Obesity Statistics



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KEYWORDS

- Obesity Obesity epidemic Epidemiology of obesity Obesity in adults
- Obesity in children and adolescent

KEY POINTS

- Obesity is a chronic disease that is associated with increased morbidity and mortality, including cancer, cardiovascular disease, disability, diabetes mellitus, hypertension, osteoarthritis, and stroke.
- Obesity occurs because of an energy imbalance between caloric intake and expenditure. The resulting energy excess and associated weight gain are caused by a complex interaction between genetics, environment, economics, and individual behaviors.
- Worldwide, more than 2.1 billion people are overweight or obese. In the United States nearly 35% of adults are classified as obese and one-third of children and adolescents are obese or overweight.
- Overweight and obesity are the fifth leading cause of death in the world, accounting for nearly 3.4 million deaths annually.
- Obesity-related health care costs are difficult to ascertain precisely and vary between countries. In the United States, obesity-related costs of several hundred billion dollars have been reported.

INTRODUCTION

Obesity is a complex, multifactorial disease that is strongly associated with multiple comorbidities.^{1–6} These comorbidities include certain types of cancer, cardiovascular disease, disability, diabetes mellitus, gallbladder disease, hypertension, osteoarthritis, sleep apnea, and stroke.¹ Obesity is associated with a high rate of cardiovascular and all-cause mortality.⁷ Obesity has been described as a worldwide pandemic.⁴ Globally, the prevalence of overweight and obesity increased by 28% in adults and 47% in children between 1980 and 2013.⁴ Current estimates suggest that there are nearly 2.1 billion people in the world who are either overweight or obese.⁴ In the United

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States, data from the National Health and Nutrition Examination Surveys (NHANES) collected between 2011 and 2012 suggest that 35% of adults are obese.⁸ Likewise, nearly 17% of American children and adolescents are obese and nearly one-third are either obese or overweight.⁸ Obesity is the fifth leading cause of death, estimated to be associated with 3.4 million deaths in 2010.⁴ Current trends in obesity seem stable in most developed countries, with the notable exception that the number of individuals classified as morbidly obese continues to increase.⁴ The prevalence of obesity in developing countries is increasing toward levels currently seen in the United States.⁴ Expenditures of \$190 billion per year are associated with the treatment of obesity and obesity-related complications,⁹ which represents approximately 21% of total United States health care expenditures.⁹ Compared with normal-weight people, obese individuals are responsible for 46% higher inpatient costs, 27% more outpatient visits, and 80% higher spending on prescription medications.¹⁰ Obesity results from an energy imbalance between caloric intake and caloric expenditure. Multiple factors, including genetics, socioeconomic status, environment, and individual decisions, all play a significant role in the pathogenesis of obesity. This article reviews the epidemiology of obesity with an emphasis on disease description, risk factors, prevalence and incidence, and mortalities.

DISEASE DESCRIPTION

To understand obesity, a description of body weight classification for both adults and children is necessary. Body mass index (BMI) is the most widely used standard for classifying somatotype. BMI is obtained by dividing weight in kilograms by height in meters squared. BMI classifications for white, Hispanic, and African American adults have been endorsed by the National Heart, Lung, and Blood Institute, the World Health Organization (WHO), the American Heart Association, American College of Cardiology, and The Obesity Society^{2,11,12} (Table 1).

- Normal weight: BMI greater than 18 to 24.9 kg/m²
- Overweight: BMI greater than 25 to 29.9 kg/m²
- Obesity: BMI greater than 30 kg/m²
- Obesity class I: BMI of 30 to 34.9 kg/m²
- Obesity class II: BMI of 35 to 39.9 kg/m²
- Obesity class III (severe obesity): BMI greater than 40 kg/m² (or >35 kg/m² in the presence of comorbidities)

This traditional BMI classification underestimates risk in Asian and South Asian people. A separate guideline for this population classifies overweight as a BMI between 23 and 24.9 kg/m² and obesity as a BMI of greater than 25 kg/m².¹³

Body weight classifications also differ significantly between adults and children because of variations in growth and resultant body surface area. There are also significant differences between boys and girls. The WHO Child Growth Standards are used internationally for children from birth to 5 years old.¹ Updated classifications for children from the age of 5 years old to 19 years old were published in 2007.¹ In the United States, data from the National Center for Health Care Statistics and the Centers for Disease Control and Prevention (CDC) are used to determine age-appropriate weight for children between 2 and 19 years of age (see Table 1):

- Normal weight: BMI between the 5th and 85th percentiles for age and sex
- Overweight: BMI between the 85th and 95th percentiles for age and sex
- Obese: BMI greater than 95th percentile for age and sex

