.4-84.0
1994	80.3%	78.5-82.1
1996	79.2%	77.4-81.0
1998	76.5%	74.5-78.5
2000	80.0%	78.4-81.5
2002	78.3%	77.1-79.4
2003	78.0%	76.7-79.2
2005	78.0%	76.7-79.3

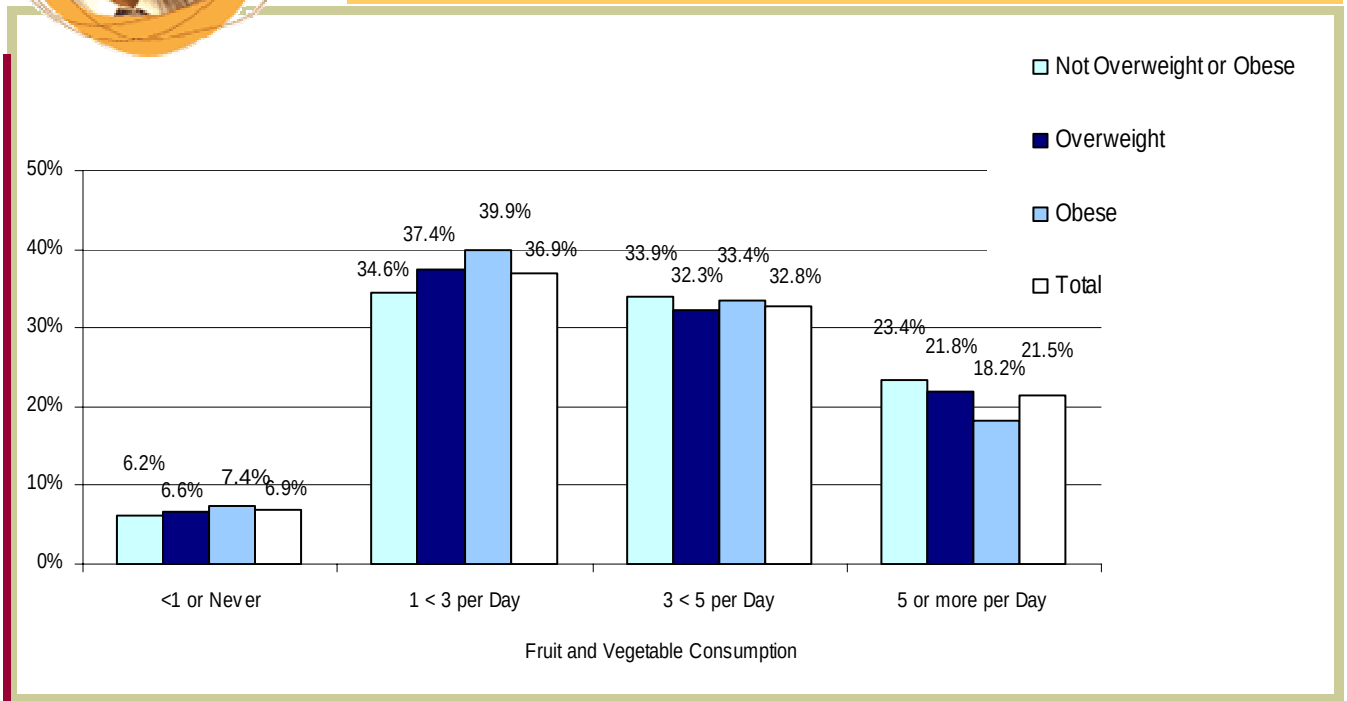
Figure 2.12. Percent of Adults who Consume Less than five Servings of Fruits and Vegetables per Day, Indiana.



Source: CDC, BRFSS Data for Indiana 1992-2005.

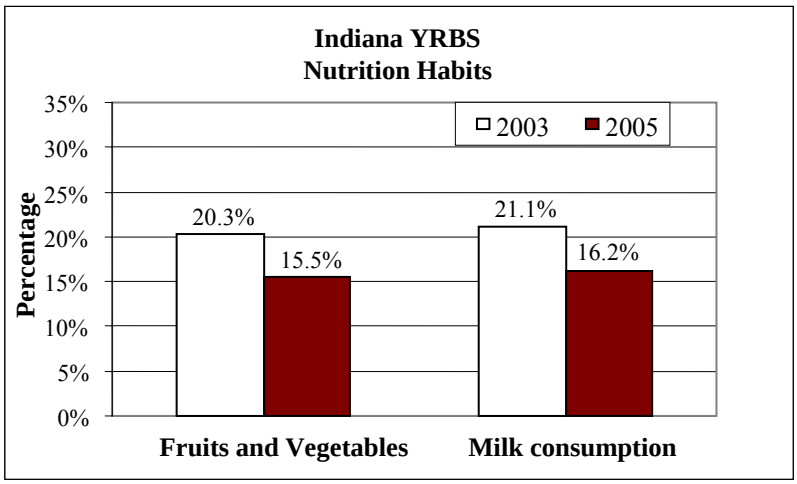
Fruit and vegetable consumption varies only slightly among those who are obese, overweight, or of healthy weight as shown in Figure 2.13. Both overall and within these subpopulations, far fewer Hoosiers than the CDC goal of 75 percent of the population consume at least five servings of fruits and vegetables daily.

Figure 2.13. Daily Fruit and Vegetable Consumption by BMI.
Source: CDC, BRFSS Data for Indiana 2005.



According to the 2005 Indiana YRBS, 15.5 percent of students have eaten five or more servings of fruits and vegetables in the past seven days, a significant decrease from the 2003 YRBS results of 20.3 percent. The survey results also indicate a significant decrease in milk consumption among Indiana high school students in 2005 (16.2 percent) from 2003 levels (21.1 percent). These values are shown in Figure 2.14.

Figure 2.14. Fruit and Vegetable Consumption and Milk Consumption among Indiana High School Students, 2003 and 2005.



Source: Indiana State Department of Health, YRBS Data for Indiana, 2003 and 2005.

In addition to questions about consumption of fruits, vegetables and milk, the YRBS includes a series of items about the consumption of specific food items as shown in Table 2.8. While it is encouraging to see that young people are eating some healthy foods, the amount is far from the recommended health guidelines, and thus it is still important to increase the number of portions being consumed per day.

Table 2.8. Nutrition: Percentage of students who during the past seven days…

YRBS Item	*Percent*		
	Male	Female	Total
…ate five or more servings of fruits and vegetables per day	17.7	13.2	15.5
…drank 100% fruit juices one or more times	79.5	77.1	78.3
…ate fruit one or more times	83.0	85.7	84.3
…ate green salad one or more times	63.4	67.3	65.3
…ate potatoes one or more times	73.2	70.8	72.0
…ate carrots one or more times	48.1	48.3	48.2
…ate other vegetables one or more times	80.8	83.9	82.3
…drank three or more glasses of milk per day	21.5	10.6	16.2

Source: Indiana State Department of Health, YRBS Data for Indiana, 2005.

Indiana WIC Program

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

The Special Supplemental Nutrition Program for Women, Infants, and Children—better known as the WIC Program—serves to safeguard the health of low-income prenatal, postpartum, and breastfeeding women (household income at or below 185 percent of federal poverty level), infants, and children up to age 5 *who are at nutritional risk* by providing nutritious foods to supplement diets, information on healthy eating, and referrals to health care.

This program captures specific weight, diet and disease information about the pregnant women, new mothers and children in the program as shown in Table 2.9. Nutritional risk factors are based on objective data such as height, weight and hemoglobin levels, as well as on self-reported data from the participant. WIC participants receive personalized food prescriptions to meet their nutritional needs. Items on the prescription include iron-fortified baby formula, milk, eggs, cheese, peanut butter, fruit juice and fortified cereal.

The Indiana WIC participant risk factor data is a valuable resource for the study of obesity and overweight and related factors among low-income pregnant women, new mothers and children in Indiana.

Table 2.9. Nutritional Risk Factors of Indiana WIC Participants, Oct. 1, 2004 through Sept. 30, 2005, by Quarter.

	Risk Factor	Prenatal	Breastfeeding Post Partum	Post Partum	Child 1-3 yr	Child 3-5 yr	Infant	Total
Q1	**111*** Overweight	3,893	2,685	4,237				**10,815**
Q2		4,231	2,736	4,188				**11,155**
Q3		3,948	2,718	4,261				**10,927**
Q4		3,316	2,574	4,102				**9,992**
	113* Overweight				1,013	2,046		**3,058**
					1,010	2,025		**3,035**
					1,018	2,027		**3,045**
					1,001	2,046		**3,048**
	114* Risk for Overweight				1,210	2,075		**3,285**
					1,228	2,087		**3,315**
					1,192	1,953		**3,145**
					1,262	2,059		**3,321**
	133* High Weight Gain	451	2,668	4,712				**7,831**
		439	2,647	4,463				**7,549**
		417	2,647	4,446				**7,510**
		419	2,538	4,389				**7,346**
	153* Large for Gestational age						1,019	**1,019**
							992	**992**
							971	**971**
					1		961	**962**
	341 Nutrient Deficient Disease	2			3	3		**8**
		2			1	2	2	**7**
		2		2	4	4		**12**
		2	2	2		4		**10**
	343 Diabetes	56	35	32	3	7	1	**134**
		70	17	54	3	10		**154**
		67	22	41	2	5		**137**
		72	25	41	3	9	1	**151**
	358 Eating Disorder	12	2	7				**21**
		19	4	5				**28**
		23	4	3			4	**34**
		13	1	7				**21**
	403 Highly Restrictive Diet	26	7	31	67	25	7	**163**
		36	5	34	51	33		**159**
		36	9	27	48	29	4	**153**
		45	8	32	68	24	2	**179**
	416 Feeding Other Foods Low in Essential Nutrition						35	**35**
							38	**38**
							55	**55**
							16	**16**
	422 Inadequate Diet	8,254	4,493	7,799	18,068	10,944	1,198	**50,757**
		8,470	4,482	7,626	18,193	11,189	1,093	**51,053**
		8,073	4,537	7,709	18,292	10,877	1,208	**50,696**
		6,993	4,333	7,482	17,137	10,564	1,135	**47,644**

Notes to Table 2.9

* Automatically assigned based on objective data. Other risk factors are assigned by WIC staff based on self-reported data.

