Body Composition
Chapter Six
**What Is Body Composition?**

- **Body composition** is the body’s relative amounts of fat mass and fat-free mass.

- **Body fat** includes two categories:
  - **Essential fat** is crucial for normal body functioning:
    - 10% of total body weight in males
    - 15% of total body weight in females
    - The percentage is higher in women due to fat deposits in the breasts, uterus, and other sex-specific sites.
  - Most fat is storage in fat cells under the skin or adipose tissue (subcutaneous fat) and around major organs (visceral or intra-abdominal fat).
Body Composition of a Typical Man and Woman (20-24 Years Old)

![Diagram illustrating body composition of a typical man and woman.](image)

**Figure 6.1** Body composition of a typical man and woman, 20–24 years old.

Defining Overweight and Obesity

- **Overweight** is defined as total body weight above the recommended range for good health; ranges are set by population scales.

- **Obesity** is defined as a more serious degree of overweight, characterized by excessive accumulation of body fat.

- The prevalence of obesity has increased from about 13% in 1960 to about 34% today.
Excess Body Fat and Wellness

- As rates of overweight and obesity increase, so do the problems associated with them
- Obesity reduces life expectancy by 10-12 years
- Excess body fat and wellness:
  - Metabolic syndrome, diabetes
  - Body fat distribution and health
    - Performance of Physical Activity
    - Emotional Wellness and Self-Image
- Problems associated with very low levels of body fat
  - Less than 15% for women and 8% for men
  - Amenorrhea and loss of bone mass
  - Anorexia and eating disorders (male and female)
Body Fat Distribution

- Distribution of body fat is an important indicator of health
- There are two recognizable shapes
  - Apple (fat stored in the abdominal region)
  - Pear (fat stored in the hips, thighs, buttocks) considered more healthy
- Excessive fat in the abdominal region increases the risk of many diseases such as:
  - Diabetes
  - Heart disease
  - Stroke
  - Certain cancers
  - Early mortality
Problems Associated with Very Low Levels of Body Fat

- Too little body fat is also dangerous
- Extreme leanness is linked to the following disorders:
  - Reproductive
  - Circulatory
  - Immune system
- Eating disorders have been associated with low percentages of body fat, especially in women but also in men especially in sports populations and dance, diving, judged sports.

See the box “The Female Athlete Triad”
Calculating Body Mass Index

- Body Mass Index (BMI) is a measure that can classify risks, based on the concept that a person’s weight should be proportional to height

  
nhlbisupport.com/bmi/bmianojs.htm

- To determine this, body weight in kilograms is divided by the square of height in meters
- Elevated BMI is linked to increased risk, especially if associated with a large waist circumference
Basal Metabolic rate

- [http://www.bmi-calculator.net/bmr-calculator/](http://www.bmi-calculator.net/bmr-calculator/)

- Based on:
  - Height
  - Weight
  - Age
  - Gender
  - **NOT ACTIVITY**
# Body Mass Index Classifications

## Table 6.1  Classifications from the World Health Organization

### Body Mass Index (BMI) Classifications

<table>
<thead>
<tr>
<th>WEIGHT STATUS CLASSIFICATION</th>
<th>BODY MASS INDEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Severe thinness</td>
<td>&lt;16.0</td>
</tr>
<tr>
<td>Moderate thinness</td>
<td>16.0–16.9</td>
</tr>
<tr>
<td>Mild thinness</td>
<td>17.0–18.4</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5–24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25.0–29.9</td>
</tr>
<tr>
<td>Obese, Class I</td>
<td>30.0–34.9</td>
</tr>
<tr>
<td>Obese, Class II</td>
<td>35.0–39.9</td>
</tr>
<tr>
<td>Obese, Class III</td>
<td>≥40.0</td>
</tr>
</tbody>
</table>

### Waist Circumference Classifications

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>WAIST CIRCUMFERENCE IN INCHES (CENTIMETERS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;32 in. (80 cm)</td>
</tr>
<tr>
<td>Increased</td>
<td>≥32 in. (80 cm)</td>
</tr>
<tr>
<td>Substantially increased</td>
<td>≥35 in. (88 cm)</td>
</tr>
</tbody>
</table>

