BODY COMPOSITION

A PowerPoint presentation (no narration) containing much of this information is available at the below web page:

http://facweb.northseattle.edu/troot/HEA150

What does "overweight" mean? Simply getting on a scale and obtaining a number tells very little about how much of that weight is in the form of fat, muscle, or bone. For example, muscle weighs more than fat, which means a muscular person's total body weight is higher than the "average" individual. Similarly, a person with a larger amount of fat on the body may not necessarily have a weight higher than "average." Therefore, identifying a person's body composition--the amount of fat mass and fat-free mass in the body--is more meaningful. There are various ways to assess body composition, some of them better than others.

Scale Weight In this method, total body mass is assessed. An advantage of scale weight is its ease in measurement. A person can stand on a scale, and a weight is obtained quickly. The major disadvantage, however, is a lack of information about how much bone, muscle, or fat is in the body.

Height and Weight Charts This method requires height and weight be measured. The measured values are then compared to values on a height and weight chart to determine whether a person is overweight for his/her height. These charts are often used for insurance purposes; one can be found on the web at Health Check Systems (O). An advantage of these charts is their ease of use, while a disadvantage is the inability to distinguish fat from fat-free mass. Even when "frame size" is added to the chart, there is no differentiation between fat and fat-free tissues in the body. Moreover, frame size is often indicated by elbow breadth, which is not a common measure done on many people. If wanting to see variation of weight across ethnicities, travel to halls.med (O).

Body Mass Index Body Mass Index (BMI) has been receiving a lot of media attention over the last couple years. To calculate BMI, a person's weight is divided by the square of his or her height. Travel to the National Heart Lung and Blood Institute's Body Mass Index Calculator or to the Centers for Disease Control (click on adult or child and teen calculator) to assess and interpret your body mass index (R--for knowledge purposes only). One advantage of using BMI as a body composition tool is its ease to obtain as well as its relative accuracy in assessing disease risk. One disadvantage to using BMI, like the other methods, is the lack of actual fat, muscle, or bone measurement.

Circumferences Circumferences refer to measures of specific areas of the body. Common site, measured with a standard measuring tape, include arms, legs, waist, chest, buttocks, hips. Although this method can be fairly quick to administer as well as inexpensive to perform, it also does not differentiate fat from fat free mass. For example, a professional football player will obviously have larger arms and legs than an average individual. These larger numbers, however, may be due to the extra muscle the football player has throughout the body, not due to excess fat. Therefore, this method has limitations, as well.
**Waist to Hip Ratio** This method involves measuring circumferences around two areas of the body—the waist and hips. Based on the ratio obtained, a person's cardiovascular disease risk can be estimated. There is much research indicating that a person who carries more fat in the abdominal region ("waist") has a higher risk for cardiovascular disease than a person carrying more fat in the hip region. Therefore, higher ratios indicate higher risk. Measures from 0.75-0.85 and above for women, and measures from 0.90-1.0 and above for men are considered "high risk."

**Near infrared reactance** is most frequently used in health clubs. A study published in Medicine and Science in Sports & Exercise in 1992 is commonly cited in reference to the technique's accuracy. Visit [Georgia State University](http://www.gsu.edu) to read about the method (R).

**Skinfolds** This method involves the measurement of fat at different sites around the body. The fat that is measured is located underneath the skin; there is other fat around bodily organs and between and within muscle tissue that is not measured by this method. A specific tool, "skinfold calipers," are used to measure fat at regions such as the triceps, the midsection (abdominal and suprailiac regions), chest, thigh, and other regions. Several models are advertised at [Creative Health Products](http://www.creativehealthproducts.com) (R). Based upon the millimeters of skin and fat measured at each site, an extrapolation of total body fat can be made. The advantage of this method is that it can be quite accurate, although its disadvantages is that accuracy and precision require a trained technician. [ABCbodybuilding.com](http://www.abcbodybuilding.com) provides photos showing common skinfold measures (R). If anyone can find an online video of a skinfold assessment and send the link to me by the end of Monday, October 27, he/she can earn three extra credit points.

**Bioelectrical Impedance Analysis (BIA)** To use this method, a small, painless electrical current is conducted through the body. The impedance analyzer measures the resistance to the signal as it travel's through the body's water, found in muscle and fat. The more muscle a person has, the more water he or she can hold. The more water within the body, the easier a current can pass through. Therefore, a person who is more muscular will have smaller electrical resistance values. A person with more fat on his or her body will have higher electrical resistance values. An image showing a bioelectrical impedance analysis measurement is available at the American Academy of Family Physician's website (R). Although Ms. Ashley's photo shows the method typically used in a research laboratory, the lay public often has access to bioelectrical impedance analysis in health clubs. The equipment used is quite different, usually a device the consumer stands on (R), or a device the consumer holds with both hands. The University of Vermont has a [BIA interactive tutorial](http://www.uvm.edu), developed by Paul R. Buzzell and Stephen Pintauro (O).

**Hydrostatic Weighing** Hydrostatic weighing is one of the most widely-used laboratory methods for body composition assessment. This method requires a person be immersed under water and weighed, demonstrated in a photo located on Minnesota State University's website (R--to view photo). Based upon water and land weights, as well as calculated volume, a person's body density is determined. From this body density value, a fat percentage is estimated. This method is considered quite accurate, with a typical 2-4% error. Hydrostatic weighing is, however, expensive and requires specialized training and equipment. If interested in learning more about hydrostatic weighing, Stephen Pintauro, University of Vermont, provides an animated [tutorial](http://www.uvm.edu) (O).
Air Displacement One of the newer body composition assessment developments is the Bod Pod (R—to view the device). An individual sits inside the "Bod Pod" for five to ten minutes. The device measures air displacement to determine body volume. Like hydrostatic weighting, body density can then be calculated and, subsequently, fat percentage estimated. A relatively new procedure, the "Bod Pod's" accuracy is approximately a 3-5% error. Advantages of this method include a short measurement time, and its ability to assess special populations (elderly, disabled, children). Disadvantages include the cost (approximately $40,000 per machine) and its availability.

Dual energy x-ray absorptiometry One of the most accurate methods around, DEXA uses a low radiation-dose x-ray beam to differentiate fat, muscle and bone tissues. This method, then, can assess overall body composition with relatively strong accuracy, estimated from 1-4% error. Although many researchers view DEXA as a new "gold standard" in body composition assessment, others feel that hydrostatic weighing is still the best method at this time. Visit the foreign slimnica website to see a picture of DEXA (R). Another animated, interactive tutorial, about DEXA, is available through the University of Vermont (O).

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