111. Overweight. Pre-pregnancy BMI equal to or greater than 25.

113. Overweight. Children 24 months to five years and BMI equal to or greater than 95th percentile weight for stature.

114. At Risk of Becoming Overweight. Children 24 months to five years with BMI equal to or greater than 85th and less than 95th percentile weight for stature.

133. High Maternal Weight Gain. For pregnant women, a weight gain of seven or more pounds per month. For breastfeeding and non-breastfeeding postpartum women, total gestational weight gain based on prenatal BMI:

153. Large for Gestational Age. Birth weight nine or more pounds or physician diagnosis.

341. Nutrient Deficiency Disease. Diagnosis of nutritional deficiencies or a disease caused by insufficient dietary intake of nutrients. Includes but not limited to scurvy, rickets, hypocalcaemia, pellagra, Menkes disease.

Pre-pregnancy Weight Groups	Definition	Cut-off Value
Underweight	BMI < 19.8 or ≤ 90% ideal body weight (IBW)	>40 pounds
Normal Weight	BMI 19.8 to 26.0 or 91% to 120% IBW	>35 pounds
Overweight	BMI 26.1 to 29.0 or 121% to 135% IBW	>25 pounds
Obese	BMI ≥ 29.1 or ≥ 135% IBW	>15 pounds

343. Diabetes. Diabetes Mellitus.

358. Eating Disorder. Eating disorders such as anorexia nervosa or bulimia.

403. Highly Restrictive Diet. Diets that are very low in calories, severely limit intake of important food sources of nutrients or otherwise involve high-risk eating patterns.

Notes to Table 2.9 continued

416. Feeding Other Foods Low in Essential Nutrients. Infants routinely consuming foods low in essential nutrients and high in calories or caffeine-containing foods or beverages that replace or are in addition to age-appropriate, nutrient-dense foods needed for growth and development.

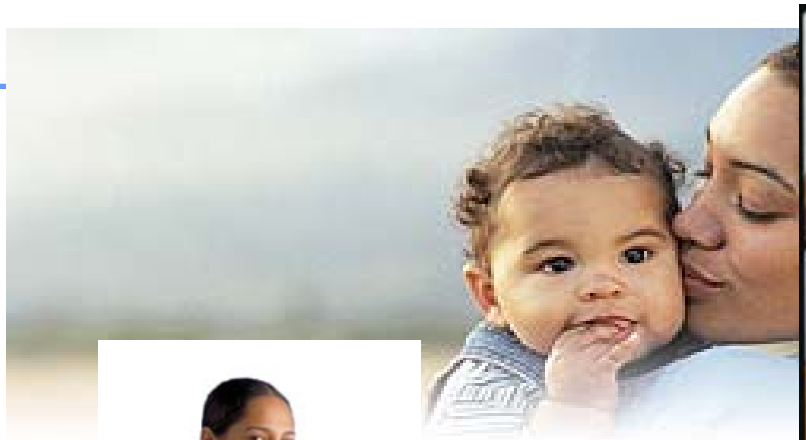
422. Inadequate Diet. For infants this may include:

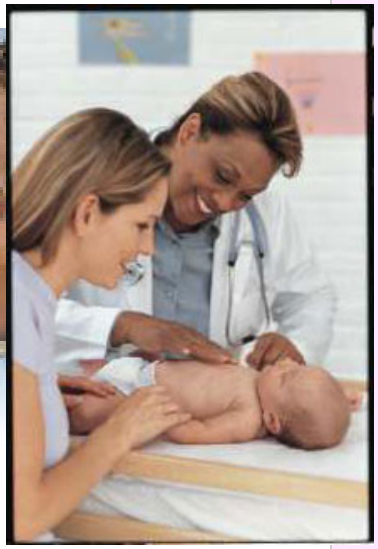
- taking cow's milk, goat's milk or low-iron formula;
- receiving inadequate amounts of approved formula;
- receiving less than 80 percent of Recommended Daily Allowance (RDA) for iron and Vitamin C and less than 100 percent RDA for calories and protein; and
- no additional solids after six months.

For exclusively breastfed infants, inadequate diet is an insufficient number of feedings.

For women and children inadequate diet may include:

- completely deficient in one food group or less than the number of servings indicated in the RDA for at least two of the food groups;
- low in both Vitamin A and Vitamin C; or
- low in Vitamin A or Vitamin C plus a low food group.





Physical Activity Patterns

For adults, the CDC's recommended physical activity guidelines are to participate in at least 20 minutes of vigorous physical activity per day for at least three days a week or at least 30 minutes of moderate physical activity per day for at least five days a week. Nearly three-fourths of Hoosiers report physical activity outside of work, a figure that has not changed much since 1998 as shown in Tables 2.10 and 2.11.

Table 2.10. During the past month, other than your regular job did you participate in any physical activities?

Source: CDC, BRFSS Data for Indiana 2005.

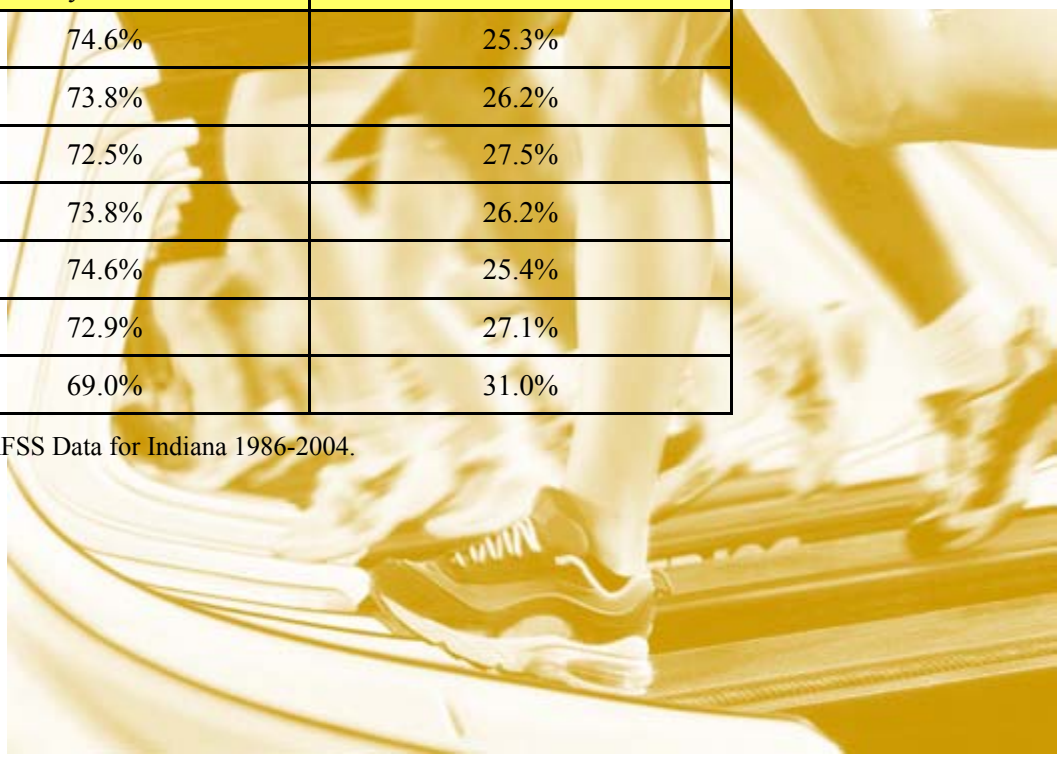
CI = confidence interval.

	Yes	No
%	73.1	26.9
CI	71.7-74.4	25.6-28.3

Table 2.11. Trend in Leisure Time Physical Activity or Exercise.

Year	Had Leisure Time Physical Activity or Exercise	No Leisure Time Physical Activity or Exercise
2004	74.6%	25.3%
2003	73.8%	26.2%
2002	72.5%	27.5%
2001	73.8%	26.2%
2000	74.6%	25.4%
1998	72.9%	27.1%
1986	69.0%	31.0%

Source: CDC, BRFSS Data for Indiana 1986-2004.



