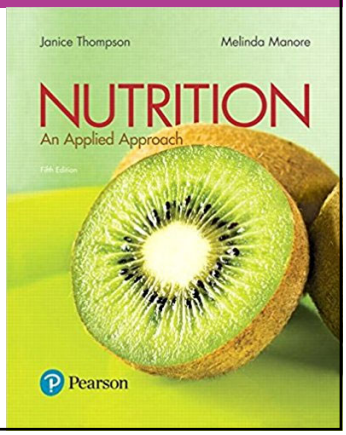
Chapter 1 Lecture

Chapter 1: Nutrition: Linking Food and Health, and In Depth 1.5, New Frontiers in Nutrition and Health



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What Is Nutrition?

- Nutrition: the study of food, including
  - How food nourishes our bodies
  - How food influences our health
- Nutrition is a relatively new discipline of science
- **Nutrition research focuses on supporting health and preventing and/or treating chronic diseases**

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What Is Nutrition? (cont.)

- Nutrition involves study of the following:
  - Food consumption
  - Food digestion
  - Food absorption
  - Food storage
  - Factors that influence eating patterns
  - Recommended amounts of types of food
  - Food safety
  - The global food supply

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How Does Nutrition Support Health?

- Nutrition supports health and wellness
- Wellness: A multidimensional, active process by which people make choices to enhance their lives
  - Includes: physical, emotional, social, occupational, and spiritual health
- Critical components of wellness
  - Nutrition
  - Physical activity

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Wellness

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Nutrition and Chronic Disease Prevention

- **Nutrition can prevent disease**
  - **1) Nutrient-deficiency diseases**: scurvy, pellagra
  - Three **2) chronic diseases** strongly associated with poor nutrition: heart disease, stroke, diabetes
  - Diseases in which nutrition plays a role: osteoarthritis, osteoporosis
- Obesity is the primary link between poor nutrition and mortality

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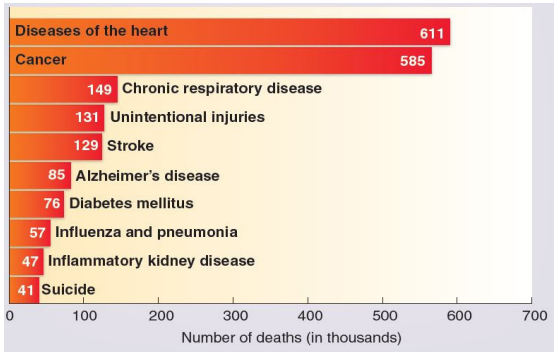
Leading Causes of Death in the U.S.



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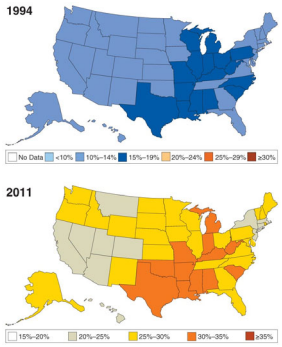
Increase in Obesity Rates (needs new picture)



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Healthy People 2020

- Nutrition is so important that it has become a national goal
- The *Healthy People* plan, revised every decade, identifies goals and objectives to reach by 2020

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Healthy People 2020 (cont.)

- Goals of *Healthy People 2020*
  - Attain high-quality, longer lives free of preventable disease, disability, injury, and premature death
  - Achieve health equity, eliminate disparities, and improve the health of all groups
  - Create social and physical environments that promote good health for all
  - Promote quality of life, healthy development, and healthy behaviors across all life stages

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Healthy People 2020 (cont.)

