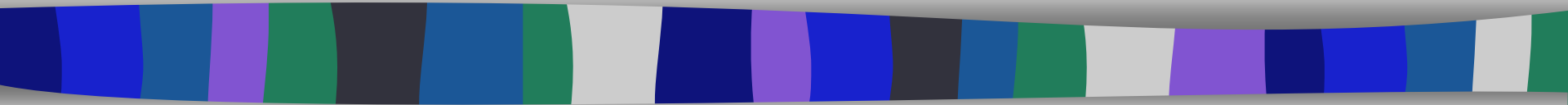


Body Composition



Carbohydrates
Proteins
Vitamins
Minerals

Fat

Water



Carbohydrates
Proteins
Vitamins
Minerals

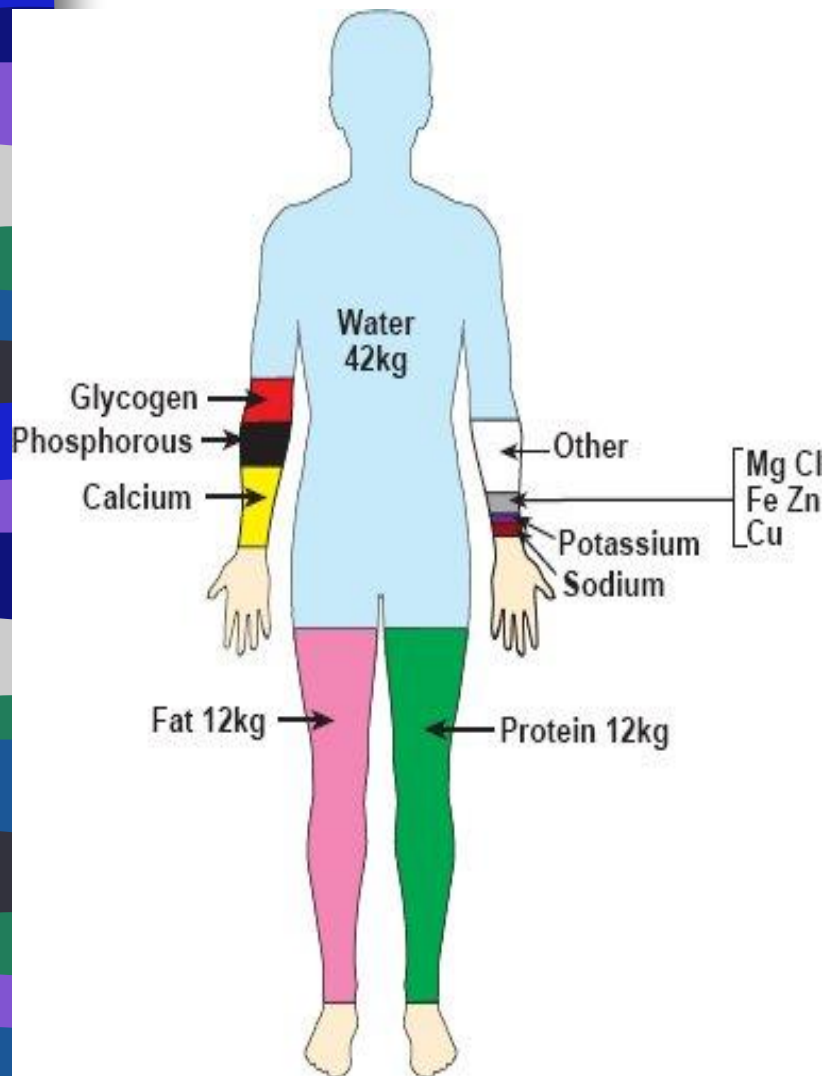
Fat

Water



The body composition

- The body composition is affected by the proportions of the body component (bones, muscles, and other tissues)
- It can be seen that the major component of the human body is water.
- The protein and fat component are relatively small, with the remainder being primarily bone and minerals