Table 1 Common classifications of body weight in adults and children					
	Age	Indicator	Normal Weight	Overweight	Obese
Adults	≥20 y	BMI (kg/m²)	18.50–24.99	≥25.00	≥30.00 Class 1: 30.00–34.99 Class 2: 35.00–39.99 Class 3: ≥40.00
Children					
International					
WHO 2006	0–60 mo	BMI Z or WH Z	>–2 to \leq 2 SD At risk of overweight: >1 to \leq 2 SD	>2 to \leq 3 SD	>3 SD
WHO 2007	5–19 y	BMI Z	>–2 to \leq 1 SD	>1 to ≤2 SD	>2 SD
IOTF	2–18 y	Growth curve for BMI at age 18		BMI = 25	BMI = 30
United States	2–19 y	BMI percentile	≥5th to <85th	≥85th to <95th	≥95th

Abbreviations: IOTF, International Obesity Task Force; SD, standard deviation; WH, weight for height; Z, z score. Adapted from Hruby A, Hu FB. The epidemiology of obesity: a big picture. Pharmacoeconomics 2015;33(7):674. Severe obesity: BMI greater than the 120th percentile or BMI greater than 35 kg/ m² (whichever is lower)

For children less than 2 years of age, the CDC recommends using the WHO classifications to determine age-appropriate body weight.¹⁴

Energy balance, which determines body weight, represents the difference between energy intake and energy expenditure.¹⁵ To maintain a stable body weight, energy intake must equal energy expenditure. Weight gain occurs when energy intake exceeds energy expenditure, resulting in a positive energy balance. Likewise, weight loss occurs when energy expenditure exceeds energy intake. Energy is expended through physical activity and through homeostatic metabolic processes.¹⁵ Although low energy expenditure is one component of excess weight gain, multiple other factors play a significant role. These factors include genetic predisposition, physical inactivity and sedentary behaviors, diet, socioeconomic factors, and other novel risk factors.

RISK FACTORS

Genetics

Box 1

Obesity occurs when a sustained positive energy balance leads to an increase in body weight. Multiple genetic, social, economic, and personal factors affect this energy balance and the development and maintenance of overweight and obesity. Genetic factors are the only risk factors that are not personally modifiable (**Box 1**).

Family studies including twins and adoptees clearly implicate genetic factors as central to the development of overweight and obesity.^{16,17} Studies show a similar risk of obesity in twins raised in separate environments compared with those raised in the same household.¹⁶ Adoptees have been shown to mirror the BMIs of their biological parents rather than their adoptive parents.¹⁶ Although multiple genetic markers have been identified, the 32 most common genetic variants associated with obesity are responsible for less than 1.5% of the overall interindividual variation in BMI.¹⁸

Risk factors				
Adults				
Genetic factors				
Physical inactivity/sedentary behaviors				
• Diet				
Socioeconomic factors				
Medications				
Medical conditions				
Gut bacteria				
Children/adolescents				
Physical inactivity/lack of sports participation				
• Diet				
Sugar-sweetened beverages				
Television viewing				
Electronic games				

Individuals with the highest genetic risk had BMIs that were only 2.7 kg/m² higher than those with a low genetic risk.¹⁸

Physical Activity

Physical activity provides the largest contribution to significant energy expenditure. The American College of Sports Medicine recommends that 150 to 250 minutes of moderate intensity exercise per week is needed to prevent weight gain when accompanied by appropriate dietary interventions.¹⁹ However, appropriate levels of physical activity to prevent weight gain are not required in modern daily activities of daily living for most people.²⁰ Life in most developed (and some developing) nations does not require the same levels of activity for subsistence that was required in the past.²⁰ Technology has made it easier to be productive while being mostly sedentary.²⁰ As an example, television viewing has a clear and significant association with obesity.²¹ Even after adjusting for age, smoking, exercise level, and dietary factors, every 2-hour increment spent watching TV is associated with a 23% increase in obesity.²¹ In the context of modern living, sufficient physical activity is a cornerstone of weight management. However, according to the Surgeon General's report on physical activity, the percentage of adults living in the United States who participate in physical activity continues to decline with age.²²

