Chapter 14: Feeding the world
Student learning outcomes: At the end of this chapter, you should be able to:

- Compare and contrast the causes and effects of undernutrition and overnutrition
- Discuss causes of malnutrition in the world and US
- Take an action to help eliminate/decrease hunger and food insecurity
Malnutrition

- Increases illness, decreases life expectancy, and decreases productivity

- Undernutrition
  - Hunger: recurrent involuntary lack of food
  - Starvation: severe reduction in energy and nutrient intake leading to illness and death

- Overnutrition
Malnutrition

PREGNANT WOMEN
- Low weight gain
- Increased maternal mortality

INFANTS
- Low birth weight
- High mortality rate
- Impaired mental development
- Increased risk of adult chronic disease

ADULT MEN AND WOMEN
- Poor health
- Poor productivity in the workforce

ADOLESCENTS
- Stunted growth
- Decreased physical capacity

CHILDREN
- Stunted growth
- Reduced mental capacity
- Impaired immunity

In addition to insufficient food, inadequate health care and frequent infections contribute to malnutrition at all stages of life.
Malnutrition

Causes of death in neonates and children under age 5 in the world

- Noncommunicable disease (postneonatal) 4%
- Other infectious and parasitic diseases 9%
- HIV/AIDS 2%
- Measles 4%
- Malaria 7%
- Diarrheal diseases (postneonatal) 16%
- Acute respiratory infectious disease (postneonatal) 17%
- Injuries (postneonatal) 4%

Neonatal deaths 37%
Interpreting data

What percentage of all deaths in children under age 5 is due to infection?

a) 9%
b) 17%
c) 55%
d) 63%
Undernutrition

- Increases:
  - Low-birth-weight babies
  - Infant mortality rate: number of deaths in the first year of life per 100 live births
  - Infections
  - Stunting: decrease in linear growth rate // Decreases adult productivity // Increases low-birth-weight babies
  - Abdominal obesity
Overnutrition

- Number of over nourished people exceeds the number of under nourished people
- By 2030, 57.8% of the world’s population will be overweight or obese
Nutrition transition

- When poor countries become more prosperous
- Diet, physical activity, health, nutrition changes
- Decreases low-birth-weight babies and infant mortality
- Increases life expectancy, chronic disease, natural resource use
Nutrition transition

- Diets in developing countries and rural areas:
  - Limited foods
  - Starchy grains
  - Root vegetables
Nutrition transition

- Diets in developed countries and urban areas:
  - Increased variety
  - Increased meats
  - Increased low-nutrient-density foods
  - Decreased activity
Nutrition transition

Traditional rural diets
Low-fat
Low-sugar
High-fiber
Monotonous, little variety
Mainly carbohydrate staples

Inadequate in energy and/or nutrients

Adequate and prudent

Nutrition transition

Affluent Western diets
High-fat
High-sugar
Low-fiber
Diverse, varied
High in animal protein

Nutritionally adequate but imprudent

Disease
Lack of medical care

Undernutrition
Increased risk of infection

Optimal nutrition
Lower risk of chronic and infectious disease

Overnutrition
Obesity, coronary heart disease, diabetes, hypertension, stroke

Inactivity
Smoking
Alcohol
Stress

© 2012 John Wiley & Sons, Inc. All rights reserved.
Concept check

- How prevalent are undernutrition and overnutrition around the world?

- What is the impact of stunting on the health and productivity of a population?

- How does nutrition transition affect a population’s health?
THINK about this – then share within a PAIR – then SHARE with the class

What do you think are some causes of hunger and starvation in the world? In the US? In your community?
Food insecurity

- Lack adequate physical, social, or economic access to sufficient, safe, and nutritious food to meet dietary needs and food preferences for an active and healthy life

- Underlying cause: inequitable food distribution

  - Results in food shortage or wrong combination of food to meet needs
Food shortages

- **Chronic shortages:**
  - Caused by: economic inequities causing lack of money, education, or health care; populations outgrow food supply; culture and/or religion limit choices; environmental damage

- **Famine:** widespread lack of food access resulting from a disaster
  - Caused by: drought, flood, crop destruction, wars, civic conflict
Food shortages
Poverty

- Increases food insecurity
- Reduces health-care access increasing disease and disability prevalence
- Reduces access to education
Poverty

Prevalence of poverty
(Income/person/year)

Prevalence of undernutrition
(millions of people)

Developed countries 19
Near East and North Africa 37
Latin America and the Caribbean 53
Sub-Saharan Africa 239
Total = 925 million