The body is composed of:

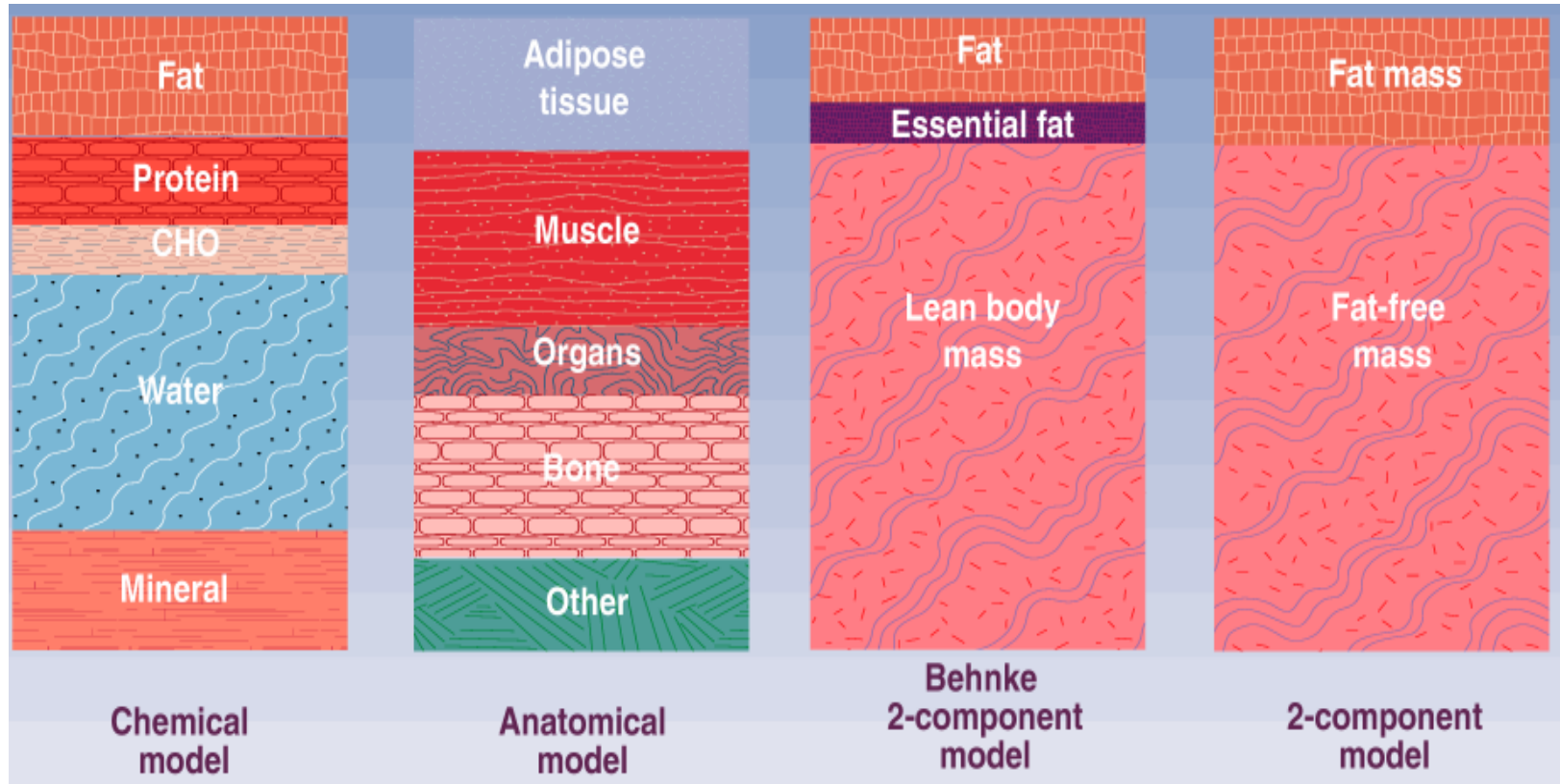
- Water 61.6%
- Fat 13.8%
- Protein 17%
- Carbohydrate 1.5%
- Various vitamins and minerals 6.1%



