

Chapter 8: Energy Balance and Body Composition

Energy Balance

- E_{in} = calories (consumed from foods)
- E_{out} = calories expended

- Homeostatic state for this balance to be maintained, thus body weight remains the same

Energy In: the kcals the body takes in through food and fluid

- Note that here we include all foods and fluids
 - recall that even some apparently "empty" foods, such as flavored water, can have some kcalories

- Hunger initiates the desire (physiological need) to eat

- Satiation is the feeling of fullness that prompts to stop eating (release of cholecystokinin among other factors)
 - protein and fiber in a meal promote satiation
 - fat in a meal has a weak effect on satiation; however, when in the intestines it is strong (following absorption) due to the release of cholecystokinin

Energy Out: the kcals the body expends

- Basal metabolism
 - maintenance activities
 - see factors affecting metabolic rate in table 8-1

- Physical activity
 - voluntary
 - varies widely (do you "burn" enough kcals this way???)

- Energy expended for food consumption (thermic effect of food)

- Estimated Energy Requirement: method by which DRI committee establishes recommended kcal intake for its tables
 - calculate your estimated energy requirement by following the steps on page 240 of your textbook
 - there are also websites (like the SuperTracker at the USDA ChooseMyPlate.gov) where you can enter your personal information and the program will do it for you

Body Composition

- Ratio of lean body weight to fat weight
- Lean tissue = all fat-free mass
 - o muscle and body organs
 - o bone
 - o fluids
- Fat tissue = triglycerides stored in adipose tissue

Body Mass Index

- Relates weight to height
 - o is considered a reliable indicator of total body fat (in a majority of cases, the BMI calculation places the individual in the same weight category as when taking a percent fat measure such as those listed below)
 - o determine your BMI from Table 8-4 and from the calculation provided in the "How To" box.
 - o see classifications in text
 - *you will be responsible for knowing the "healthy" category for BMI measures (18.5-24.9)*
- Used frequently in medical and health-related professions as well as scientific literature
- The score is valid for both men and women but it does have some limits. The *limits* are:
 - o does NOT measure body composition and so it may **overestimate** body fat in athletes and others who have a muscular build (all that muscle is heavy!) or greater bone density, such as black Americans
 - o may **underestimate** body fat in older persons and others who have lost muscle mass

Fat Distribution

- Even more important than the amount of fat is where your fat is located; fat that is located in your abdominal area is associated with an increased risk of heart disease, high blood pressure, and diabetes
 - o referred to as central obesity or upper body fat (the "apple" shape)
- Waist circumference
 - o health risks are greater if waist circumference measures are:
 - men > 40 in.

- women > 35 in.

Other Measures of Body Composition (see Fig. 8-10)

- Skinfolds measure level of storage fat (most of which is just beneath skin's surface); easy to use
 - o healthy level of body fat for men: 12-20%
 - o healthy level of body fat for women: 20-30%
- Underwater weighing
- Bioelectrical impedance
- Others shown

Negative health consequences of overweight

- Diabetes
- Hypertension
- CV disease
- Some cancers
- Inflammation and Metabolic Syndrome
- Arthritis
- Other joint problems
- Sleep apnea
- Abdominal hernias
- Gallbladder disease
- Complications in pregnancy and surgery

Possible health consequences of underweight

- Especially if correlated to malnutrition and wasting, such as in anorexia or other clinical conditions
 - o poor immune response
 - o nutritional deficiencies
 - o complications during pregnancy and small birth weight baby
- Athletic women with very low levels of body fat often experience menstrual irregularities; these are not serious, but do illustrate the need for women to carry