TABLE 1.1 Weight, Nutrition, and Physical Activity Objectives from *Healthy People 2020*

Topic	Objective Number and Description
Weight status	NWS-8. Increase the proportion of adults who are at a healthy weight from 30.8% to 33.9%.
	NWS-9. Reduce the proportion of adults who are obese from 34.0% to 30.6%.
	NWS-10.2. Reduce the proportion of children aged 6 to 11 years who are considered obese from 17.4% to 15.7%.
Food and nutrient composition	NWS-14. Increase the contribution of fruits to the diets of the population aged 2 years and older.
	NWS-15. Increase the variety and contribution of vegetables to the diets of the population aged 2 years and older.
Physical activity	PA–1. Reduce the proportion of adults who engage in no leisure-time physical activity from 36.2% to 32.6%.
	PA–2.1. Increase the proportion of adults who engage in aerobic physical activity of at least moderate intensity for at least 150 minutes per week, or 75 minutes per week of vigorous intensity, or an equivalent combination from 43.5% to 47.9%.
	PA–2.3. Increase the proportion of adults who perform muscle-strengthening activities on 2 or more days of the week from 21.9% to 24.1%.

Data adapted from: Healthy People 2020 (U.S. Department of Health and Human Services).

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What Are Nutrients?

- Nutrients: chemicals in foods that are critical to human growth and function
- There are six groups of essential nutrients found in foods:
  - Carbohydrates
  - vitamins
  - fats and oils
  - minerals
  - proteins
  - water

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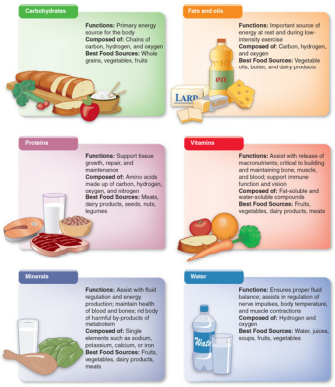
Six Groups of Essential Nutrients



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What Are Nutrients? (cont.)

1. Macronutrients: nutrients required in relatively large amounts
   - Provide energy
   - Carbohydrates, fats and oils, proteins
2. Micronutrients: nutrients required in small er amounts
   - Vitamins and minerals

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Macronutrients Provide Energy

- We measure energy in kilocalories (kcal)
- Kilocalorie: amount of energy required to raise the temperature of 1 kg of water by 1° C
- On food labels, “calorie” actually refers to kilocalories

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Carbohydrates

- Carbohydrates are the primary source of fuel for the body, especially for the brain
  - Provide 4 kcal per gram
  - Contain carbon, hydrogen, and oxygen
  - Found in grains, vegetables, fruits, legumes, dairy, nuts, and seeds

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Fats

- Fats are composed of lipids, molecules that are insoluble in water
  - Provide 9 kcal per gram
  - Contain carbon, hydrogen and oxygen
  - Found in butter, margarine, vegetable oils (such as canola oil, olive oil, sunflower oil and more)

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Proteins

- Proteins are chains of amino acids
  - Can supply 4 kcal of energy per gram, but are not usually a primary energy source
  - Contain carbon, hydrogen, oxygen and *nitrogen*
- Protein sources include meats, dairy products, seeds, nuts, and legumes

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Proteins (cont.)

- Proteins are important for:
  - Building cells and tissues
  - Maintaining bones
  - Repairing damaged tissues
  - Regulating metabolism
  - Fluid balance

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Micronutrients

- Vitamins and minerals are known as micronutrients
- Micronutrients: Nutrients needed in relatively small amounts to support normal health and body functions
- Neither vitamins nor minerals provide kilocalories

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Vitamins

- Vitamins: organic molecules that assist in regulating body processes
- Vitamins are classified by the way they are absorbed, transported and stored in the body
  - Fat-soluble vitamins
  - Water-soluble vitamins

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Overview of Vitamins

TABLE 1.2 Overview of Vitamins

Type	Names	Distinguishing Features
Fat soluble	A, D, E, K	Soluble in fat Stored in the human body Toxicity can occur from consuming excess amounts, which accumulate in the body
Water soluble	C, B-vitamins (thiamin, riboflavin, niacin, vitamin B_6, vitamin B_{12}, pantothenic acid, biotin, folate)	Soluble in water Not stored to any extent in the human body Excess excreted in urine Toxicity generally only occurs as a result of vitamin supplementation

