

## Chapter 2

# Definitions, Terminology, and Measurement

Sharron Dalton

**Abstract** Weight management is the practice of aiming for and achieving a healthy body weight, a major tool in the prevention and treatment of chronic diseases. An expanded definition determines the line between a healthy and unhealthy weight considering absence of disease, body size and shape, and physical and psychological ability to function. The definition of body weight standards is important to health professionals in planning and providing guidance for lifestyle choices about food, eating, physical activity, and using weight-related products and services as are mind-body influences, natural healing power, and cultural beliefs and preferences. Many terms, “obesity,” “overweight,” “fat,” and “big,” are used by health professionals and the media.

Is obesity a disease? Since 2002, many key agencies have changed their position on the question which involves discussions of the cost, cost-effectiveness, and safety of interventions employed in weight management; questions remain about public perception and the role of personal and collective responsibility for prevention and treatment.

Standard definitions based on body mass index (BMI) do not distinguish between body fat and other body tissues (muscle, bone, water). BMI is used by government and international health organizations to establish weight standards for given heights. Measurements of waist circumference, waist-to-hip ratio, skinfold thickness, and bioelectrical impedance are useful in clinics and community settings to determine percentage of weight that is body fat.

Weight management intervention includes physical and psychological screening, dietary assessment, intensive behavioral therapy, and monitoring weight-loss maintenance. Measurable indicators of effectiveness include improved quality of life with increased functional and physical activity, qualitative changes in food consumption, and overall health regardless of body size.

**Keywords** Healthy weight • Obesity as disease • Weight-/fat-related measurements • Weight management intervention • Weight intervention effectiveness • Weight as individual or environmental responsibility

### Key Points

- Weight management is the practice of aiming for and achieving a healthy body weight, which is a major tool in the prevention and treatment of chronic diseases and determines the line between a

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healthy and unhealthy weight considering absence of disease, body size and shape, and physical and psychological ability to function.

- The definition of body weight standards is important for providing guidance for lifestyle choices about food, eating, physical activity, and using weight-related products and services.
- Many key agencies have changed their position on the question of whether obesity is a disease, which involves discussions of the cost, cost-effectiveness, and safety of interventions employed in weight management.
- Standard definitions based on body mass index (BMI) do not distinguish between body fat and other body tissues (muscle, bone, water).
- Weight management intervention includes physical and psychological screening, dietary assessment, intensive behavioral therapy, and monitoring weight-loss maintenance.
- Measurable indicators of effectiveness include improved quality of life with increased functional and physical activity, qualitative changes in food consumption, and overall health regardless of body size.

Weight management, broadly defined, is the practice of aiming for and achieving a healthy body weight. As a branch of health care, weight management, like nutrition, is a major tool in the prevention and treatment of chronic diseases such as cardiology, pediatrics, and other medical specialties. Ideally, weight management would simply describe the process of maintaining a “healthy weight.” Yet an expanded definition is needed to determine the line between a healthy and unhealthy weight. Is it the absence of disease? Is it a specific body size? A body shape? A physical ability to function in daily living activities? A psychological ability to cope with social and cultural body size standards? Measurements of body weight at a given height are categorized according to the absence or degree of biological disease risk, in each category, for heart disease, hypertension, and diabetes, all leading causes of death. Weight management aims to prevent disease, whether the goal is attaining and/or maintaining a healthy weight or reducing burdensome excess weight. The definition of body weight standards is important to health professionals in planning and providing guidance for lifestyle choices about food, eating, physical activity, and using weight-related products and services. The framework of traditional weight management embraces a whole person approach with emphasis on eating and physical activity behaviors and less attention to mind-body influences and natural healing power. The support of health-care practitioners who consider social and cultural factors and relationships (beliefs and preferences) that affect a person’s weight, size, and shape is recommended but often overlooked in traditional weight management.