Respondents who reported doing 30 or more minutes per day of *moderate* physical activity for five or more days per week met the CDC recommended guideline for moderate physical activity. Examples of moderate physical activity include jogging, yard work, bike riding or any activity that causes an increase in breathing. Table 2.12 shows the percentage of respondents who meet the CDC recommendation for moderate physical activity.

Table 2.12. Proportion Meeting the CDC Recommended Guideline for *Moderate* Physical Activity.

Table 2.12. Proportion Meeting the CDC Recommended Guideline for *Moderate* Physical Activity.

	Meet Recommendation	Insufficient Activity	No Moderate Activity
%	34.8	49.4	15.7
CI	33.3-36.4	47.8-51.0	14.6-16.9

Source: CDC, BRFSS Data for Indiana 2005. CI = confidence interval.

Respondents who reported doing 20 or more minutes per day of *vigorous* physical activity for three or more days per week met the CDC recommended guideline for vigorous physical activity. Vigorous physical activity is described as running, backpacking, competitive sports, heavy yard work, or any activity that causes sweating, and large increases in breathing. Table 2.13 shows the percentage of respondents who met the CDC criteria for having vigorous physical activity.

Table 2.13. Proportion Meeting the CDC Recommended Guidelines for *Vigorous* Physical Activity.

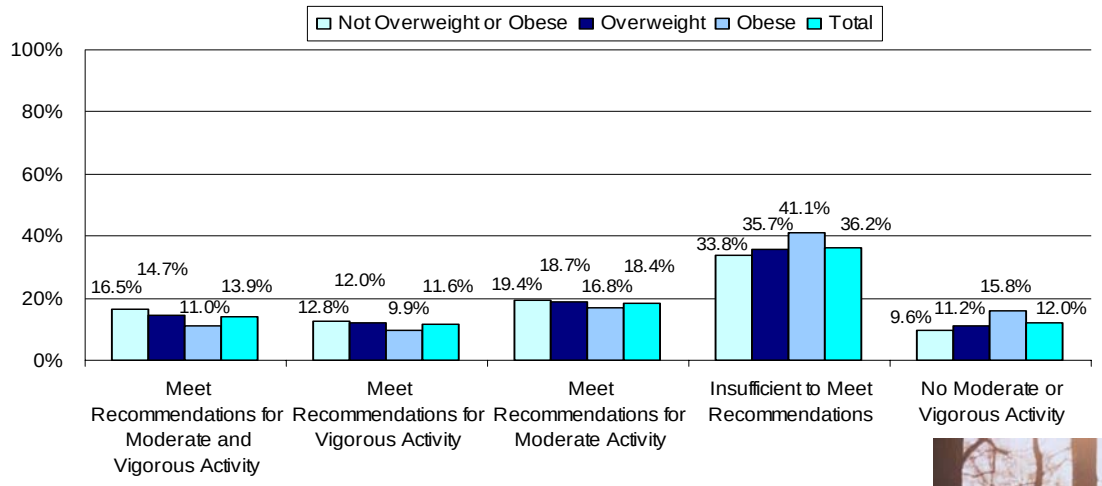
Table 2.13. Proportion Meeting the CDC Recommended Guidelines for *Vigorous* Physical Activity.

	Meet Recommendation	Insufficient Activity	No Vigorous Activity
%	27.1	21.5	51.4
CI	25.6-28.6	20.1-22.8	49.9-53.0

Source: CDC, BRFSS Data for Indiana 2005. CI = confidence interval.

Moderate and vigorous physical activities provide the best benefit for both short and long-term health. Being engaged in an active lifestyle helps to build and maintain healthy bones and muscles, controls weight, and has positive psychological benefits, while at the same time decreases the risk of developing diabetes and many chronic diseases.[4] As shown in Table 2.14 and Figure 2.15, only 13.9 percent of Indiana adults meet the recommendations for moderate and vigorous physical activity. More than one-third of all adults (36.2 percent) had insufficient activity to meet the guidelines for moderate or vigorous physical activity. Almost 13 percent of Indiana adults report no moderate or vigorous physical activity.

Figure 2.15. Overall Physical Activity Categories by BMI.



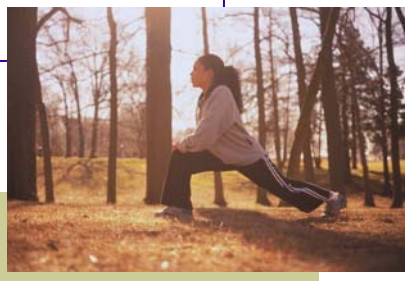


Table 2.14. Risk Factor for Meeting Recommended Guidelines for Moderate and/or Vigorous Physical Activity

	Meet Recommendations for Moderate and Vigorous	Meet Recommendations for Vigorous	Meet Recommendations for Moderate	Insufficient to Meet Recommendations	No Moderate or Vigorous Activity
Not Overweight or Obese	16.5%	12.8%	19.4%	33.8%	9.6%
Overweight	14.7%	12.0%	18.7%	35.7%	11.2%
Obese	11.0%	9.9%	16.8%	41.1%	15.8%
Total	13.9%	11.6%	18.4%	36.2%	12.0%

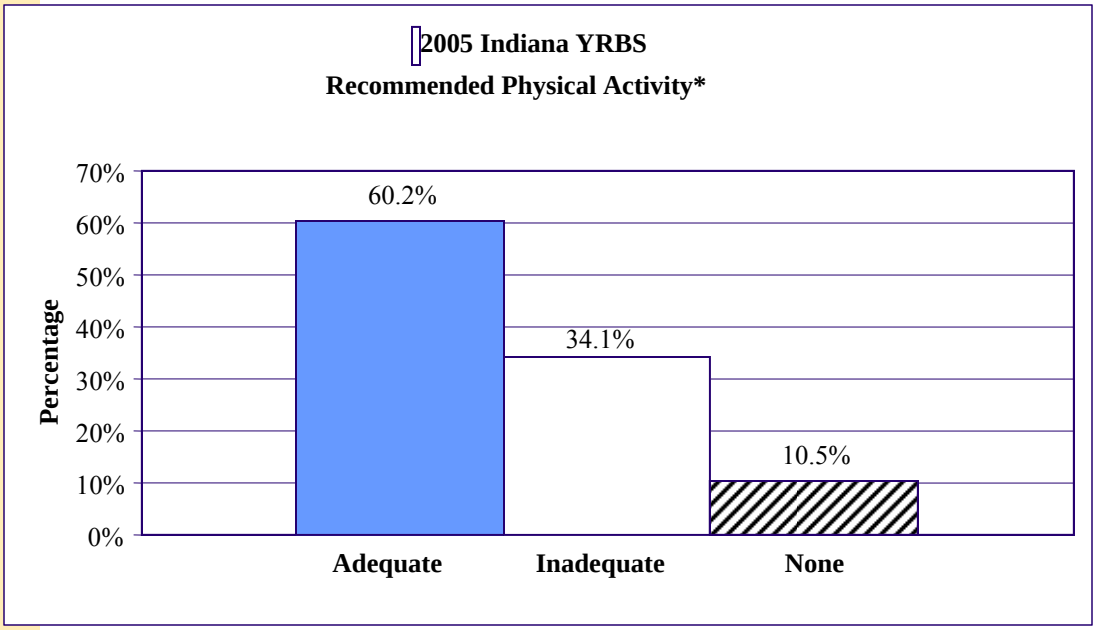
Source: CDC, BRFSS Data for Indiana 2005.

The CDC recommends that *youth* participate in at least 20 minutes of vigorous physical activity on three or more days per week or at least 30 minutes of moderate physical activity on five or more days per week.

As shown in Figure 2.16, the 2005 Indiana YRBS results indicate that 60.2 percent of Indiana high school students participate in physical activity at the recommended levels. However, 34.1 percent of students did not achieve this CDC recommendation, and10.5 percent of students did not participate in any physical activity at all.

Figure 2.16. Percent of Students Participating in Physical Activity at Recommended Levels, 2005.

Source: Indiana State Department of Health, YRBS Data for Indiana, 2005.



*** Recommended levels of physical activity are at least 20 minutes of vigorous physical activity on three or more of the past seven days or at least 30 minutes of moderate physical activity on five or more of the past seven days.**

The 2005 Indiana YRBS results also indicate a significant increase in the percentage of *female* students who did not participate in any physical activity during the past seven days (12.1 percent), when compared to the 2003 survey results (7.3 percent). Table 2.15 provides more information on all the questions asked about physical activity in the 2005 Indiana YRBS.

Table 2.15. Physical Activity: Percentage of students who…

YRBS Item	*Percent*		
	Male	**Female**	**Total**
…did *not* participate in at least 20 minutes of vigorous physical activity on three or more of the past seven days and did *not* do at least 30 minutes of moderate physical activity on five or more of the past seven days	29.1	39.2	34.1
…did not participate in any vigorous or moderate physical activity during the past seven days	9.0	12.1	10.5
…attended physical education class daily	31.2	25.1	28.2
…exercised or participated in physical activities for at least 20 minutes that made them sweat and breathe hard on three or more of the past seven days	65.7	54.6	60.2
…participated in physical activity that did *not* make them sweat or breathe hard for at least 30 minutes on five or more of the past seven days	23.6	21.8	22.7
…watched three or more hours of TV per day on an average school day	34.2	29.6	31.9
…attended physical education class one or more days during an average school week	44.5	32.7	38.7
…among those enrolled in physical education class, exercised or played sports more than 20 minutes during an average physical education class	87.7	84.9	86.5
…played in one or more sports teams during the past 12 months	60.3	57.2	58.8

Source: Indiana State Department of Health, YRBS Data for Indiana, 2005.