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Minerals

Minerals: inorganic substances required for body processes

- Minerals include sodium, calcium, iron, potassium, and magnesium
- Minerals have many different functions, such as fluid regulation and energy production; are essential to bones and blood; and help eliminate harmful by-products of metabolism

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Overview of Minerals

TABLE 1.3 Overview of Minerals

Type	Names	Distinguishing Features
Major minerals	Calcium, phosphorus, sodium, potassium, chloride, magnesium, sulfur	Needed in amounts greater than 100 mg/day in our diet Amount present in the human body is greater than 5 g (5,000 mg)
Trace minerals	Iron, zinc, copper, manganese, fluoride, chromium, molybdenum, selenium, iodine	Needed in amounts less than 100 mg/day in our diet Amount present in the human body is less than 5 g (5,000 mg)

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Water Supports All Body Functions

- Water is an inorganic nutrient that is vital for health and survival
- Water is involved in many bodily processes:
  - fluid balance
  - nutrient transport
  - nerve impulses
  - removal of wastes
  - muscle contractions
  - body temperature

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Determining Nutrient Needs

- **Dietary Reference Intakes (DRIs)** identify the
  - Amount of a nutrient needed **to prevent deficiency disease** in healthy people
  - Amount of a nutrient that may **reduce the risk of chronic disease**
  - Upper level of safety for nutrient intake

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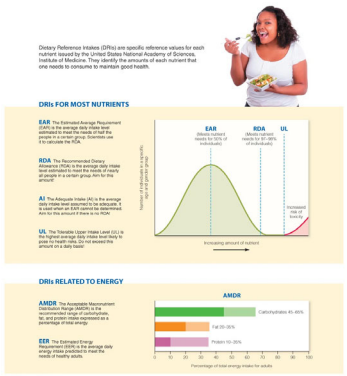
Determining Nutrient Needs (cont.)



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Determining Nutrient Needs (cont.)

- DRIs consist of four values
  - Estimated Average Requirement (EAR)
  - Recommended Dietary Allowance (RDA)
  - Adequate Intake (AI)
  - Tolerable Upper Intake Level (UL)

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Determining Nutrient Needs: EAR

Estimated Average Requirement (EAR)

- The average daily intake level of a nutrient that will **meet the needs of half of the healthy people** in a particular life stage and gender group
- Used to determine the Recommended Dietary Allowance (RDA) of a nutrient

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Determining Nutrient Needs: RDA

Recommended Dietary Allowance (RDA)

- The average daily intake level required to **meet the needs of 97–98%** of healthy people in a particular life stage and gender group

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Determining Nutrient Needs: AI

Adequate Intake (AI)

- Recommended average daily intake level for a nutrient that is assumed to be adequate
- **Based on observations and estimates from experiments**
- Used when the RDA is not yet established: vitamin D, vitamin K, fluoride and chromium

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Determining Nutrient Needs: UL

Tolerable Upper Intake Level (UL)

- Highest average daily intake level that is not likely to have adverse effects on the health of most people
- Consumption of a nutrient at levels above the UL is not considered safe

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DRI's and Energy

- Two DRIs apply to energy specifically
  - Estimated Energy Requirement (EER)
  - Acceptable Macronutrient Distribution Range (AMDR)

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Determining Nutrient Needs: EER

Estimated Energy Requirement (EER)

- Average dietary energy intake to maintain energy balance
- Based on age, gender, weight, height, and level of physical activity

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Determining Nutrient Needs: AMDR

Acceptable Macronutrient Distribution Range (AMDR)

- The range of energy intake from carbohydrate, fat, and protein associated with reduced risk of chronic disease
- The range of macronutrient intake that provides adequate levels of essential nutrients

CHO: 900-1300 kcal / 2000 kcal
Fat: 400-700 kcal / 2000 kcal
Protein: 200-700 kcal / 2000 kcal

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Interpreting Nutrition Research