Caloric Intake

The global food supply has changed significantly over the last half-century. The availability of cheap, convenient, calorically dense food has contributed significantly to the increase in obesity.²³ Specifically, an increase in carbohydrate and fat content in foods processed outside the home has been linked to obesity.²⁴ The increase in body weight during middle age is particularly associated with increased intake of potato chips, sugar-sweetened beverages, unprocessed red meats, and processed meats.²⁴ Body weight is inversely associated with a diet high in fruits, vegetables, whole grains, nuts, and yogurt.²⁴ The intake of sugar-sweetened beverages is also increasingly implicated in excess weight gain.²⁵ Highlighting the complex interplay between genetic and environmental factors, there seems to be a genetic predisposition for excess weight gain associated with the intake of sugar-sweetened beverages.²⁶

Socioeconomic Status

Socioeconomic status is another well-established risk factor associated with overweight and obesity. The role socioeconomic status plays in the obesity pandemic has shifted over the past century. In the mid-twentieth century, obesity in the United States and Europe was directly associated with income. Individuals with more income were more likely to be overweight or obese.²⁷ That relationship no longer holds. Obesity is more prevalent in lower socioeconomic groups.^{28,29} The relationship between wealth and obesity is multifactorial and likely related to factors such as nutrition, neighborhood food environments, education, and the built environment (the safety of people's neighborhood, access to playgrounds and sidewalks, transportation, number of fast food restaurants, neighborhood trails, and social services).^{30,31}

Miscellaneous Risk Factors

A variety of other factors place people at risk of becoming obese or overweight. Certain medications (eg, glucocorticoids, antidiabetic medications, antidepressants, and antipsychotics) increase risk for weight gain. Certain disease states (eg, Cushing syndrome, hypothyroidism, and polycystic ovary syndrome) are associated with excess weight gain. An individual's microbiome has also been shown to play a role in energy metabolism and risk of obesity.³²

Risk in Children and Adolescents

As with adults, environmental factors, such as caloric intake and lack of physical activity, play a significant role in the development of obesity in children and adolescents. Sugar-sweetened beverage intake contributes to obesity as well.^{25,33} Excess screen time is associated with higher BMI in children.³⁴ The excess use of electronic games is related to obesity in childhood.³⁵ The association between obesity and television watching is stronger than that between obesity and electronic games in children, likely because gaming requires some degree of emotional or physical participation.³⁴ Advertising energy-dense foods specifically to children is also more prevalent on television.³⁴ Participation in sports is inversely related to overweight/ obesity in children and adolescents.^{36,37} The reduction in school sports programs has likely contributed to an increase in the rates of obese and overweight children and adolescents.³⁶

PREVALENCE/INCIDENCE IN THE UNITED STATES

The prevalence of overweight and obesity in the United States is has important implications. The prevalence of overweight and obesity in the United States has increased to the point at which people who are overweight or obese outnumber normal-weight individuals by 2:1. In addition, the prevalence of severe obesity has increased to 7%.⁷ Nearly 85% of American adults will be either overweight or obese by the year 2030.⁶ Obesity rates increased from 24% in 1990 to 37% in 2010 for individuals more than 60 years of age.³⁸ Obesity rates in Hispanic people and non-Hispanic black people were 43% and 48% respectively in 2012.⁸ Compared with men, women are disproportionately affected by severe obesity regardless of age or race.⁸ However, rates of obesity seem to have plateaued at 35% between 2003 to 2004 and 2011 to 2012.⁸

Equally serious, overweight and obesity rates in children parallel those of adults. Nearly one-third of American children are either overweight or obese.⁸ The prevalence of obesity in children between 2011 and 2012 was 17%.⁸ This percentage also seems to have stabilized, because obesity rates in children did not change significantly between 2004 and 2010.⁸ As with adults, although rates of obesity in children seem to have stabilized, the prevalence of severe obesity has continued to increase. From the period 1976 to 1980 through 2012, the rate of severe obesity in children increased from 1% to 6%.³⁹

WORLDWIDE/REGIONAL INCIDENCE

Worldwide, the prevalence of overweight and obesity increased by 28% for adults from 1980 to 2013⁴ (Fig. 1). From 1980 to 2013, the number of overweight and obese people increased from 857 million to 2.1 billion. Worldwide, 37% of men and 38% of women are estimated to have a BMI greater than 25 kg/m².^{4,23} At present, 50% of obese individuals live in only 10 countries (United States, China, India, Russia, Brazil, Mexico, Egypt, Germany, Pakistan, and Indonesia). In Europe, 17% of adults are obese and current trends place Europe on an obesity trajectory similar to the United States.⁴⁰ Significant regional variations exist in Europe as well, suggesting that socio-economic conditions play a role in the development of obesity.⁴¹ Specifically, 20% of men and 22% of women in Belgium are obese, and 25% of men and 33% of