© 2012 John Wiley & Sons, Inc. All rights reserved.
Poverty
Interpreting data

What percentage of the world’s undernourished live in sub-Saharan Africa?

a) 25.8%
b) 62.5%
c) 50%
d) 4%
Overpopulation

- When the number of people is greater than what natural resources can support

- Enough food is produced to feed everyone; not distributed equitably

- Rate of population growth could exceed ability to produce food for the world’s population

- Increased grain demand for more grain-intensive livestock and to produce fuel

  - Increased grain and food prices and decreased aid
World population growth

- 2010: 6.9 billion
- Less-developed countries
- More-developed countries

© 2012 John Wiley & Sons, Inc. All rights reserved.
Cultural practices

- Food access may be limited by gender, control of income, education, age, birth order, and genetic endowments
- Culturally acceptable and unacceptable foods
Limited environmental resources

- Limited land and other food-production resources
  - Non-renewable resources: cannot be replaced if used (fossil fuels, minerals)
  - Renewable resources: if used at a rate that allows them to be restored and replaced by natural processes (soil, water)

- Soil erosion, nutrient depletion, and pollution reduces amount of land that can be used
Modern mechanized agriculture

- Increased food production

- Soil erosion, nutrient depletion

- Fertilizers and pesticides pollute water

- Refrigeration, freezing, and processing increase energy use
Increased demand for meat-based diets

- Animals produce methane, a greenhouse gas
  - More methane produced with large-scale farming when waste is stored in ponds and heaps
  - Livestock emit a larger percentage of greenhouse gases than all cars combined
- Accounts for >8% of human water use
- Releases nutrients, pathogens and pollutants into waterways
- Oceans are being depleted of fish
Environmental impact on oceans
Poor-quality diets

- Malnutrition can occur even if enough food is consumed.

- Typical diet in developing countries: high-fiber grains and root vegetables with little variety.

- Deficiencies in protein, iron, iodine, vitamin A, niacin, thiamin, vitamin C, folate, zinc, selenium, calcium.

- At most risk: ill, pregnant, young, and old.
Protein & micronutrient deficiencies

Bruce Brander/Photo Researchers, Inc.

ALISON WRIGHT/NG Image Collection

© 2012 John Wiley & Sons, Inc. All rights reserved.
Protein & micronutrient deficiencies

Normal red blood cells

Iron deficiency anemia

(left) B & B Photos/Custom Medical Stock Photo, Inc.; (right) Custom Medical Stock
Protein & micronutrient deficiencies
Concept check

- What causes food insecurity?

- How can environmental damage lead to food shortages?

- Why do children develop protein and micro nutrient deficiencies more often than adults?
US food insecurity

- 15% of US households

- Highest among women, children, elderly, poor, homeless, ill, disabled

- Main cause: poverty
  - >14% of Americans live at or below the poverty line
  - Reduces access to food, education, health care
  - Increased illness and nutrient deficiencies
  - Increased infant mortality rate

- Decreased access to healthier foods
US food insecurity

Low food security means that families were able to avoid substantially disrupting their eating patterns or reducing food intake by using coping strategies, such as eating a less varied diet, participating in federal food assistance programs, or getting emergency food from community food pantries.

Very low food security means that the normal eating patterns of one or more household members were disrupted and food intake was reduced at times during the year because families had insufficient money or other resources to use for obtaining food.

© 2012 John Wiley & Sons, Inc. All rights reserved.
Food desert

- Area that lacks access to affordable foods that make up a healthy diet: fruits, vegetables, whole grains, low-fat milk

- Supermarkets in suburbs
  - Small convenience stores in cities
  - Far from rural areas and migrant worker labor camps
Lack of education

- Cause and consequence of poverty
- Fewer and lower-quality educational opportunities
- Decreased knowledge about food choices, food safety, home economics
- Deficient energy and nutrients
- Poor food choices lead to obesity
- Prevents access to higher-paying jobs
Interpreting data

On average, someone with a bachelor’s degree will earn about ___ dollars more than someone with a high-school diploma?

a) 20,000  
b) 37,000  
c) 77,000  
d) 90,000
Vulnerable life stages

Pregnant and lactating women and small children

- High nutrient needs

- Almost 1/3 of households with children headed by single women live below the poverty line
Vulnerable life stages

Elderly individuals

- Higher frequency of diseases and disabilities limiting ability to purchase, prepare, and consume food

- Associated with more hospital admissions and hence higher health-care costs
Concept check

- Why are some Americans hungry in a land of plenty?
- How are education and poverty related?
- Who is at risk for undernutrition in the United States?
THINK about this – then share within a PAIR – then SHARE with the class

- Based on the causes of hunger discussed so far, what can be done to decrease hunger in the world?