- Research involves applying the scientific method
  - Observation and description of a phenomenon
  - Creation of a hypothesis
  - Design of a repeatable experiment
  - Collection, analysis, and interpretation of data
    - Formation of a conclusion, or proposal of an alternative hypothesis
  - Development of a theory based on repeated experiments

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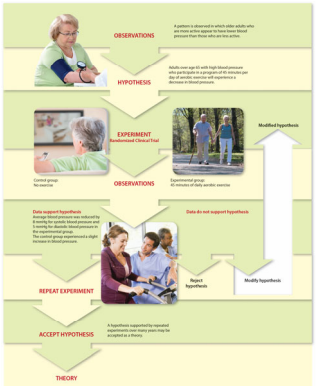
The Scientific Method



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Types of Research Studies

- Animal versus human studies
  - Drawbacks: ethical concerns, and results may not apply to humans
- Epidemiological studies
- Observational studies
  - Can only indicate relationships between factors
- Case control studies
- Clinical trials

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Clinical Trials

- In clinical trials, an intervention's effect on a certain disease or health condition is tested using two groups: the experimental group and the control group
- Randomized trials
- Single- and double-blind experiments
  - Placebo: an imitation treatment that has no effect, given to the control group in placebo-controlled double-blind randomized clinical trials

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Evaluating Nutrition-Related Claims

- Ask these questions to determine scientific validity:
  - Who is reporting the information?
    - What are their credentials?
  - Who conducted the research and who paid for it?
    - Is there a conflict of interest?

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Evaluating Nutrition-Related Claims (cont.)

- Is the report based on reputable research studies?
  - Was there a control and an experimental group?
  - Was the sample size large enough to rule out chance variation?
  - Was a placebo effectively administered?
  - Was it a double-blind study?
- Is the report based on testimonials?
- Are the claims too good to be true?

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Determining a Website's Reliability

- Look at:
  - The website sponsors' credentials
  - Whether the date of the website is recent
  - The internet address: ".gov", ".edu", and ".org" are generally considered reliable

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Whom Can You Trust?

- Trustworthy experts are educated and credentialed
  - Registered dietitian (RD)
  - Licensed dietitian
  - Nutritionist with credentials and experience
  - Professional with advanced degree(s) in nutrition (MS,MA, or PhD in nutrition)
  - Physician with appropriate expertise in nutrition

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Whom Can You Trust? (cont.)

- Government agencies are usually trustworthy
  - **The Centers for Disease Control and Prevention (CDC)** supports two large national surveys
    - National Health and Nutrition Examination Survey (NHANES)
    - Behavioral Risk Factor Surveillance System survey (BRFSS)
  - **National Institutes of Health (NIH)** focuses on specific areas of research, including cancer; heart, lung, and blood diseases; diabetes; and alternative medicine

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Whom Can You Trust? (cont.)

- Professional organizations publish cutting-edge nutrition research and information
- These include
  - Academy of Nutrition and Dietetics (AND)
  - American Society for Nutrition (ASN)
  - American College of Sports Medicine (ACSM)
  - The Obesity Society (TOS)

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In Depth: New Frontiers

Nutrigenomics studies the interactions among genes, the environment, and nutrition

- Key theory: foods and environmental factors can "switch" some genes on while turning off others
- Could help in reducing risk of diet-related disease, treating existing conditions through diet, and making personalized nutrition possible

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In Depth: New Frontiers (cont.)

- The human genome is the set of genes making up the DNA in the nucleus of a human cell
- The human microbiome is the set of genes belonging to microorganisms that inhabit the human body
  - Our health is affected by the way they interact with our human cells and genes that are required for digestion
  - GI flora: helpful bacteria in our gastrointestinal (GI) tract

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In Depth: New Frontiers (cont.)

Functional foods have biologically active ingredients that provide health benefits beyond basic nutrition

- Probiotics contain live microorganisms that improve the intestinal microbial balance
- Prebiotics are nondigestible food ingredients that stimulate the growth and/or activity of probiotic bacteria
- Phytochemicals are naturally occurring plant compounds believed to have health-promoting effects in humans

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