Chapter 8
Exercise, Diet, and Weight Control

Outline
- Define obesity and discuss potential causes
- Relationship between obesity and health risk
- Energy balance
- Basal metabolic rate, resting metabolic rate, and daily energy expenditure
- Estimation of daily energy expenditure
- Four basic components of weight loss program
- Weight loss myths
- Eating disorders
- How to gain body weight

Almost a third of the US Population is Obese
- Obesity can be defined as a BMI (weight in kg/height in m squared) \( \geq 30 \) (NIH, WHO)
- By this criterion, 30.5\% of the U.S. population 20 years and older (about 65 million people) are obese (JAMA, 2002)
  - About 28\% of men 20-74 years old
  - About 34\% of women 20-74 years old
- An additional 34\% of the adult population are classified as overweight (BMI between 25 and 30).
- Based on a 1999-2000 study of 4115 adults
Obesity increases health risk
- Why do we care about obesity rates?
- Obesity increases the risk of developing numerous health problems including:
  - Hypertension
  - Hypercholesterolemia
  - Stroke
  - Heart disease
  - Type II diabetes
  - Arthritis
  - Sleep apnea
  - Possibly some forms of cancer

Optimal Body Fat
- Researchers disagree on exact percentages of body fat that are considered optimal
- Optimal % body fat
  - Males = 10-20%
  - Females = 15-25%
- A BMI between 19.0 to 25.0 for adults (HP 2010)
- HP 2010 Objective is to reduce to less than 15% of the population the prevalence of BMI ≥ 30 (current prevalence is 2X that)

Figure 8.3 The concept of ideal body weight based on a desirable percent body fat.

Causes of Obesity
- Obesity is related to both genetics and lifestyle
  - Children of obese parents have a greater risk of becoming obese
    - One obese parent = 60% chance
    - Two parents obese = almost 90% chance
  - Twin studies, studies of adopted children
  - Creeping obesity – positive caloric balance over many years

Figure 8.1 The concept of creeping obesity.

Leptin
- The hormone product of the “ob gene”
- Produced by adipose (fat) tissue
- Higher levels of leptin reduce appetite and increase energy expenditure
- Mice with a defective ob gene become grossly overweight
- However, most overweight people have high circulating levels of leptin (only a few have leptin deficiency)
- Leptin has many effects in the body and is a topic of active research

Regional Fat Storage
- Site for body fat storage is genetically determined
  - Many men store excess fat in the abdominal area
Most women store fat in the lower body
- Affects the waist to hip ratio (Ch 2)

- Visceral fat versus subcutaneous fat
  - Visceral fat is found around the abdominal organs = central obesity = greater health risk
  - Subcutaneous fat is below the skin

Figure 8.2 Much of our body fat is stored directly beneath the skin.

Energy Balance Concept
- Caloric balance maintains a constant body weight
  - Energy intake = energy expenditure
- Positive caloric balance increases body fat
  - Energy intake > energy expenditure
- Negative caloric balance reduces body fat
  - Energy intake < energy expenditure

Energy Expenditure - Definitions
- Total daily energy expenditure = resting metabolic rate + exercise metabolic rate
- Basal metabolic rate (BMR) is the amount of energy expended at rest (lying down), NOT while digesting
- Resting metabolic rate (RMR) is the amount of energy expended during all sedentary activities (including digestion)
- Exercise metabolic rate (EMR) is the energy expenditure during any form of exercise

Components of Energy Expenditure
- BMR ~ 60-65% of the total energy expenditure
- Thermic effect of food (cost of digestion) = 5-10% of total energy expenditure
- Physical activity ~ 25-35%, but highly adjustable

Some Factors Affecting the BMR
- Age - BMR is higher in growing children than adults, decreases in advanced age
- Body size - bigger people have more body to support
- Gender, body composition - lean tissue has a higher “idle”
- Thyroid hormone - key regulator of BMR, higher levels increase BMR