Weight Management

The 2003 Indiana BRFSS asked several questions regarding behaviors related to weight control. Note that these BRFSS questions do not address BMI. However, because respondents report their height and weight elsewhere in the survey, these data can be analyzed along with calculated BMI to search for useful information about weight control behaviors among healthy-weight, overweight, or obese respondents.

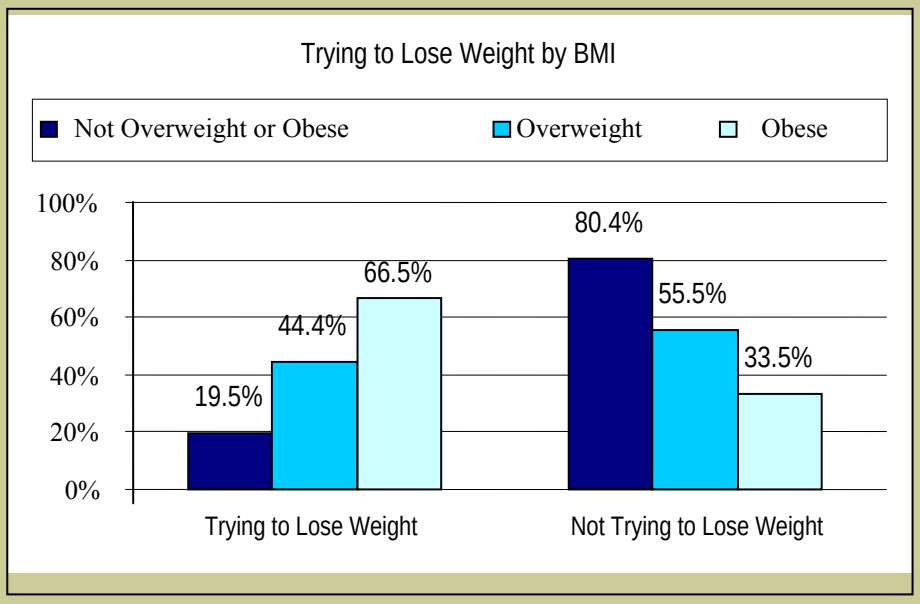
As shown in Table 2.16 and Figure 2.17, survey results indicated that 41.4 percent of all Hoosier respondents were trying to lose weight. When the responses are examined relative to BMI classification, clearly those individuals who *need* to lose weight were the ones who are trying to do so. Two thirds (66.5%) of Hoosier adults with BMI equal to or greater than 30 were trying to lose weight.

Table 2.16. Are you now trying to lose weight?

	Trying To Lose Weight	Not Trying to Lose Weight
%	41.4	58.6
CI	39.9-42.9	57.1-60.1

Source: CDC, BRFSS Data for Indiana 2003. CI = confidence interval.

Figure 2.17. Percent Trying to Lose Weight by BMI.



Source: CDC, BRFSS Data for Indiana 2003.

Respondents who are not trying to lose weight may be consciously trying to *maintain* their weight. As shown in Table 2.17, over one half of Hoosiers reported that they were intentionally trying to maintain their weight—that is, to prevent weight gain.

Table 2.17. Are you trying to maintain your current weight, that is, to keep from gaining weight?

	Trying To Maintain Weight	Not Trying To Maintain Weight
%	61.9	38.1
CI	60.0-63.9	36.1-40.0

The 2003 BRFSS survey also included a question that asked about the behaviors the adults were using to lose weight or to keep from gaining weight. Like physical activity, eating fewer calories and less fat is a good approach to losing weight and to keep from gaining weight. This is a strategy that nearly one in three Hoosiers (30.0%) reported using, as shown in Table 2.18. More than two thirds (67.5%) Hoosiers were using physical activity or exercise to control their weight as shown in Table 2.19.

Table 2.18. Are you eating fewer calories or less fat to lose weight or to keep from gaining weight?

	Eating Fewer Calories	Eating Less Fat	Eating Fewer Calories and Eating Less Fat	Not Eating Fewer Calories or Less Fat
%	18.3	23.3	30.0	28.4
CI	17.0-19.6	21.9-24.7	28.4-31.5	26.8-30.0

Table 2.19. Are you using physical activity or exercise to lose weight or keep from gaining weight?

	Using Exercise to Lose Weight	Not Using Exercise To Lose Weight
%	67.7	32.3
CI	66.1-69.3	30.7-33.9

Source: CDC, BRFSS Data for Indiana 2003. CI = confidence interval.

The majority of respondents (83.5%) reported that they have not received advice from a health professional about their weight, as shown in Table 2.20. Of those who reported that they have received advice, 13.0 percent have been advised to lose weight. Only 3.5 percent have been advised to maintain or to gain weight.

Table 2.20. In the past 12 months, has a doctor, nurse, or other health professional given you advice about your weight?

	Yes, To Lose Weight	Yes, To Gain Weight	Yes, To Maintain Weight	No
%	13.0	1.5	2.0	83.5
CI	12.0-14.0	1.13-1.87	1.61-2.39	82.4-84.6

Source: CDC, BRFSS Data for Indiana 2003.

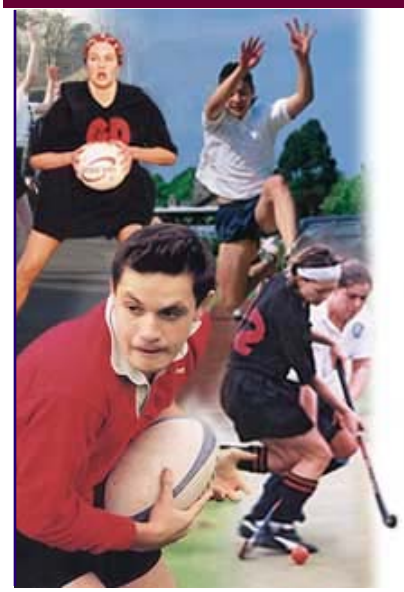
The YRBS also included some questions about young people's attitudes and behavior. Table 2.21 shows that nearly four in ten of the females (37.2%) and more than one-quarter of the males (26.9%) perceived themselves to be overweight. Interestingly, nearly twice as many of the females were trying to lose weight as perceived that they were overweight (63.1% vs. 37.2%). Slightly more males were trying to lose weight than perceived that they were overweight (30.5% vs. 26.9%). The total percent who perceived themselves to be overweight (31.9%) is similar to the percent who were overweight or at risk of being overweight based on their BMI (29.3% as discussed in relation to Figure 2.2).

Table 2.21. Weight: Percentage of students who…

Table 2.21. Weight: Percentage of students who…

YRBS Item	*Percent*		
	Male	Female	Total
…describe themselves as slightly or very overweight	26.9	37.2	31.9
…are trying to lose weight	30.5	63.1	46.5

Source: Indiana State Department of Health, YRBS Data for Indiana, 2005.



The YRBS included a question that asked about the behaviors the youth were using to lose weight or to keep from gaining weight. As shown in Table 2.22, most commonly the students were using safe strategies to lose weight or keep from gaining weight. More than one half (51.6%) of the male students and nearly three quarters (73.3%) of the female students were exercising, while more than one quarter (27.0%) of the male students and more than one half (57.2%) of the female students were eating less food, ingesting fewer calories or eating more low-fat foods. Only a few students reported unhealthy behaviors such as taking diet pills, powders or liquids without a doctor's advice, or vomiting or taking laxatives. However, this smaller group of students represents an important population who may benefit from appropriate advice and assistance.

Table 2.22. Weight Control: Percentage of students who to lose weight or keep from gaining weight during the past 30 days…

YRBS Item	*Percent*		
	Male	**Female**	**Total**
…exercised	51.6	73.3	62.3
…ate less food, fewer calories, or foods low in fat	27.0	57.2	41.8
…went without eating for 25 hours or more	7.1	17.8	12.4
…took diet pills, powders, or liquids without a doctor's advice	4.2	9.4	6.8
…vomited or took laxatives	3.7	7.3	5.5

Source: Indiana State Department of Health, YRBS Data for Indiana, 2005.

References

1. http://permanent.access.gpo.gov/lps6793/www.cdc.gov/nchs/nhanes.htm

2. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA.* 2006;295:1549-1555.

3. http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overwght99.htm.