## Defining Obesity

Health professionals and the media often dance around the term “obesity.” They may talk about the “obese person” or the “obesity epidemic,” yet are very cautious about labeling an individual “obese.” Apparently “overweight” is an acceptable label, “obese” is less so. Terms such as “big” or “large” are common in conversation and popular media. “Fat” is a common pejorative description often used by family, friends, and playmates. However, with the exception of a few muscular athletes, most overweight people are fat because fat is what they “have too much of.” The standard definitions of “overweight” and “obesity” do not distinguish between body fat and other body tissues (muscle, bone, water).

Is obesity a disease? Are we in the midst of an “obesity epidemic” among adults and children in the United States and worldwide? The traditional definition of an epidemic refers to a rapidly spreading disease that affects many individuals at the same time. Over the past three decades—about one generation—obesity has dramatically increased among Americans, doubling in adults.

The prevalence has more than tripled in children and adolescents. Two thirds of adults and one third of children in the United States are overweight and obese [1].

Globally, obesity affects nearly as many children as does undernutrition. The World Health Organization (WHO) predicts that nearly half of the children in North and South America will be overweight in the next decade and 38 % of all children will be overweight in the European Union [2]. These figures represent both “rapid” and “widespread” characteristics—certainly an epidemic. Yet language, ethnicity, and varying perceptions of weight—some that stigmatize and discriminate against obese people—make defining obesity as a disease less simple than it may seem.

Since 2002, many key agencies have changed their position on the question: Is obesity a disease? The decision involves discussions of the cost, cost-effectiveness, and safety of interventions employed in weight management; questions remain about public perception and the role of personal and collective responsibility for prevention and treatment. Summarized here are responses to the question: Is obesity a disease?

National Institute of Health (NIH): Obesity is a disease with enormous negative effects on health and survival; health-care costs caused by obesity are estimated at \$150 billion a year, about 10 % of the national medical budget [3]. This represents direct costs (treatment services, pharmaceuticals, etc.) and indirect costs (decreased productivity) [4].

Academy of Nutrition and Dietetics (AND): Obesity should be classified as a disease; it is a significant risk factor for poor health. The goal of obesity intervention is health improvement that should be measured in heart and lung performance, rates of admission to hospitals, and reduction in medication use [5].

Internal Revenue Service (IRS): Deductible medical expenses may include payments to participate in a weight-loss program for a specific disease or diseases, *including obesity*, diagnosed by a physician, but not payments for diet food items or the payment of health club dues [6]. Surgical interventions are deductible for those qualifying by BMI and comorbidity.

Centers for Medicare and Medicaid Services (CMS): The evidence is adequate that intensive behavioral therapy for *obesity* (a BMI of 30 or higher) is reasonable and necessary for the prevention or early detection of illness or disability. For those entitled to benefits under Part A or enrolled under Part B, payment is allowed for one counseling session a week for the first month and five more monthly sessions. By the end of the sixth month, a loss of at least 6.6 lb allows for six more monthly sessions. Otherwise, a wait of 6 months is required before coverage includes another weight-loss attempt. Sessions must be conducted by a qualified practitioner in a primary care setting [7].

American Medical Association (AMA): During discussion in 2008, member advocates for this designation said it will mean that this problem will be taken more seriously. Those opposed said it will negate personal and societal responsibility [8]. A 2009 news report stated that AMA objects to calling obesity a disability. “Under a new policy...the AMA formally opposes efforts by advocacy groups to define obesity as a disability. Doctors fear using that definition makes them vulnerable under disability laws to lawsuits from obese patients who don’t want their doctors to discuss their weight.” [9] As of 2012, physicians bill Medicare using code GO447, *intensive behavioral counseling for obesity*.

National Association to Advance Fat Acceptance (NAAFA): Fat people can be healthy and are therefore not suffering from a disease. NAAFA’s goal is to help build a society in which people of every size are accepted with dignity and equality in all aspects of life [10]. A physician stated one view, “We have to take into account how patients actually feel, and the vast majority, even people who are morbidly obese, do not think they’re sick” [8].

Obesity is officially recognized as a disease by most health agencies, yet viewing our country as a “diseased nation” or referring to whole populations with a term like “sick society” strips it of meaning. The continuing debate on terminology has important consequences. If we label obesity a disease, the implied remedy is medical, pharmaceutical, and/or surgical treatment. These may not be viable remedies for many individuals, especially children, or even health-care systems.