Fig. 1. Prevalence of obesity by age across birth cohorts for men and women in developed and developing countries. (*From* Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384(9945):770; with permission.)

women in Mexico are obese, 14% of men and women in Pakistan are obese, 11% of men and 10% of women in China are obese, and 13.5% of men and 42% of women in South Africa are obese.^{4,42}

Rates of obesity are increasing in developing countries as well.⁴ Although ageadjusted rates of obesity are lower in developing compared with developed countries, 62% of the world's obese people live in developing countries.⁴ The WHO suggest that, as undernourished populations decline,⁴³ obesity becomes more important as a public health disease in low-income countries. Sub-Saharan Africa is the only region of the world in which obesity is not common.⁴⁴ In the developing world, rates of overweight and obesity seem higher in women than in men.⁴

Overweight and obesity are also increasing in children and adolescents around the globe. From 1980 to 2013, the prevalence of overweight and obesity in children and adolescents in developed countries increased from 17% to 24% in boys and from 16% to 23% in girls.⁴ During the same time period, the prevalence of overweight and obesity increased from 8% to 13% in boys and from 8% to 13% in girls in developing countries.⁴ Direct comparisons between countries are more difficult in children and adolescents than in adults because of different classification systems of overweight and obesity. Despite this, in countries with comparable statistics, rates of overweight and obesity in children and adolescents exceed 30% in Greece, Italy, Great

Britain, Spain, and Portugal.⁴⁵ Thirteen percent of children and adolescents are overweight or obese in China. Fifteen percent of Israeli boys, 12% of boys in Chile, 11% of boys in Mexico, 18% of girls in Uruguay, and 12% of girls in Costa Rica are also reported to be overweight or obese.^{4,46}

MORBIDITY AND MORTALITY

Obesity is an independent risk factor for excess morbidity and mortality. Although exact numbers are difficult to define, in 2000, 15% of deaths in the United States were attributable to excess weight.⁴⁷ Obesity contributes to an estimated 111,909 to 365,000 deaths in the United States and at least 2.8 million deaths worldwide each year.^{48,49} Globally, overweight and obesity are estimated to be the fifth leading cause of death.⁴⁹ People with a greater BMI have a greater risk of all-cause mortality.⁵⁰ For both women and men, obesity as an adult is associated with a significant reduction in life expectancy. Compared with normal-weight individuals, obese patients have a higher all-cause mortality.^{7,51} Data from the Framingham Study indicate that people who were obese at age 40 years died 6 to 7 years earlier than normal-weight peers.⁵² Individuals who are overweight at age 40 years have a life expectancy that is 3 years less their normal-weight peers.⁵² The life expectancy in severely obese individuals is even worse. Median survival is decreased 8 to 10 years in this group.⁵⁰ Data from the Prospective Studies Collaboration analysis showed that overall mortality was lowest at a BMI of 22.5 to 25 kg/m^{2,50} Every 5 kg/m² increase in BMI was associated with a 30% increase in all-cause mortality⁵⁰ (Fig. 2).

In addition to the increased risk of overall mortality, overweight and obesity are associated with an increased risk for multiple morbidities.²⁷ The risk of developing a chronic disease (hypertension, heart disease, gallstones, colon cancer, and stroke) increases with increasing BMI.^{53,54} One of the strongest associations is with diabetes mellitus. More than 80% of type 2 diabetes is attributable to overweight and obesity.⁵⁵ Overweight individuals have a 3-fold higher risk and obese individuals have a 7-fold higher risk of developing type 2 diabetes compared with normal-weight individuals.⁵⁶ The American Diabetes Association (ADA) recommends any patient more than 45 years of age who is overweight or obese be tested for type 2 diabetes even if they are asymptomatic.⁵⁷ The ADA also recommends that patients who are metabolically healthy (no history of insulin resistance, poor glycemic control, hypertension, or dyslipidemia) but are obese have a 4-fold higher risk of developing type 2 diabetes than those who are metabolically healthy and of normal weight.⁵⁸

In addition to BMI, the distribution of body fat influences the risk of developing type 2 diabetes. NHANES III showed that individuals with high waist circumference values (men, >102 cm [40 inches]; and women, >89 cm [35 inches]) were more likely to develop diabetes, hypertension, and dyslipidemia than those with a normal waist circumference.⁵⁹ Obesity is associated with hyperinsulinism and insulin resistance (before the onset of overt hyperglycemia). Individuals who lose weight decrease their risk for type 2 diabetes.⁶⁰