# Body Mass Index (BMI) Chart for Adults

| WEIGHT | 4'8" | 4'9" | 4'10" | 4'11" | 5'0" | 5'1" | 5'2" | 5'3" | 5'4" | 5'5" | 5'6" | 5'7" | 5'8" | 5'9" | 5'10" | 5'11" | 6'0" | 6'1" | 6'2" | 6'3" | 6'4" | 6'5" | 6'6" |
|--------|------|------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| lbs (kg) |  260 | 117.9 |  255 | 115.7 |  250 | 113.4 |  245 | 111.1 |  240 | 108.9 |  235 | 106.5 |  230 | 104.3 |  225 | 102.1 |  220 | 99.8 |  215 | 97.5 |  210 | 95.3 |  205 | 93.0 |  200 | 90.7 |  195 | 88.5 |  190 | 86.2 |  185 | 83.9 |  180 | 81.6 |  175 | 79.4 |  170 | 77.1 |  165 | 74.8 |  160 | 72.6 |  155 | 70.3 |  150 | 68.0 |  145 | 65.8 |  140 | 63.5 |  135 | 61.2 |  130 | 59.0 |  125 | 56.7 |  120 | 54.4 |  115 | 52.2 |  110 | 49.9 |  105 | 47.6 |  100 | 45.4 |  95 | 43.1 |  90 | 40.8 |  85 | 38.6 |  80 | 36.3 |  75 | 34.0 |  70 | 31.7 |  65 | 29.4 |  60 | 27.1 |  55 | 24.8 |  50 | 22.5 |  45 | 20.2 |  40 | 17.9 |  35 | 15.6 |  30 | 13.3 |  25 | 11.0 |  20 | 8.7 |  15 | 6.4 |  10 | 4.1 |  5 | 1.8 |

- **Obese (≥30)**
- **Overweight (25-30)**
- **Normal (18.5-25)**
- **Underweight (<18.5)**

**Note:** BMI values rounded to the nearest whole number. BMI categories based on CDC (Centers for Disease Control and Prevention) criteria.

[www.vertex42.com](http://www.vertex42.com)  BMI = Weight[kg] / (Height[m] x Height[m]) = 703 x Weight[lb] / (Height[ft] x Height[ft])  © 2009 Vertex42 LLC
Assessing Body Fat Distribution

- Two of the simplest forms to assess body fat distribution are:
  - Waist circumference
  - Waist-to-hip ratios
    - Disease risk increases with total waist measurement of more than
      - 40 inches for men
      - 35 inches for women
    - Disease risk increases with total waist-to-hip measurement above
      - 0.94 for young men
      - 0.82 for young women
# Waist Circumference Classification

## Table 6.1

Classifications from the World Health Organization

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<th>Underweight</th>
<th>BMI</th>
<th>Severe thinness</th>
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<td></td>
</tr>
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<td>Obese, Class III</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Waist Circumference Classifications

<table>
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<tr>
<th>Classifications</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;32 in. (80 cm)</td>
<td>&lt;37 in. (94 cm)</td>
</tr>
<tr>
<td>Increased</td>
<td>≥32 in. (80 cm)</td>
<td>≥37 in. (94 cm)</td>
</tr>
<tr>
<td>Substantially increased</td>
<td>≥35 in. (88 cm)</td>
<td>≥40 in. (102 cm)</td>
</tr>
</tbody>
</table>

Estimating Body Composition

- There are many indirect methods that can provide an estimate of percent body fat

- Techniques include:
  - Underwater weighing
  - Skinfold caliper measurements (easiest)
  - Bod Pod
  - Bioelectrical Impedance Analysis (BIA)
  - DEXA (Dual energy X-ray absorptiometry)
  - TOBEC (Total body electrical conductivity)
Body composition measures

- **Underwater weighing**: measures the components that sink (muscle and bone) in fresh water.

- **Skinfold caliper measurements**: (easiest) measures at different sites on the body to determine amount of fat at certain sites.

- **Bod Pod**: uses air versus water to calculate body volume
Body comp measures cont’d

- Bioelectrical Impedance Analysis (BIA)- resistance of electricity to flow through the body. Fat impedes electricity.

- DEXA (Dual energy X-ray absorptiometry)- x ray- energy goes through fat easier than bone, so more energy through fat.

- TOBEC (Total body electrical conductivity)- similar to body impedance fat doesn’t transmit electrical activity as much as muscle.
Weight in Water

- Depends on the density of the water

- You will sink if you are more dense than the water you are floating in.

- You will float more easily in salt water than fresh water
Body components that make you sink

- Sink:
  - Bones
  - Muscle
  - Interstitial fluid
  - Blood
Body components that make you float

- Fat
- Air in lungs and other tissues

- Flotation devices
  - Floaties or foam? Why?
You tend to float

- With your center of bouyancy
- Over your center of gravity
- Depends on body composition
- Best way to float is on your back so you can keep breathing.
Boat safety

- Life jackets
- Knowing which way the current is going
- Not overloading a boat.
Percentage of Body Fat as the Criterion for Obesity

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>12–20%</td>
<td>20–30%</td>
</tr>
<tr>
<td>Borderline</td>
<td>21–25%</td>
<td>31–33%</td>
</tr>
<tr>
<td>Obese</td>
<td>&gt;25%</td>
<td>&gt;33%</td>
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Setting Body Composition Goals

- If fat loss would benefit your health, set a realistic goal in terms of percent body fat or BMI.
- If you have underlying health issues, check with your physician before setting a goal.
- Use the ratings in Table 6.1 or Table 6.2 to choose a target value for BMI or percent body fat.
- A little weight loss at a time can be very beneficial; focus on a healthy lifestyle including proper diet and exercise.
Making Changes in Body Composition

- Lifestyle should be your focus
- Include the following as part of a regular program:
  - Regular physical activity
  - Endurance exercise
  - Strength training
  - Moderate energy intake
- Reassess your body composition occasionally during your program