Body Composition

- There are three interrelated aspects of the human physique:
 - Size (volume, mass, surface area, length)
 - Structure (skeletal, muscular, fat arrangement and distribution)
 - Composition (amount of fat, muscle, bone)

MODELS OF BODY COMPOSITION





Body Composition

- Most common method used in body composition analysis is the 'Two-Component' model of the body
- This model includes:
 - Lean body mass (LBM)
 - Fat body mass
 - Total body fat (TBF)



Lean Body Mass

- Refers to the 'non-fat' or 'fat-free' component of the body
- Includes skeletal muscle, bone, water
- May represent a biological lower limit beyond which health is compromised
- Excessive leanness may increase a female's chances of developing amenorrhea (absence of menstruation)
- Amenorrhea includes a reduced production of estrogen, which may also increase a female's chances of developing osteoporosis

- 
- Lean body mass is calculated as follows:

$$\text{LBM} = \text{TBM} - \text{TBF}$$

Lean body mass = Total body mass - Total body fat

- TBF is calculated as follows:

$$\text{TBF} = \frac{\text{TBM} \times \% \text{BODY FAT}}{100}$$

Table 14.4

Body Composition Reference Standards for Adult Men and Women

Compartment	Men	Women
Essential fat	3 percent of total body fat	12 percent of total body fat
Desirable fatness for good health	10 to 20 percent body fat	16 to 26 percent body fat
Overfat	More than 25 percent body fat	More than 30 percent body fat

Source: Adapted from McArdle, W. D., F. I. Katch, and V. L. Katch. 2005. *Sports and Exercise Nutrition*. 2nd ed. Baltimore: Lippincott Williams & Wilkins.

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Anatomic differences in fat deposition:

The anatomic of body fat has a major influence on associated health risks

1.Apple-shaped: also called upper body obesity, the waist to hip ratio of more than 0.8 for women and more than 1 for men

2.Pear-shaped: also, called lower body obesity, in this case the lower waist to hip ratio. Waist to hip ratio less than 0.8 for women and less than 1 for men.



Upper-body fat is more common in men than in women and is closely associated with heart disease, stroke, diabetes, hypertension, and some types of cancer.

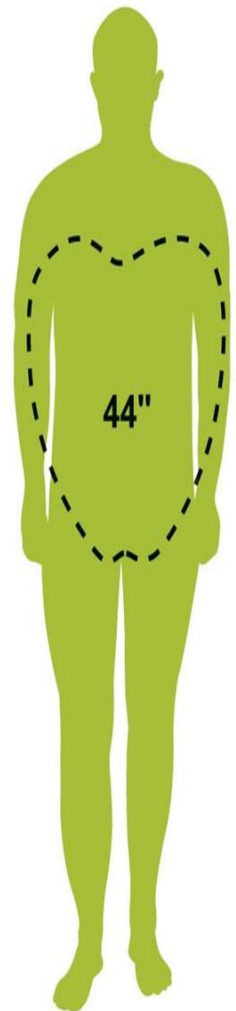
© 2007 Thomson Higher Education



Lower body fat is more common in women than in men and is not usually associated with chronic diseases.