- In the US?

- In your community?

- What could you do?
Solutions to world hunger

- Address population growth
- Meet nutrient needs of a large and diverse population with culturally-acceptable foods
- Increase food production while maintaining the global ecosystem
Millennium development goals

1. ERADICATE EXTREME POVERTY AND HUNGER
2. ACHIEVE UNIVERSAL PRIMARY EDUCATION
3. PROMOTE GENDER EQUALITY AND EMPOWER WOMEN
4. REDUCE CHILD MORTALITY
5. IMPROVE MATERNAL HEALTH
6. COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES
7. ENSURE ENVIRONMENTAL SUSTAINABILITY
8. GLOBAL PARTNERSHIP FOR DEVELOPMENT
Short-term food aid

- Bring food into areas stricken by starvation
- Generally consists of agricultural surpluses from other countries
- Often is not well-planned nutrient content
- Does little to prevent future hunger
Emergency food aid
Controlling population growth

- Balance the number of people and amount of food that can be produced
- Changes in cultural and economic factors, family planning, and government policies
Contributors to high birth rate

- High infant and child mortality rates
- Children work farms, support elders, and contribute to the family’s economic survival
- Gender inequality: girls work at home rather than go to school; women have few options other than staying home and having children
Programs to decrease birth rate

- Foster economic development
- Ensure access to food, shelter, and medical care
- Reduce need for working children
- Provide education for girls
- Provide health and family planning services acceptable to the population and compatible with cultural and religious beliefs
Education & birth rate

[Bar charts showing fertility rate and female literacy rate for different countries]
Sustainable agriculture

- Food production methods that prevent environmental damage and allow land to restore itself so food can be produced indefinitely
  - Contour plowing and terracing prevents erosion
  - Crop rotation decreases nutrient depletion
  - Quickly-degrading chemicals decrease residues
  - Diversification maximizes natural pest control and fertilization, protects farmers from market changes
  - Organic techniques reduce agricultural chemical use and pollutants but more land use (lower crop yields)
Sustainable farming

Increasing biological diversity in crops and animals protects the farmer, maximizes natural pest control, and minimizes pesticide input.

Growing a different crop in a field each year helps keep the soil healthy and minimizes soil erosion. It reduces problems caused by crop diseases, insect pests, and weeds.

Having both crops and livestock allows the farmer to recycle crop nutrients by spreading livestock manure on a field. Animals can feed on weeds and crop waste that cannot be used as human food.
Economic development

- Hunger will exist as long as there is poverty

- The poor do not have access to enough foods to maintain nutritional health

- Need:
  - Economic development leading to safe and sanitary housing, access to health care and education, resources to acquire enough food
  - Government policies that reduce poverty and improve food security by increasing the population’s income, lowering food prices, or funding food programs
Trade

- Industrial economic development can help provide food increasing international trade

- Food availability dependent on whether a country’s agricultural emphasis is on producing subsistence (for food) or cash crops (for trade)
Education for better nutrition

- Education can teach consumers what foods to grow, which foods to choose, and how to prepare them safely

  - When introducing a new crop or changing traditional dietary practices

  - To encourage breast feeding // WHO recommends that infants be exclusively breast fed for the first six months of life then continued for up to two years of age or beyond while offering other foods
Breast feeding
Fortification

- Will not provide energy
- To increase protein quality and eliminate micronutrient deficiencies
- Foods selected should be consistently consumed by the majority of the population
- Nutrient should be added uniformly and in a form that optimizes its utilization
- **Biofortification**: uses plant breeding to increase the nutrient content of staple foods
Iodized salt
Can golden rice combat vitamin A deficiency?
Nutrition safety net

- Federal programs that provide access to affordable food and promote healthy eating