Estimating Your BMR
- 1. Find your weight in kg
- 2. Multiply the kg by 1.0 cal/kg/hr (men) and 0.9 cal/kg/hr (women) to get cal/hr
- Multiply by 24 hours/day to get cal/day
- E.G.: 150 lbs = 68 kg
- 68 cal/hr * 24 hr = 1,632 cal/day (man)

24 Estimating Your Total Caloric Expenditure
- Table 8.1 - five levels of activity
- Cal/lb/day ranges from 13-18
- E.G.: 150 lbs person who is moderately active (level 3)
  
  150 * 15 = 2250 cal/day

25 Four Basic Components of a Comprehensive Weight Loss Program
- Establishing weight loss goals
- Reduced caloric diet that stresses balanced nutrition
- Exercise program
- Behavior modification program aimed at changing eating behavior

26 Fat Deficit Concept in Weight Control
- Creating a fat deficit is a recommended component of a weight loss program
- Fat usage > fat intake
  - Low-fat diet
  - Exercise

27 What is a Safe Rate of Weight Loss?
- One pound per week is generally considered safe
  - Negative energy balance of approximately 3500 calories/week
- Rate of weight loss is greater during the first several days of dieting

28 Key Points Associated with a Safe Diet
- Low in calories (but usually should not be less than 1,200/day)
- Low in fat (15 - 30% cal from fat)
- Contains a variety of foods & all essential nutrients
- Contains at least 55% of cal from carbohydrate, mostly complex (not sugars)
- Uses foods that are readily available
- Lifelong

29 Exercise and Weight Loss
- Exercise plays a key role in weight loss
  - Both low and high intensity exercise can assist in weight loss
  - Both cardiorespiratory and strength training are recommended

30 Behavior Modification
- Behavior modification is a key factor in achieving both short-term and long-term weight loss
- Eating behaviors are learned & relearning is possible
- Behavior modification is a means of eliminating unhelpful eating habits, E.G:
  - Identify and eliminate inappropriate eating cues
    - Eat during TV watching?
    - Eat during studying?
Eat in response to certain social situations?
Can’t pass up a vending machine?

31 - Weight Loss Myths
- Diet pills
  - Many are ineffective for sustained weight loss
  - Some are dangerous – e.g., fenfluramine and dexfenfluramine were removed from the market when a link to valvular heart disease was discovered (2-12% prevalence); ephedrine (ma huang) a herbal diet aid may also be dangerous (it’s been banned in Canada)
- Spot reduction – doesn’t work
- Eating before bed – timing less important than total calories
- Cellulite – just plain subcutaneous fat
- Fat dissolving creams – don’t work
- Saunas, steam baths, and rubber suits – weight loss is in sweat

32 - Eating Disorders
- Anorexia nervosa – essentially a state of starvation due to a refusal to eat
  - Patients are typically adolescent females
  - Distorted body image, morbid fear of weight gain, perfectionism
- Bulimia - an obsessive-compulsive disorder usually involving “binge eating” – periodic ingestion of large quantities of food followed by vomiting, laxative use, diuretic use, extreme exercise, or fasting
  - Patients are typically young adults
  - More common than anorexia
  - Medical complications related to electrolyte imbalance and consequences of repeated vomiting

33 - Gaining Muscle Mass
- Weight training and increased caloric intake
- Protein supplementation is generally unnecessary
- Rate of muscle growth for men and women is generally no more than 0.25 lbs. per week

34 - Summary
- Obesity affects millions of Americans and is linked to many diseases.
  - Social and economic costs
- Optimal body fat is 10-20% for men and 15-25% for women.
- Energy balance theory: energy intake must be equal to expenditure.
- Total energy expenditure is the sum of RMR and ExerciseMR – the latter can be increased with voluntary activity

35 - Summary (continued)
- Weight loss goals should be both short- and long-term.
- Weight loss programs should include goals, moderate caloric restriction, exercise, and behavior modification.
- Two serious eating disorders are anorexia nervosa and bulimia.
- Weight training and positive caloric balance are needed to increase muscle mass.