4. Child Trends Data Bank. "Vigorous Physical Activity by Youth." http://www.childtrendsdatabank.org/indicators/16PhysicalActivity.cfm, 2003

Chapter 3. Diseases and Other Health Problems Attributable to Obesity

Health Consequences of Overweight and Obesity

A body mass index (BMI) equal to or greater than 25.0 (overweight) or equal to or greater than 30.0 (obese) increases the risk of developing many poor health conditions and diseases. Obesity may not be the direct cause of certain ailments, but it can be a contributing factor. Studies have concluded that second only to tobacco use, overweight and obesity contribute to the deaths of more Americans than any other single lifestyle behavior. More deaths each year can be attributed to obesity than to alcohol consumption, toxic agents, motor vehicle crashes, firearms, sexual behavior (including Acquired Immune Deficiency Syndrome, or AIDS), and illegal drug use combined. Individuals who are overweight or obese are at greater risk for developing:

- Coronary heart disease
- Specific cancers (endometrial, breast, prostate, gall bladder, kidney and colon)
- Hypertension
- Sleep apnea
- Asthma and other respiratory problems
- Osteoarthritis
- Gall bladder disease
- Lipid disorders (high total cholesterol, high LDL cholesterol, low HDL cholesterol, high triglycerides)
- Type 2 diabetes
- Stroke
- Complications of pregnancy

Overweight and obesity are significant contributors to deaths from:

- Heart disease
- Diabetes
- Stroke
- Cancer

In May 2006, the U.S. Surgeon General's office issued the following summary of the health consequences of obesity and overweight based a review of current research.[1]

Premature Death

- An estimated 300,000 deaths per year in the U.S. may be attributable to obesity.
- The risk of death rises with increasing weight.
- Even moderate weight excess (10 to 20 pounds for a person of average height) increases the risk of death, particularly among adults aged 30 to 64 years.
- Individuals who are obese have a 50 to 100 percent increased risk of premature death from all causes, compared to individuals with a healthy weight.

Heart Disease

- 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.
- High blood pressure is twice as common in adults who are obese than in those who are at a healthy weight.
- Obesity is associated with elevated triglycerides (blood fat) and decreased HDL cholesterol ("good cholesterol").

Diabetes

- A weight gain of 11 to 18 pounds increases a person's risk of developing type 2 diabetes to twice that of individuals who have not gained weight.
- More than 80 percent of people with diabetes are overweight or obese.

Cancer

- Overweight and obesity are associated with an increased risk for some types of cancer including endometrial (cancer of the lining of the uterus), colon, gall bladder, prostate, kidney, and postmenopausal breast cancer.
- 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.

Breathing Problems

- Sleep apnea (interrupted breathing while sleeping) is more common in obese persons.
- Obesity is associated with a higher prevalence of asthma.

Arthritis

- For every 2-pound increase in weight, the risk of developing arthritis is increased by 9 to 13 percent.
- Symptoms of arthritis can improve with weight loss.

Reproductive Complications

- Women who are overweight or obese are more likely to have complications of pregnancy.
- Obesity during pregnancy is associated with increased risk of death in both the baby and the mother and increases the risk of maternal high blood pressure by 10 times.
- Obesity during pregnancy is associated with an increased risk of birth defects, particularly neural tube defects, such as spina bifida.
- Obesity in premenopausal women is associated with irregular menstrual cycles and infertility.
- In addition to many other complications, women who are obese during pregnancy are more likely to have gestational diabetes and problems with labor and delivery.
- Infants born to women who are obese during pregnancy are more likely to be high birth weight and, therefore, may face a higher rate of Cesarean section delivery and low blood sugar (which can be associated with brain damage and seizures).

Additional Health Consequences

- Overweight and obesity are associated with increased risks of gall bladder disease, incontinence, increased surgical risk, and depression.
- Obesity can affect the quality of life through limited mobility and decreased physical endurance as well as through social, academic, and job discrimination.

Children and Adolescents

- Risk factors for heart disease, such as high cholesterol and high blood pressure, occur with increased frequency in overweight children and adolescents compared to those with a healthy weight.
- Type 2 diabetes, previously considered an adult disease, has increased dramatically in children and adolescents. Overweight and obesity are closely linked to type 2 diabetes.
- Overweight adolescents have a 70-percent chance of becoming overweight or obese adults. This increases to 80 percent if one or more parent is overweight or obese.
- The most immediate consequence of overweight, as perceived by children themselves, is social discrimination.

Benefits of Weight Loss

- Weight loss, as modest as 5 to 15 percent of total body weight in a person who is overweight or obese, reduces the risk factors for some diseases, particularly heart disease.
- Weight loss can result in lower blood pressure, lower blood sugar, and improved cholesterol levels.
- A person with a BMI above the healthy weight range may benefit from weight loss, especially if he or she has other health risk factors, such as high blood pressure, high cholesterol, smoking, diabetes, a sedentary lifestyle, and a personal and/or family history of heart disease.

Due to the major health impact of overweight and obesity, the Healthy People 2010 Objectives for the United States include six objectives specifically related to this issue, as shown in Table 3.1.[2] Communities are advised to use these targets where feasible to direct their activities.

Table 3.1. Healthy People 2010 Objectives Related to Overweight and Obesity.

Number	Objective
12-11	Increase the proportion of adults with high blood pressure who are taking action (for example, losing weight, increasing physical activity, and reducing sodium intake) to help control their blood pressure from ***82 to 95 percent.***
19-1	Increase the proportion of adults who are at a healthy weight from ***42 to 60 percent***.
19-2	Reduce the proportion of adults who are obese from ***23 to 15 percent***.
19-3	Reduce the proportion of children and adolescents who are overweight or obese from ***11 to 5 percent***.
22-1	Reduce the proportion of adults who engage in no leisure-time physical activity from ***40 to 20 percent***.
22-2	Increase the proportion of adults who engage regularly, preferably daily, in moderate physical activity for at least 30 minutes per day from ***15 to 30 percent***.

Table 3.2 shows the prevalence of specific conditions in Indiana and in the U.S. for which obesity is a known risk factor. These are not mortality rates. The percentage of each condition that can be attributed to obesity is not known; however, experts agree that reducing the percentage of individuals who are overweight or obese would greatly reduce the prevalence of these conditions. Generally, the prevalence for each condition is higher in Indiana than in the U.S. This trend is not surprising since the rate of obesity is higher for Indiana than in the general U.S. adult population.

Table 3.2. Prevalence of Disease Conditions, Indiana and U.S. 2004.

Disease Condition	Indiana[2] %	U.S. [1] %
Hypertension	26.2	25.5
Diabetes mellitus	8.3	7.3
Arthritis	29.3	27.0
Coronary Heart Disease	4.8 [5]	6.4 [2]
High Cholesterol	38.0	35.6
a) High LDL		39.5 [3]
b) Low HDL		22.6 [3]
Stroke	2.6	2.6 [2]
Asthma	12.7	12.6
a) Ever had	12.7	12.6
b) Still have (current)	8.2	8.0
Cancers		
a) Breast Cancer		1.2 [2]
b) Prostate Cancer	3.7[5]	1.9 [2]
Gestational Diabetes	1.0	0.8
Pre-eclampsia	2.3 [4]	

References

1. 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, 2005, unless otherwise noted.

2. Lethbridge-Cejku M, Rose D, Vickerie J. Summary health statistics for U.S. Adults. National Health Interview Survey, 2004. National Center for Health Statistics. Vital Health Stat 10(228). 2006.

3. Thom et al. Heart Disease and Stroke Statistics-2006 Update: A Report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Circulation 2006; 113: e85-e151. Available at http://circ.ahajournals.org/cgi/reprint/113/6/e85

4. Indiana State Department of Health. 2004 Indiana Natality Data. Epidemiology Resource Center, Data Analysis Team.

5. 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, 2004.

As was the case for morbidity, shown in the previous table, Table 3.3 shows that the age adjusted mortality rates for the conditions for which obesity is a known risk factor are generally higher in Indiana when compared to the U.S. as a whole. Of the 55,474 deaths of Indiana residents in 2003, only 879 (1.6%) had obesity listed as an underlying cause or contributory cause. In these cases, obesity was a specific cause of death that the physicians felt certain listing on the death certificate. Undoubtedly many more deaths for the causes listed in this table were likely at least partially attributable to obesity.

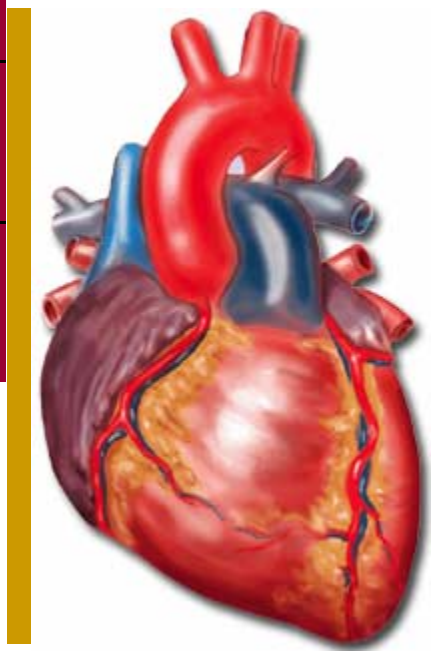
Table 3.3. Age-Adjusted Mortality Rates, Indiana and U.S. 2004.