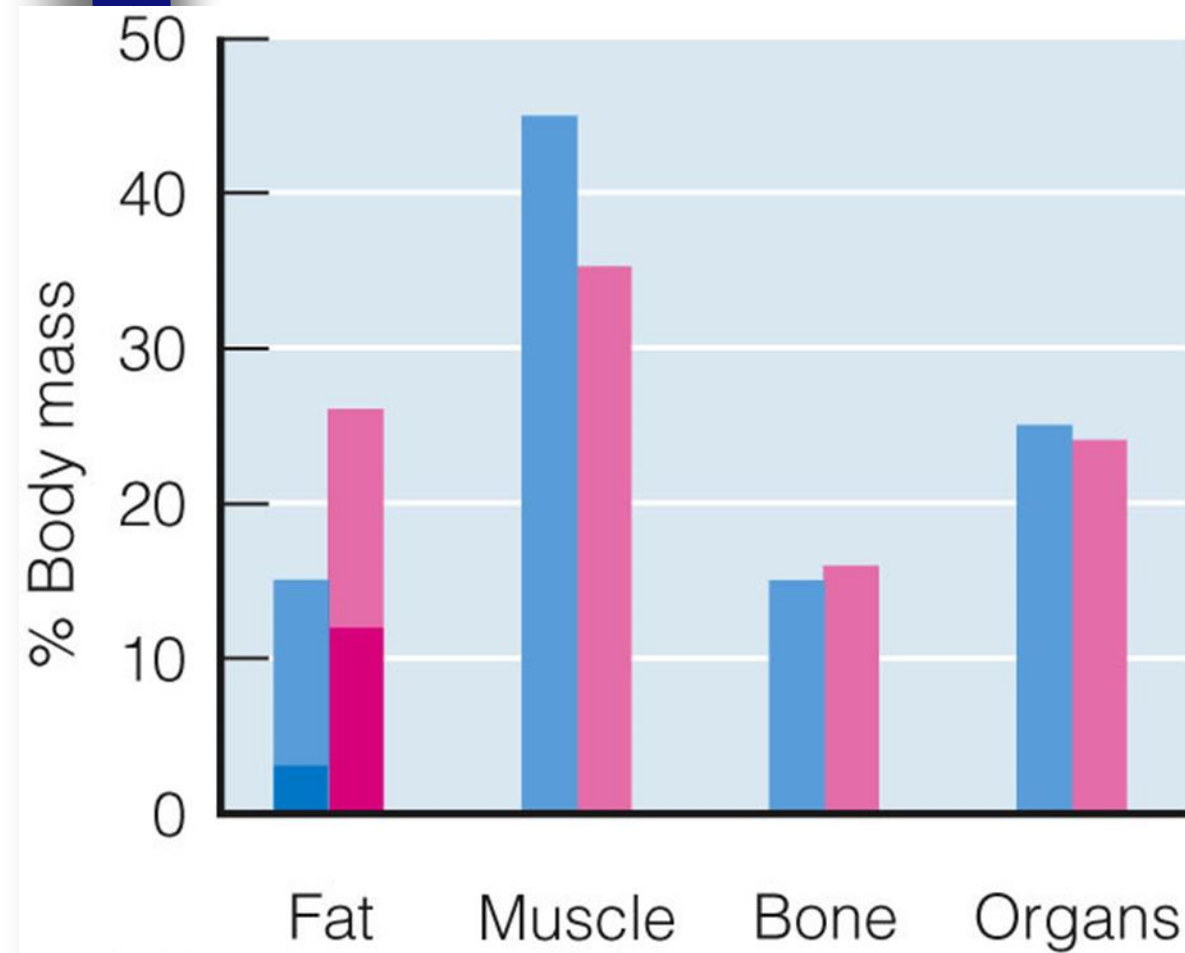


**Greater lower body
fat distribution**



**Greater upper body
fat distribution**