Obesity also increases the risk of certain cancers in both men and women. In 2007, 6% of all cancers were associated with obesity.⁶¹ A 5 kg/m² increase in BMI in men is associated with an increased risk of renal, colon, thyroid, and esophageal cancers.⁶² A 5 kg/m² increase in BMI for women was associated with an increased risk of endometrial, renal, esophageal, and gallbladder cancer.⁶²



Fig. 2. All-cause mortality versus BMI for each sex in the range 15 to 50 kg/m² (excluding the first 5 years of follow-up). Relative risk at ages 35 to 89 years, adjusted for age at risk, smoking, and study, were multiplied by a common factor (ie, floated) to make the weighted average match the prospective studies collaboration (PSC) mortality at ages 35 to 79 years. Floated mortalities are shown above each square and numbers of deaths below. Area of square is inversely proportional to the variance of the log risk. Boundaries of BMI groups are indicated by tick marks. Ninety-five percent confidence intervals (CIs) for the floated rates reflect uncertainty in the log risk for each single rate. Dotted vertical line indicates 25 kg/m² (boundary between upper and lower BMI ranges in this report). (*From* Prospective Studies Collaboration. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. Lancet 2009;373(9669):1087; with permission.)

Obesity has a particularly strong relationship with cardiovascular disease. Obesity is associated with an increase in the risk of stroke, heart failure, atrial fibrillation, lipid abnormalities, coronary disease, and hypertension. Along with ischemic heart disease, stroke is one of the leading causes of death around the world.⁶³ Multiple studies show an increased risk of ischemic stroke with increasing BMI.^{64–66} In the Framing-ham Heart Study, obesity was thought to be causal in 14% of cases of heart failure for women and 11% of cases of heart failure for men.⁶⁷ Obesity also increases the risk of developing atrial fibrillation.⁶⁸ Lipid abnormalities, including a reduction in

high-density lipoprotein cholesterol along with an increase in low-density lipoprotein cholesterol, very-low-density lipoprotein cholesterol, triglycerides, and total cholesterol, are associated with obesity.⁶⁹ Coronary heart disease is significantly increased in both overweight and obese individuals.⁷⁰ Overweight and obesity account for nearly 26% of hypertension in men and 28% of hypertension in women.⁷¹ There is a 2-fold or higher risk of developing hypertension, coronary heart disease, and stroke in children who are obese.⁷²

Compared with normal-weight individuals, obese individuals have a 30% greater chance of mortality from surgery and a 50% increase in the risk of major complications from surgery.²⁷ Obesity is associated with a 45% increased risk of overall mortality, higher rates of complications, and longer time in the intensive care unit in patients with trauma.⁷³ Obese individuals are at increased risk of surgical site, intensive care unit, urinary tract, and other infections during hospitalizations. Obese individuals are also at higher risk of acquiring respiratory tract infections during influenza season.^{74,75}

Osteoarthritis risk increases with increasing BMI as well. Obesity is second only to age as the predominant risk factor for osteoarthritis.⁷⁶ Excess mechanical forces lead to excessive joint loading and early osteoarthritis of the knee in obese individuals.⁷⁷ Osteoarthritis of non-weight-bearing joints such as the hand and wrist also occurs at higher rates in obese patients.^{78,79} However, rates of osteoarthritis decrease in patients who lose weight.⁸⁰

COSTS OF OBESITY

Calculating the exact cost of obesity is difficult. Estimates for the costs of obesity in the United States range from \$147 billion to \$210 billion per year,⁹ which represents roughly 21% of annual United States health care expenditures.⁹ Per capita spending on health care is \$2741 higher per person for obese individuals.⁹ Compared with normal-weight people, obese individuals are responsible for 46% higher inpatient costs, 27% more outpatient visits, and 80% higher spending on prescription medications.¹⁰ Obesity-related medical costs are projected to increase sharply over the next decade in the United States.⁸¹

More than \$14 billion in direct costs are associated with the treatment of obesity in children and adolescents.⁸² Medicaid data suggest that obese children account for \$6730 annually in health care costs compared with \$2446 in health care costs for normal-weight children.⁸³ Hospitalizations of children with obesity between 1999 and 2005 almost doubled, whereas total health care costs of obesity-related hospitalizations increased to nearly \$238 million in 2005.⁸⁴

SUMMARY

Obesity is a worldwide epidemic associated with increased morbidity and mortality and a significant burden to health care systems worldwide. Obesity is a complex disease affecting large numbers of people throughout the world. A complex combination of genetic, environmental, and social factors in an increasingly technical world with increased availability of cheap, calorically dense foods has created the perfect conditions for sharp increases in rates of overweight and obesity across the globe.

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