Disease Condition	Indiana [2]	U.S. [1]
	Rate per 100,000	Rate per 100,000
Total Deaths from All Causes	849.5	801.1
Heart Disease	227.7	217.5
Coronary Heart Disease	149.7	159.8
Stroke	53.8	50.0
Diabetes mellitus	26.3	24.4
Breast Cancer	13.6	13.6
Colorectal Cancer	19.9	17.9

References

1. Centers for Disease Control and Prevention (CDC). National Center for Health Statistics, Division of Vital Statistics, National Vital Statistics Reports, Volume 54, Number 19, Table 2, June 28, 2006. Available at http://www.cdc.gov/nchs/data/nvsr/nvsr54/nvsr54_19.pdf

2. Indiana State Department of Health, Table 1, Epidemiology Resource Center, Data Analysis Team. Available at http://www.in.gov/isdh/dataandstats/mortality/2004/table01/tbl01_00.htm



Hospital Discharge Data for Indiana, 2004

Obesity is a known risk factor for many diseases that often produce serious health consequences and hospitalization. Not all hospitalizations for a primary diagnosis of obesity-related disease are actually attributable to obesity, but reducing obesity rates would likely result in reductions in the rate of hospitalizations for these conditions, shown in Table 3.4.

Table 3.4. Hospitalization Rates for Selected Disease Conditions in the U.S. 2004.

	U.S. [1]	
	Percent of discharges	Mean length of stay (days)
Colorectal cancer	0.4	9.0
Esophageal cancer	0.0	10.0
Breast cancer	0.2	2.7
Prostate cancer	0.2	3.4
Bladder cancer	0.1	5.7
Diabetes mellitus without complications	0.1	2.9
Diabetes mellitus with complications	1.3	5.4
Anemia	0.7	4.2
Major depressive disorder, single episode	0.4	6.4
Major depressive disorder, recurrent episode	0.6	7.2
Neurotic depression	0.0	5.0
Diseases of the heart	12.7	4.1
Hypertension	0.8	4.7
Cerebrovascular disease	2.4	5.1
Asthma	1.1	3.4
Osteoarthritis	1.7	3.8

References

1. Agency for Healthcare Research and Quality (AHRQ). Statistics for U.S. hospital stays, multi-level clinical classification software diagnoses, 2004. Available at http://hcup.ahrq.gov/HcupNet.asp?Id=B287A973806E5B37&Form=SelDXPR&JS=&Action=%3E%3ENext%3E%3E&_DXPR=PreRunDCCHPRE.

In addition to likely reductions in hospitalizations for obesity-related disease, reducing overweight and obesity in Indiana would clearly reduce hospitalizations for obesity diagnoses. In 2004, 2,366 Hoosiers were hospitalized for a principal diagnosis that contained the word "obesity." More than 97 percent of these patients were diagnosed with morbid obesity. The rest were scattered in 10 other categories. More than 98 percent of the procedures associated with these patients involved surgeries of the stomach to promote weight loss.

Self-reported Morbidity

The BRFSS for 2001, 2003, and 2005 collected information that helps to indicate the severity or prevalence of chronic diseases or pre-disposing conditions, such as cardiovascular disease, stroke, hypertension, and high cholesterol. These indicators are relevant to understanding and analyzing obesity in Indiana.

Tables 3.5 to 3.7 and Figure 3.1 show the responses to questions about whether survey participants have ever been diagnosed with specific cardiovascular diseases. Few responded that they had been diagnosed with these conditions. In Table 3.5 and Figure 3.1, the responses are shown by weight status. Clearly, those who were more overweight were more likely to indicate that they had been diagnosed with a form of cardiovascular disease.

Table 3.5. Cardiovascular Disease by BMI 2005.

	Not Overweight or Obese	Overweight	Obese	Total
Diagnosed with Heart Attack	3.3%	6.0%	6.4%	5.0%
Diagnosed with Coronary Heart Disease	3.5%	4.5%	7.3%	4.8%
Diagnosed with Stroke	1.9%	3.0%	2.9%	2.6%

Figure 3.1. Cardiovascular Disease by BMI 2005.

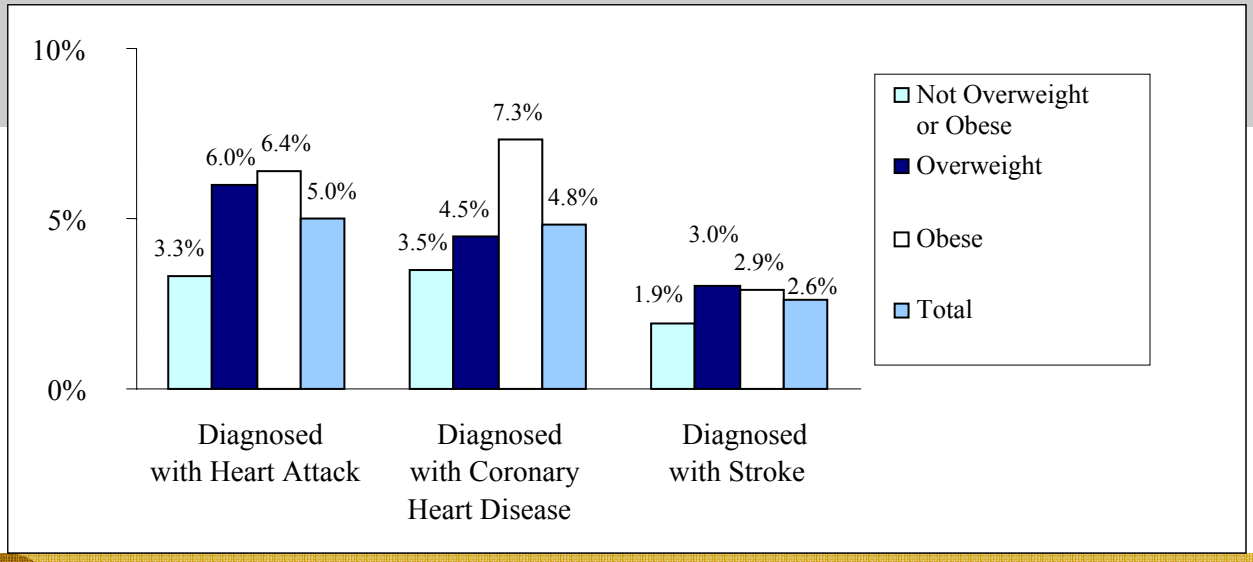


Table 3.6. Has a doctor, nurse or other health professional told you that you had a heart attack or myocardial infarction?

	Yes	No
%	5.0%	95.0%
CI	4.4-5.6	94.4-95.6
Source: CDC, BRFSS Data for Indiana 2005.		

Table 3.7. Has a doctor, nurse or other health professional ever told you that you had a stroke?

	Yes	No
%	2.6%	97.4%
CI	2.1-3.0	97.0-97.9
Source: CDC, BRFSS Data for Indiana 2005.		

Table 3.8. Have you ever been told by a doctor that you have diabetes?

	Yes	Yes, pregnancy-related	No	No, pre-diabetes or borderline
%	8.3%	1.0%	89.7%	1.0%
CI	7.6-9.1	0.7-1.2	88.8-90.5	0.7-1.3
Source: CDC, BRFSS Data for Indiana 2005.				

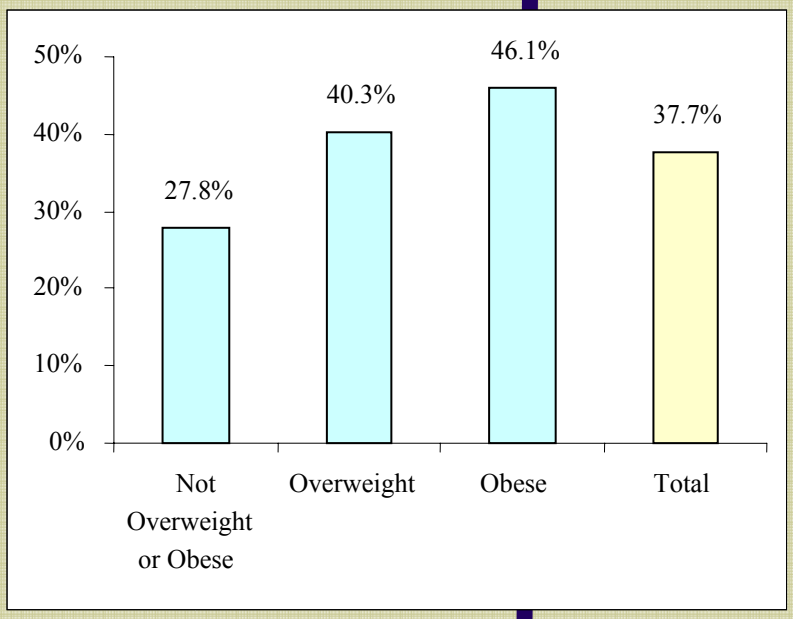
Another question on the BRFSS questionnaire inquired whether respondents had their cholesterol checked and whether a health professional had told them that their cholesterol was high. If the answer to both questions was "yes," then the individual was classified as being at risk of having high cholesterol. Over one third (37.7%) were in the at-risk group, as shown in Table 3.9 and Figure 3.2, which also shows the percentage of individuals at risk of having high cholesterol by BMI category. The data show that the percentage increases as individuals are more overweight.

Table 3.9. At Risk for High Cholesterol* by BMI.

Not Overweight or Obese	27.8%
Overweight	40.3%
Obese	46.1%
Total	**37.7%**
Source: CDC, BRFSS Data for Indiana 2005.	