## Measurements in Weight Management

Body mass index (BMI) is used by government and international health organizations to establish weight standards for given heights. Measurements of waist circumference, waist-to-hip ratio (WHR), skinfold thickness, and bioelectrical impedance are useful in clinics and community settings to determine percentage of weight that is body fat.

The medical or clinical definition of healthy or unhealthy body weight for height uses measurement “cut points” to determine categories labeled *underweight*, *healthy weight*, *overweight*, *obese*, *very obese*. The categories are based on a variety of physical and biochemical measurements and statistical estimates of disease risk. A practical definition is less precise, incorporating elements of medical, social, and psychological measurement. Effectiveness in individual weight management is usually based on changes in weight or size but may also reflect psychological or social responses to weight, such as coping, resilience, and motivation, valuable in determining overall health status, guiding goal setting and care, as well as evaluating change and progress.

### Physical Measurements

Body mass index is the ratio of weight to height, calculated as weight (kg)/height (m<sup>2</sup>) or weight (lb)/height (in<sup>2</sup>) multiplied by 703. The terms *overweight* and *obese* describe ranges of weight that are greater than what is considered healthy for a given height, while *underweight* describes a weight that is lower than what is considered healthy for a given height. The adult BMI categories are age independent and the same for both men and women. Examples of the cut points for adults in the obesity range: 5'4" in height is 174 lb or more; 5'9" in height is 203 lb or more. These categories are a guide, and some people at a healthy weight also may have weight-responsive health conditions. Because children and adolescents are growing, their BMI is plotted on growth charts for sex and age. The percentile indicates the relative position of the child's BMI among children of the same sex and age (Table 2.1).

A high BMI predicts a higher risk of chronic disease and early death. For many people, BMI is strongly correlated with body fat levels. However, although easy to measure and inexpensive, BMI does not accurately predict body fat in elderly people compared to middle-aged adults. At the same BMI, women generally have more body fat than men, as do Asians compared to Caucasians.

The term “morbid obesity” usually indicates a level of obesity above a BMI of 30 combined with one or more risk factors (comorbidities) determined by measuring blood pressure, lipids, glucose, insulin sensitivity, and symptoms such as sleep apnea.

In the NIH 1998 publication (revised edition due 2013), *The clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults*, three subclasses are included in the obese category: Obese Class I (30.0–34.9 BMI), Class II (35.0–39.9 BMI), and Class III (≥40 BMI) [11]. The WHO guidelines concur with the NIH [12]. Because severe obesity is frequently surgically treated, NIH guidelines specify a BMI of 40 without or 35 with significant obesity-related comorbidity, in screening candidates for bariatric surgery. The gastric banding system was approved by FDA in 2011 for patients with a BMI as low as 30.

Children's BMI is calculated from measured height and weight and is plotted on a growth chart according to age and gender and then compared to recommended values for growth and BMI based on percentile ranges. Adult standards use arbitrary cutoff points to assign weight categories; childhood standards use percentiles. The BMI changes dramatically during childhood and adolescence. For example, the average BMI for age 6 or 7 is about 16; at age 17 the BMI is close to 22. Thus the BMI must always relate to age. Differences between boys and girl are most striking in the high percentiles.

**Table 2.1** Weight definitions by BMI categories for children, adolescents, and adults

Category	Children and adolescents (BMI for age percentile range)	Adults (BMI)
Underweight	Less than the fifth percentile	Less than 18.5 g/m <sup>2</sup>
Healthy weight	Fifth percentile to less than the 85th percentile	18.5–24.9 kg/m <sup>2</sup>
Overweight	85th percentile to less than the 95th percentile	25.0–29.9 kg/m <sup>2</sup>
Obese	Equal to or greater than the 95th percentile	30.0 kg/m <sup>2</sup> or greater

*Source:* U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office, December 2010

Adult BMI can be calculated at <http://www.nhlbisupport.com/bmi/>

A child and adolescent BMI calculator is available at <http://apps.nccd.cdc.gov/dnpabmi/>