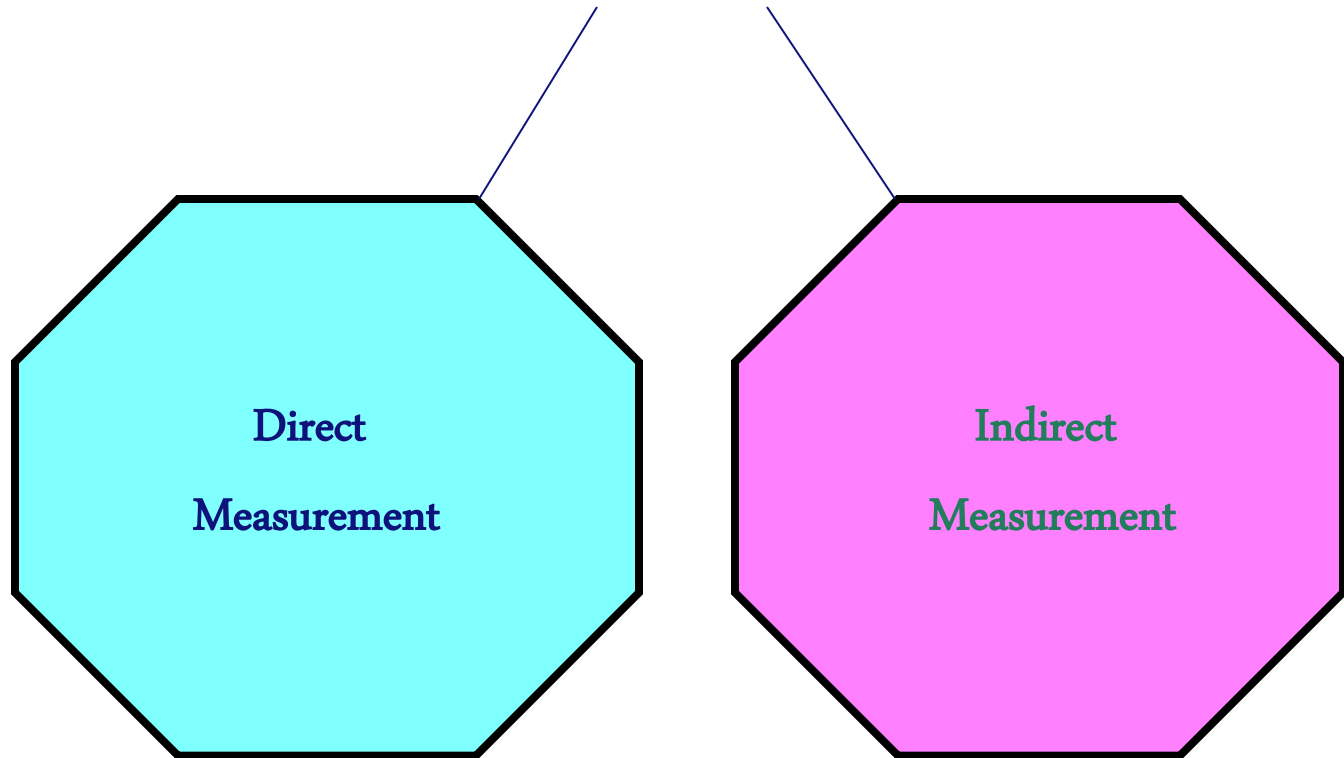
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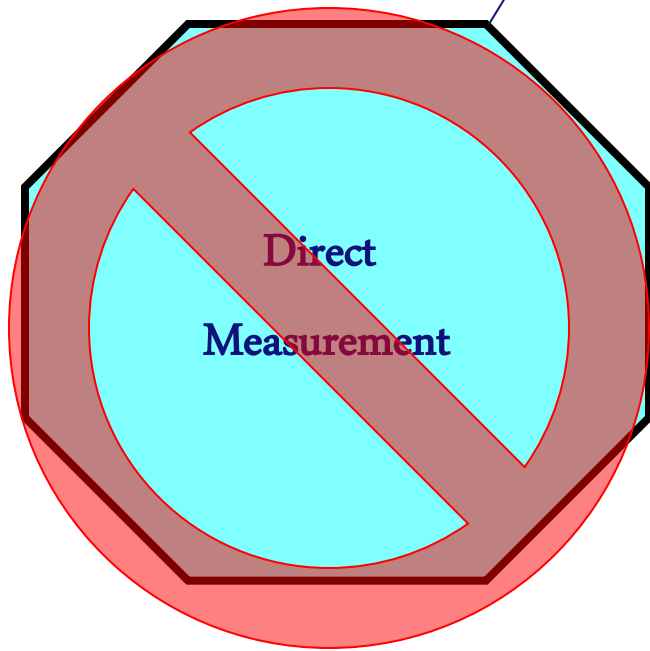
Key:

- Healthy man
- Healthy woman
- } Essential fat

Measuring Body Fat



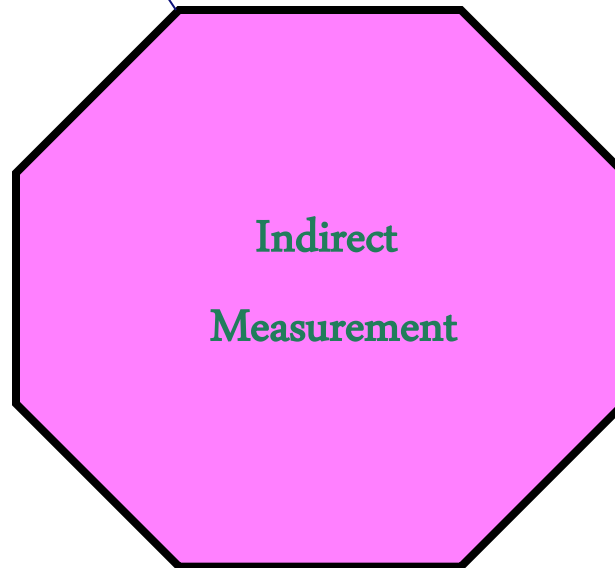
Measuring Body Fat



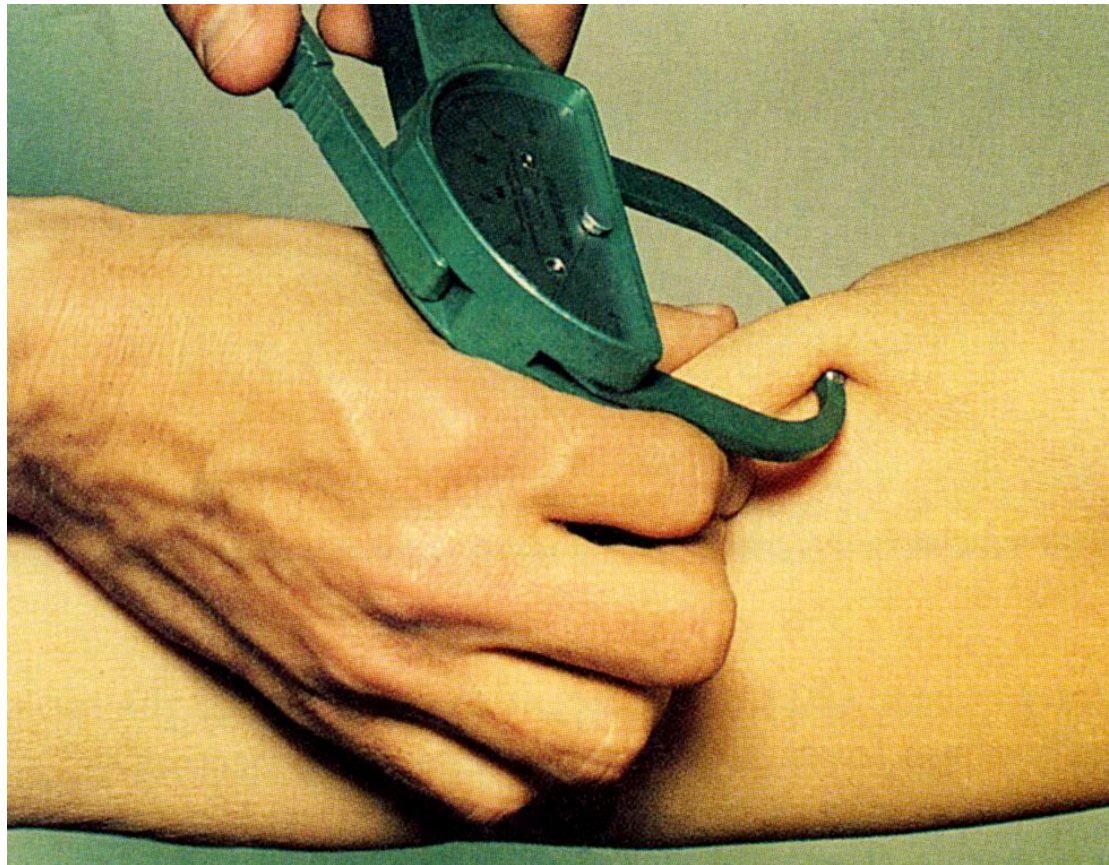
- Involves grinding tissue
- Measures fat via chemical analysis
- Impractical for living organisms
- Used on cadavers