Figure 3.2. At Risk for High Cholesterol* by BMI.

Source: CDC, BRFSS Data for Indiana 2005.



* Had cholesterol checked and was told high by doctor, nurse, or other health care professional.

Respondents were also asked if they had ever been told by a health professional that they had high blood pressure. Over one quarter (26.1%) indicated that they had been told. Table 3.10 shows the percentage of respondents who had been told that they had high blood pressure within each of the weight status categories. There appears to be a strong relationship between weight status and having high blood pressure. The rate of high blood pressure was almost three times higher for respondents in the obese group (40.8%) compared to those who were not overweight or obese (15.2%).

Table 3.10. At Risk for High Blood Pressure* by BMI.

Not Overweight or Obese	15.2%
Overweight	26.5%
Obese	40.8%
Total	**26.1%**

Source: Indiana State Department of Health, BRFSS 2005.

* Ever told one has high blood pressure by doctor, nurse, or other health care professional.

References

1. **http://www.surgeongeneral.gov/topics/obesity/calltoaction/fact_consequences.htm**
2. **http://www.healthypeople.gov/LHI/Priorities.htm**

Chapter 4. Economic Impact of Obesity

Introduction

Obesity is not only a global public health problem but also a major economic and social phenomenon with negative consequences. As the prevalence of obesity increases, so does the incidence of obesity-related diseases. As a result of the increasing prevalence of obesity in the United States, obesity now accounts for approximately 300,000 deaths per year, second only to tobacco. Nearly two-thirds of Americans are either overweight or obese and the prevalence has increased by 12 percent and 70 percent respectively over the past decade. This trend is even more alarming given the association between obesity and many chronic diseases such as cardiovascular disease, coronary heart disease, stroke, type 2 diabetes, certain cancers (endometrial, post menopausal breast, kidney, colon and other hormone-dependent and gastro-intestinal cancers), musculoskeletal disorders, sleep apnea, and gallbladder disease, as well as psychological problems resulting in an overall lower quality of life.[1] Several studies have shown that the rapid increase in body weight is associated with a commensurate increase in obesity-related medical expenditures.[2, 3, 4, 5]

For the most part, health providers and payers are not consistently providing services or coverage of services that address the problem of obesity. One reason may be that medically managed weight reduction programs have not been proven to be very effective with participants often returning to unhealthy weight and lifestyle choices once the program has ended. Secondly, policy makers may not be fully aware of the economic consequences of obesity.[6]

The purpose of this chapter is to address the second reason by providing a review of recent studies estimating the economic consequences of obesity in the United States and, to the extent possible, within Indiana, so that policy makers can better understand the "economic costs of obesity."

Methods

Many studies attempting to estimate the economic costs of specific diseases (diabetes or heart disease, for example) or individual lifestyles and related behavioral risk factors (obesity, smoking, exposure to second-hand smoke, or alcohol use) use the cost-of-illness (COI) methodology. The purpose of COI is to identify and measure all direct costs attributable to a disease and often the indirect costs, such as losses in productivity or premature death. These cost estimates are used to measure the monetary impact of a specific disease and establish priorities for future resource allocation.

COI studies generally take one of two approaches. One is a *prevalence-based study,* which estimates the total cost of a disease for a given year. Another is an *incidence-based approach,* which estimates the lifetime costs of a disease from the time when first diagnosed and is more complex and resource-intensive. Both approaches estimate direct, disease-specific, health-care related costs and may include preventive, diagnostic and treatment costs. Occasionally, these studies also address secondary costs related to lost productivity or premature mortality. Morbidity costs can be thought of as the value of lost income from decreased productivity, restricted activity, absenteeism, and bed-rest days. Mortality costs generally refer to the value of future lost income resulting from premature death. These "costs" are obviously more difficult to quantify in monetary terms.

Less often do these studies address the indirect costs related to morbidity and mortality, such as the time that the individual suffers from pain and discomfort as a result of the disease. For the most part, prevalence-based COI studies are used to estimate a national, disease-specific economic burden.[7]

National Health, Social, and Economic Costs of Obesity

Much has been published about the economic consequences of obesity. A recent (Sept. 19, 2005) Internet search resulted in over 1,570,000 matches using search words "economic costs" and "obesity." The text found on the next page summarizes the most relevant and recent findings documenting the impact of obesity on annual medical expenditures that were obtained from this search.

Obesity Costs in Relation to Co-Morbidities

In 1999, the Lewin Group examined the costs of 15 conditions and diseases that were causally related to obesity as summarized in Table 4.1. For each disease, the percentage of the total cost related to obesity was determined through a review of the scientific literature. The results were an estimate of the annual direct health care costs due to obesity.[8]

Table 4.1. Direct Cost of Disease Attributed to Obesity.

Disease	Direct Disease Cost Attributed to Obesity (millions)	Direct Cost of Disease (millions)	Percent of Cost Attributed to Obesity
Arthritis	$7.4	$23.1	32%
Breast Cancer	$2.1	$10.2	21%
Heart Disease	$30.6	$101.8	30%
Colorectal Cancer	$2.0	$10.0	20%
Diabetes (Type 2)	$20.5	$47.2	43%
Endometrial Cancer	$0.6	$2.5	24%
ESRD	$3.0	$14.9	20%
Gallstones	$3.5	$7.7	45%
Hypertension	$9.6	$24.5	39%
Liver Disease	$3.4	$9.7	35%
Low Back Pain	$3.5	$19.2	18%
Renal Cell Cancer	$0.5	$1.6	31%
Obstructive Sleep Apnea	$0.2	$0.4	50%
Stroke	$8.1	$29.5	27%
Urinary Incontinence	$7.6	$29.2	26%
TOTAL DIRECT COST	$102.2	$331.4	31%

Nearly one-third (31%) of the total annual direct cost to provide medical care to patients with any of the 15 diseases listed above was directly attributable to obesity. That is, $331.4 million dollars was expended on treatment for these patients and of that amount, $102.2 million was directly attributable to obesity.

Until Finkelstein, Fiebelkorn and Wang's study was published in 2004, there were no published estimates of the economic impact of obesity-attributable disease expenditures at the individual state level.[9] Using an approach that has been used in the past to measure state-level medical expenditures for smokers, a summary of the results comparing the annual obesity-attributable medical costs for obese and normal-weight individuals for Indiana and the U.S. are displayed in Table 4.2. For total medical expenditures, for Medicare expenditures and for Medicaid expenditures, the proportion attributable to obesity in Indiana was higher than for the U.S. as a whole. Of special note was the finding that obesity-attributable expenditure in the Medicaid programs for Indiana (15.7%) was three times that for the U.S. as a whole (5.7%).

Table 4.2. U.S. and Indiana Obesity-Attributable Expenditures.

	Amount	% of total
Total obesity attributable medical expenditures		
U.S.	$75,051 Million	5.7%
Indiana	$1,637 Million	6.0%
Total *Medicare* obesity attributable expenditures		
U.S.	$17,701 Million	5.7%
Indiana	$379 Million	7.2%
Total *Medicaid* obesity attributable expenditures		
U.S.	$21,329 Million	5.7%
Indiana	$522 Million	15.7%

For comparison, Finkelstein's study found that the obesity-attributable medical expenditures:

- Overall ranged from $87 million (Wyoming) to $7.7 billion (California), while Indiana spent $1.6 billion;
- Medicare expenditures ranged from $15 million (Wyoming) to $1.7 billion (California), while Indiana's expenditures were $379 million;
- Medicaid expenditures ranged from $23 million (Wyoming) to $3.5 billion (New York) and Indiana spent $522 million.

Likelihood of Morbidity Prevalence by Levels of Obesity

The Lewin Study confirmed the results of other studies showing a direct correlation between increases in BMI and increases in the prevalence of selected morbidities (increased likelihood) as shown in Table 4.3.[8]

This table shows the "odds ratios" of having a specific condition, given the weight-status of individuals. Odds ratios are a measure of relationship between a specific risk factor and a specific outcome. These measures are interpreted as a multiplier of the increased likelihood of having the outcome if the factor is present as compared to the likelihood of having the outcome if the factor is not present. For example, using the data in Table 4.3, people who are severely obese (BMI equal to or greater than 35) are more than six times (6.16) as likely to have type 2 diabetes mellitus when compared to people with normal weight (BMI less than 25) and are more than five times (5.48) as likely to have gallstones.

Table 4.3. Likelihood of Selected Morbidities by Body Mass Index (BMI) Value.

Disease	BMI <25	BMI 25-30	BMI 30-35	BMI >35
	Odds Ratios			
Arthritis	1.0	1.56	1.87	2.39
Heart Disease	1.0	1.39	1.86	1.67
DM Type 2	1.0	2.42	3.35	6.16
Gallstones	1.0	1.97	3.30	5.48
Hypertension	1.0	1.92	2.82	3.77
Stroke	1.0	1.53	1.59	1.75

Medical Care Utilization and Costs

Compared to people of normal weight, obese individuals report more physician visits, experience more inpatient days, have more pharmacy dispenses, and incur higher medical expenses, as shown in the following list of published findings.