Growth charts are available at <http://www.cdc.gov/growthcharts>

The BMI and corresponding growth charts do not show the whole picture. First, they do not account for variation in amount of body fat. Second, one BMI value provides only a snapshot of a child’s weight-for-height, not the rate of growth. A series of measures over time are essential to determine growth rate. Ignoring these two factors may result in identifying a disproportionate number of tall, apparently overweight children while overlooking short overweight ones. In judging a child’s body size, parents and caregivers often use comparisons to siblings and other relatives. These comparisons influence opinions about the “right size” for their children. Many studies indicate that cultural expectations differ from one ethnic group to another along with pride and protective instincts that result in a parental definition of a “normal size.”

## Body Fat Measurements

A waist circumference measurement of adults is the most simple and common way to measure “abdominal obesity”—the extra fat found around the middle, an important indicator of health risk, even independent of BMI. A waist measurement of greater than 94 cm (>40 in.) for men or 80 cm (>35 in.) for women is an indicator of internal (visceral) fat deposits, which can impair the heart, kidneys, liver, and pancreas, thus increasing the risk of chronic disease. Visceral fat is strongly linked to increased markers of inflammation, insulin resistance, and nonalcoholic fatty liver disease. A combination of (BMI) and waist circumference is recommended for the clinical measurement of adult overweight and obesity. A 2012 study reported that 29 % of people classified as healthy weight and 80 % of those classified as overweight according to BMI had body fat measures, according to waist circumference, within the obesity range (defined as over 25 % body fat for men and 35 % for women) [13]. This suggests that waist circumference is the more accurate method of determining risk for disease.

Although the waist is easy to measure, the procedure is difficult to standardize. The variability can be high when following the guidelines: “measure at the natural waist (in between the lowest rib and the top of the hip bone), the umbilicus (belly button), or at the narrowest point of the mid-section” [11]. Waist circumference should only be used for adults to check the risk of developing a chronic disease. Waist measurements that indicate increased risks for children and teenagers have not been developed.

The WHR measures central or abdominal obesity as well as the distribution of subcutaneous or truncal fat; both contribute to body shape. Persons with central fat are commonly referred to as “apple shaped” or android (male). Those with peripheral fat are called “pear shaped” or gynoid (female). Waist to hip ratio  $\geq 1.0$  for men and  $\geq 0.8$  for women is associated with increased risk. The increased amount and metabolic turnover of visceral fat, compared to subcutaneous fat, increase the risk of cardiovascular disease, stroke, and insulin resistance.

## ***Other Body Fat Methods of Measurement***

Skinfold thickness, a “pinch” of skin and the fat beneath it in selected areas of the body (trunk, thighs, upper arm, under shoulder blade) are measured with a special caliper. Equations are used to predict body fat percentage based on these measurements. Equations are also used with bioelectric impedance (BIA). The rate of resistance to a safe electric current through body fat, lean mass, and water estimates body fat percentage. Dual-energy X-ray absorptiometry (DEXA), typically used to measure bone mineral density from X-ray beams passing through different body tissues at different rates, also estimates fat body mass.

## **Functional Measures of Overweight and Obesity**

Ability to perform activities of daily living is important to an individual and caregivers. Other measures include number of hospitalizations, excessive physician visits, work-loss day, and restricted activity days. This type of definition is important in estimating health-care costs and an individual's concerns regarding daily living and social and financial well-being.

In addition to physical and functional measurements, a comprehensive definition in weight management may include an individual's perceived body image based on a socially acceptable body size and shape. Some measurements of psychological and emotional perceptions are necessary in setting goals and evaluating progress in weight management. Measurement tools may include current and desired body size comparisons, assessment of disordered eating, and motivational readiness to change behavior.