Measuring Body Fat

- Skinfold calipers
- Hydrostatic weighing
- Bod-Pod
- Bioelectrical impedance
- DEXA

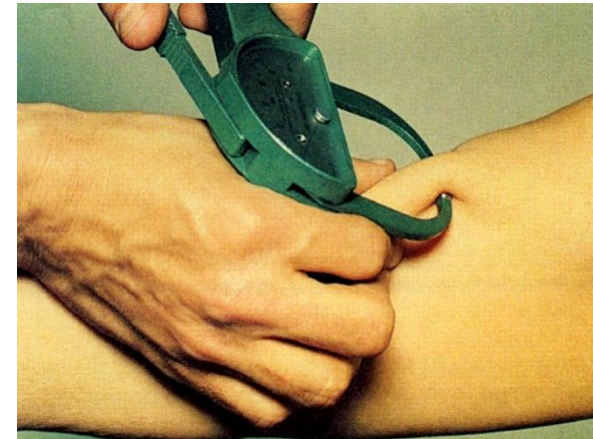


Skinfold Calipers



Skinfold Calipers

- Measures skinfold thickness to predict or estimate total body fat
- Based on the assumption that subcutaneous fat is directly related to total body fat
- Accuracy is $\pm 3\%$ when performed correctly



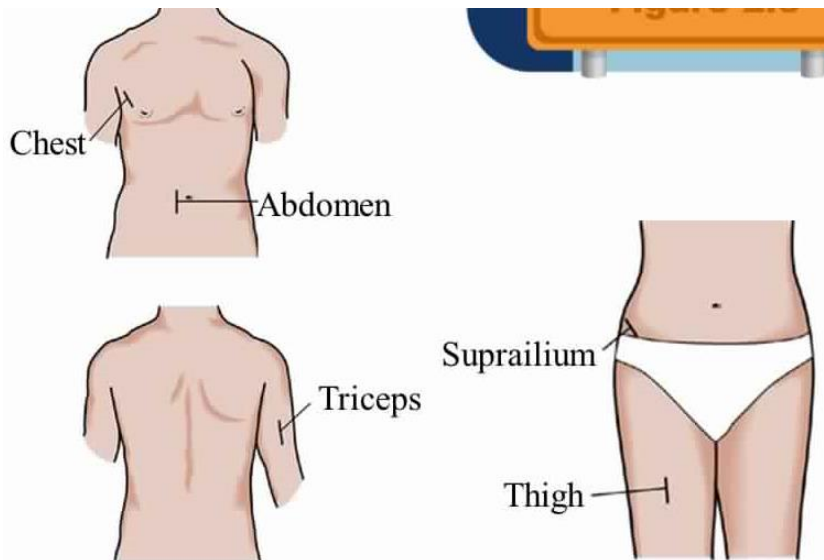
YMCA Skinfold Test

■ Equipment:

- Skinfold calipers

■ Skinfold sites:

- Four sites: abdomen, suprailium, triceps, thigh



© 2005 Wadsworth - Thomson



Norms for Percent Body Fat

Rating	Males		Females	
	18-25	26-35	18-25	26-35
Very Lean	4-7	8-12	13-17	13-18
Lean	8-10	13-15	18-20	19-21
Leaner than average	11-13	16-18	21-23	22-23
Average	14-16	19-21	24-25	24-26
Fatter than average	18-20	22-24	26-28	27-30
Fat	22-26	25-28	29-31	31-35
Overfat	28-37	30-37	33-43	36-48

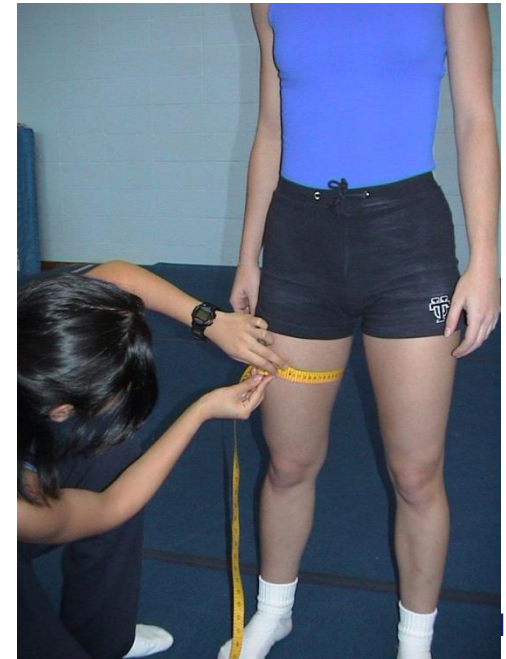
Circumference (Girth) Measurements

■ Equipment:

- A flexible steel or cloth measuring tape

■ Circumference sites:

- Neck, chest, hips, thigh, calf, biceps, abdomen

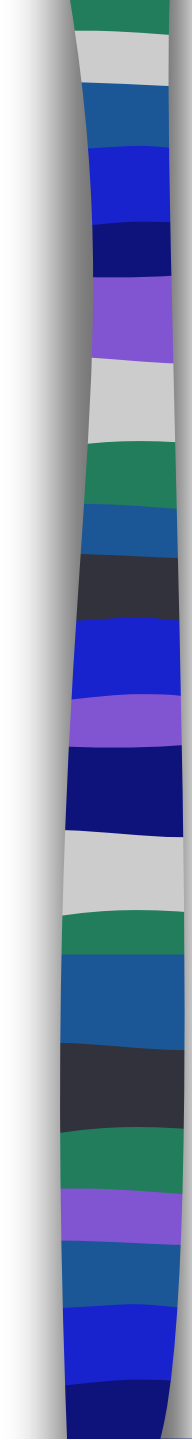




Body Mass Index (BMI)

- Can be used as an easy, inexpensive method for determining an individual's healthy body weight
- Considers weight (kg) and height (m)

$$\text{BMI} = \frac{\text{Weight (kg)}}{[\text{Height (m)}]^2}$$



BMI	Disease Risk	Classification
<20.00	Moderate to Very High	Underweight
20.00 to 21.99	Low	Acceptable
22.00 to 24.99	Very Low	
25.00 to 26.99	Low	Overweight
27.00 to 29.99	Moderate	
30.00 to 39.99	High	Obese
≥40.00	Very High	



Body Mass Index (BMI)

- Three general ranges:
 1. Underweight
 2. Healthy or Acceptable Weight
 3. Overweight
 - Severe Overweight
 - Morbid Obesity
- BMI score > 30 is classified as obese and associated with an increased risk of developing health problems
- Risk of developing health problems is also associated with BMI's classified as being within the underweight range



Body Mass Index (BMI)

- The BMI is intended for men and women aged 20-65
- It is not intended for:
 1. Babies
 2. Children
 3. Teenagers
 4. Pregnant women
 5. Very muscular people, such as athletes