Utilization

- Compared to normal-weight individuals, people who are moderately obese (BMI 30 to less than 35) and severely obese (BMI equal to or greater than 35) have 14 percent and 25 percent more physician visits respectively; [5]
- Obese individuals (BMI equal to or greater than 30) have 38 percent more primary care physician visits;[8]
- Obese individuals (BMI equal to or greater than 30) experience a 3.85 greater risk of hospitalization in comparison to non-obese individuals;[10]
- Moderately obese (BMI 30 to 34.9) and severely obese (BMI equal to or greater than 35.0) individuals have 34 percent and 74 percent more inpatient days compared to individuals with normal weight;[5]
- Obese individuals (BMI equal to or greater than 30) have 1.84 times the annual number of pharmacy dispenses compared to people with normal weight and include:
    - 6 times the dispenses for diabetes;
    - 3.4 times the dispenses for cardiovascular medications.[8]

Costs

- Obese adults age 18 to 65 incur annual medical expenditures 36 percent higher than do normal-weight individuals;[11]
- The average increase in annual medical expenditures associated with obesity is 37.4 percent ($732);[12]
- Total health spending attributed to obesity is approximately 5 percent of health insurance expenditures;[13]
- Obesity-related aggregated U.S. health care costs range from 5.5 to 7.0 percent of annual medical expenditures;[14]
- Of the $78.5 billion expended on obesity-attributable diseases in 2003, ($92.6 billion in 2002 dollars), approximately one half are financed by Medicare or Medicaid;[15]
- The growing prevalence of obesity accounts for approximately 12 percent of the increase in healthcare costs.[16]

Non-Medical Expenses

An increase in medical expenditures is not the only additional cost associated with obesity. Many studies have shown that obese individuals, and especially women, are more likely to be absent from work for illnesses.

- Obese women are 1.74 times more likely and obese men 1.61 times more likely to experience seven or more absences due to illness in a six-month period;[17]
- Obesity-related absenteeism cost employers $2.4 billion dollars in 1998, which would be equivalent to $2.95 billion in 2003 dollars;[18]
- Obesity-related diseases were responsible for 239 million resting activity days and 89.5 million bed days in 1995.[3]

Occupational Choice and Wages

There is evidence that obese individuals' occupations—particularly among women—differ from those of normal-weight individuals:[2]

- Obese women work mostly in relatively low-paying occupations and are largely excluded from high-paying managerial/professional and technical occupations;[18]
- 65 percent of normal-weight women in the aerospace industry were in managerial/professional positions compared to 39 percent of overweight women.[19]

Although there appeared to be a negative correlation between women's wages and weight, these researchers were unable to determine whether lower wages result from higher weight or vice-versa.

ECONOMICS, POLICY, & OBESITY

Conclusions

It is estimated that aggregate annual obesity-attributable medical costs in the U.S. range between 5 and 7 percent of annual health expenditures. Further, it has been estimated that it costs the average U.S. taxpayer about $175 per year to finance obesity-related medical expenditures among Medicare and Medicaid recipients.[2] There is no doubt that these economic figures will increase the interest in combating obesity in the United States and will convince people that obesity is a significant public health problem.

However, many health economists believe that the future value of economics for the study of obesity lies not in measuring the economic burden of obesity but in applying formal economic evaluation principles to assess how scarce healthcare resources deployed to prevent or treat obesity can be used efficiently and effectively.[7] In other words, what value will Indiana gain by investing in an obesity-reduction program? Knowing what obesity costs from the cost-of-illness studies is only part of the answer. It is also necessary to know which interventions reduce obesity and by how much. Studies such as randomized controlled trials are the best way to determine the efficacy of an obesity intervention—that is, how well it reduces obesity under ideal circumstances. Then, effectiveness of each intervention needs to be assessed to measure how well it performs in the "real world" using limited resources and non-selected populations. Linking this effectiveness data with the economic costs of the intervention determines the cost-effectiveness of the intervention—that is, the dollar value spent to improve obesity status in a quantifiable way.

Unfortunately, the obesity research community has not done much to document the efficacy, effectiveness and cost-effectiveness of weight-loss interventions and their impact on the prevalence of disease and on an individual's health status. No wonder many are skeptical of weight-control interventions.

The answer to the question "How much does obesity cost?" has been answered, and the costs are staggering. What remains is to begin a systematic examination of the question "What is the value gained?" from obesity-reduction interventions.[20] In the future, resources should be used to evaluate specific obesity-reduction interventions and to identify those interventions that are the most efficient and effective.

References

1. WIN Weight-control Information Network. "Statistics Related to Overweight and Obesity." http://win.niddk.nih.gov/statistics/index/htm, October 2004.

2. Finkelstein EA, Ruhm CJ, Kosa KM. "Economic Causes and Consequences of Obesity." Annual Rev Public Health. 2005;26:239-57.

3. Wolf AM, Colditz GA. "Current Estimates of the Economic Cost of Obesity in the United States." Obes Res. 1998;6(2):97-106.

4. Thompson D, Brown JB, Nichols GA, Elmer PJ, Oster G. "Body Mass Index and Future Healthcare Costs: A Retrospective Cohort Study." Obes Res. 2001;9(3):210-218.

5. Quesenberry CP Jr., Caan B, Jacobson A. "Obesity, Health Services Use, and Health Care Costs among Members of a Health Maintenance Organization." Arch Intern Med. 1998;158(5):466-472.

6. Wolf A. "What is the Economic Case for Treating Obesity?" Obes Res. 1998;6(1):2S – 6S.

7. Roux L, Donaldson C. "Economics and Obesity: Costing the Problem or Evaluating Solutions?" Obes Res. 2004;12:173-179.

8. American Obesity Association. "Costs of Obesity." http://www.obesity.org/treatment/cost/shmtl, May 2005.

9. Finkelstein EA, Fiebelkorn IC, Wang G. "State-Level Estimates of Annual Medical Expenditures Attributable to Obesity." Obes Res 2004;12(1).

10. Raebel M, Malone D, Conner D, Xu S, Porter J, Lanty F. "Health Services Use and Health Care Costs of Obese and Nonobese Individuals." Arch Intern Med. 2004;164:2135-2140.

11. Williamson DF, Venkat Narayan KM, Teutsch SM. "The Economic Impact of Obesity in the United States: Whither?" Obes Res. 1998;6(2):173-175.

12. Sturm R. "The Effects of Obesity, Smoking, and Drinking on Medical Problems and Costs." Health Affairs. 2002;21(2):245-253.

13. Finkelstein EA, Fiebelkorn IC, Wang G. "National Medical Spending Attributable to Overweight and Obesity: How Much, And Who's Paying." Health Affairs. 2003;W3:219-226.

14. Thompson D, Edelsberg J, Kinsey KL, Oster G. "Estimated Economic Costs of Obesity to U.S. Business." Am J Health Promotion. 1998;13(2):120-127.

15. Wolf AM, Colditz GA. "Social and Economic Effects of Body Weight in the United States." Am J Clinical Nutrition 1996;63(3 Suppl):466S-469S.

16. Centers for Disease Control and Prevention, "Overweight and Obesity: Economic Consequences." http://www.cdc/gov/nccdphp/dnpa/obesity/economic_consequences.htm, April 2005.

17. Thorpe K, Florence C, Howard D, Joski P. "The Impact of Obesity On Rising Medical Spending." Health Affairs. 2004;W4:480-486.

18. Tucker LA, Friedman GM. "Obesity and Absenteeism: An Epidemiologic Study of 10,825 Employed Adults." Am J Health Promotion. 1998;12(3): 202-207.

19. Pagan JA, Davila A. "Obesity, Occupational Attainment, and Earnings." Social Science Quarterly. 1997;78(3):756-770.

20. Haskins K, Ransford HE. "The Relationship between Weight and Career Payoffs among Women." Sociology Forum. 1999;14(2):295-318.

Epilogue

Those who produced this Resource Guide hope that you will find this volume helpful in both understanding the problem of obesity and overweight as well as in providing information needed to build public support for community efforts to combat this disease. This Resource Guide is the first of a planned series of Resource Guides to help support community efforts to reduce obesity and improve the health of individuals. The next Resource Guide will provide tools to enable communities to identify opportunities to make a local impact. It will include instructions on collecting community level information and suggestions for questions to answer. After that, a future resource guide will include examples of other community level activities that have been used and found to be effective in other communities. Hopefully, some of those examples will be appealing for adaptation to your community.

In the meantime, additional information about obesity and its health effects can be found at the following web sites. Readers are encouraged to visit these and other web sites to stay abreast of the latest information in this field.

- http://www.surgeongeneral.gov/topics/obesity/
- http://www.iom.edu/Object.File/Master/24/332/0.pdf
- http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=10546692&dopt=Abstract
- http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=15361887&dopt=Abstract
- http://content.healthaffairs.org/cgi/content/full/hlthaff.w3.219v1/DC1
- http://www.cnr.berkeley.edu/cwh/PDFs/Flegal_methods_04.pdf
- http://www.cdc.gov/nccdphp/dnpa/obesity/economic_consequeces.htm
- http://www.cdc.gov/nccdphp/dnpa/obesity/consequences.htm

Most importantly, we want to thank you for your efforts to make a difference in your community and wish you well in your endeavors!

-- The Authors