## **Weight Management Intervention**

As defined by Medicare and Medicaid Services [7], “intensive behavioral therapy” for obesity consists of the following:

1. Screening for obesity in adults using measurement of BMI calculated by dividing weight in kilograms by the square of height in meters (expressed in kg/m<sup>2</sup>)
2. Dietary (nutritional) assessment
3. Intensive behavioral counseling and behavioral therapy to promote sustained weight loss through high intensity interventions on diet and exercise

The intensive behavioral intervention for obesity should be consistent with the 5A framework that has been highlighted by the US Preventive Services Task Force (USPSTF):

1. *Assess*: Ask about/assess behavioral health risk(s) and factors affecting choice of behavior change goals/methods.
2. *Advise*: Give clear, specific, and personalized behavior change advice, including information about personal health harms and benefits.
3. *Agree*: Collaboratively select appropriate treatment goals and methods based on the patient's interest in and willingness to change the behavior.
4. *Assist*: Using behavior change techniques (self-help and/or counseling), aid the patient in achieving agreed-upon goals by acquiring the skills, confidence, and social/environmental supports for behavior change, supplemented with adjunctive medical treatments when appropriate.

5. *Arrange*: Schedule follow-up contacts (in person or by telephone) to provide ongoing assistance/support and to adjust the treatment plan as needed, including referral to more intensive or specialized treatment.

## Weight-Loss Maintenance

Weight maintenance is often defined as “not gaining or losing” weight over a period of time. Weight-loss maintenance definitions vary by amount and duration of weight loss and the amount and duration of weight regain after weight loss. The Institute of Medicine (IOM): Losing at least 5 % of body weight or reducing BMI by at least 1 unit, and keeping weight below this level for at least 1 year [14]. The NIH: A weight regain of less than 3 kg in 2 years after weight loss and a sustained reduction in waist circumference of at least 4 cm [11].

Other programs use significant weight loss (5 or 10 %) and focus on the end point by allowing some regain by a 1- or 2-year mark. There is little data about successful weight-loss maintenance because, in part, the definition of success varies widely among programs and interventions. Measuring risk factors may be the most useful. Research studies have shown that a modest 5 % weight loss and maintenance can greatly improve blood pressure, glucose, and lipid control [15].

## Measuring Effectiveness of Intervention

A definition of successful weight management is more inclusive than a given weight or fat loss—or even a long-term decrease in health risk. Maintenance of a healthier weight, improved quality of life with increased functional and physical activity, qualitative changes in food consumption, and overall health regardless of body size are measureable indicators of effectiveness. Quality of life measures inform the degree of progress that indicates a lifelong approach to weight management marked by interaction with family, community, and most environmental and social structures.

A whole person approach to weight management calls for identifying and attending to the environmental forces, whether real or perceived, in an individual’s life. This involves addressing beliefs about personal responsibility and control.

A 2012 IOM report and accompanying documentary, *The Weight of the Nation*, present a strong case that the obesity epidemic has been driven, not solely by individuals making poor decisions, but largely by structural changes in our environment. The report asks for accelerated change through an approach of “shared responsibility across sectors and levels,” for modification of external factors such as excessive exposure to energy dense foods in the media and the marketplace and the limited availability of affordable healthy foods [16]. However, public opinion surveys report that 64 % of Americans identify personal factors (overeating, lack of exercise, watching too much television) as individual choices causing the epidemic. These respondents believe that addressing weight problems is an individual responsibility, not one of schools, workplaces, communities, media, or food and beverage systems [17].

A classic 1930 medical view of obesity stated that “obesity results not from ‘gland dysfunction’ or other ‘endogenous’ problems but rather from various human weaknesses such as over-indulgence and ignorance and lessened activity” [18]. Increased understanding about the role of genetics, counter-regulatory mechanisms and the forces of our environment challenge the notion that weak willpower is the defining root cause of obesity. We do know that traditional weight management for individuals and groups has not prevented increased prevalence of overweight and obesity. Weight management in a living environment that is itself integrated with the goal to provide healthy foods and living spaces, safe activity, and supportive health care may be successful.



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<http://www.springer.com/978-1-4939-0547-8>

## Integrative Weight Management

A Guide for Clinicians

Mullin, G.E.; Cheskin, L.J.; Matarese, L.E. (Eds.)

2014, XXXVI, 503 p. 60 illus., 41 illus. in color.,

Hardcover

ISBN: 978-1-4939-0547-8

A product of Humana Press