- Combination of general nutrition assistance with specialized programs targeted to groups with particular nutritional risks
Nutrition assistance programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Target population</th>
<th>Goals and methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplemental Nutrition Assistance Program (SNAP)</td>
<td>Low-income individuals</td>
<td>Increases access to food by providing coupons or debit cards that can be used to purchase food at a grocery store</td>
</tr>
<tr>
<td>Commodity Supplemental Food Program (CSFP)</td>
<td>Low-income pregnant women, breast-feeding and non-breast-feeding postpartum women, infants and children under age 6, and elderly people</td>
<td>Provides food by distributing U.S. Department of Agriculture (USDA) commodity foods</td>
</tr>
<tr>
<td>Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)</td>
<td>Low-income pregnant women, breast-feeding and non-breast-feeding postpartum women, and infants and children under age 5</td>
<td>Provides vouchers for the purchase of foods (including infant formula and infant cereal) high in nutrients that are typically lacking in the program's target population; provides nutrition education and referrals for health care</td>
</tr>
<tr>
<td>WIC Farmers’ Market Nutrition Program</td>
<td>WIC participants</td>
<td>Increases access to fresh produce by providing vouchers that can be used to purchase produce at authorized local farmers’ markets</td>
</tr>
<tr>
<td>National School Breakfast Program</td>
<td>Low-income children</td>
<td>Provides free or low-cost breakfasts at school to improve the nutritional status of children</td>
</tr>
<tr>
<td>National School Lunch Program</td>
<td>Low-income children</td>
<td>Provides free or low-cost lunches at school to improve the nutritional status of children</td>
</tr>
<tr>
<td>Special Milk Program</td>
<td>Low-income children</td>
<td>Provides milk for children in schools, camps, and child-care institutions with no federally supported meal program</td>
</tr>
<tr>
<td>Summer Food Service Program</td>
<td>Low-income children</td>
<td>Provides free meals and snacks for children when school is not in session</td>
</tr>
</tbody>
</table>

© 2012 John Wiley & Sons, Inc. All rights reserved.
## Nutrition assistance programs

### Table 14.1: Programs to prevent undernutrition in the United States

<table>
<thead>
<tr>
<th>Program</th>
<th>Target population</th>
<th>Goals and methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child and Adult Care Food Program</strong></td>
<td>Children up to age 12 and elderly and disabled adults</td>
<td>Provides nutritious meals to children and adults in day-care settings</td>
</tr>
<tr>
<td><strong>Team Nutrition</strong></td>
<td>School-age children</td>
<td>Provides nutrition education, training and technical assistance, and resources to participating schools, with the goal of improving children’s lifelong eating and physical activity habits</td>
</tr>
<tr>
<td><strong>Head Start</strong></td>
<td>Low-income preschool children and their families</td>
<td>Provides meals and education, including nutrition education</td>
</tr>
<tr>
<td><strong>Nutrition Program for the Elderly</strong></td>
<td>Individuals age 60 and over and their spouses</td>
<td>Provides free congregate meals in churches, schools, senior centers, or other facilities and delivers food to homebound people</td>
</tr>
<tr>
<td><strong>Senior Farmers’ Market Program</strong></td>
<td>Low-income seniors</td>
<td>Provides coupons that can be exchanged for eligible foods at farmers’ markets, roadside stands, and community-supported agricultural programs</td>
</tr>
<tr>
<td><strong>Homeless Children Nutrition Program</strong></td>
<td>Preschoolers living in shelters</td>
<td>Reimburses providers for meals served</td>
</tr>
<tr>
<td><strong>Emergency Food Assistance Program</strong></td>
<td>Low-income people</td>
<td>Provides commodities to soup kitchens, food banks, and individuals for home use</td>
</tr>
<tr>
<td><strong>Healthy People 2020</strong></td>
<td>U.S. population</td>
<td>Sets national health promotion objectives to improve the health of the U.S. population through health-care system and industry involvement, as well as individual actions</td>
</tr>
<tr>
<td><strong>Expanded Food and Nutrition Education Program (EFNEP)</strong></td>
<td>Low-income families</td>
<td>Provides education in all aspects of food preparation and nutrition</td>
</tr>
<tr>
<td><strong>Temporary Assistance for Needy Families (TANF)</strong></td>
<td>Low-income households</td>
<td>Provides assistance and work opportunities to needy families by granting states federal funds to implement welfare programs</td>
</tr>
<tr>
<td><strong>Food Distribution Program on Indian Reservations</strong></td>
<td>Low-income households living on reservations and Native Americans living near reservations</td>
<td>Provides food by distributing USDA commodity foods</td>
</tr>
</tbody>
</table>

© 2012 John Wiley & Sons, Inc. All rights reserved.
Nutrition assistance programs

- Supplemental Nutrition Assistance Program (SNAP): monthly coupons or debit cards for food purchases (formerly Food Stamps)

- Four other programs targeting high-risk groups
  - National School Lunch Program
  - Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
  - Child and Adult Care Food Program
  - National School Breakfast Program
Hunger relief

- Church, community, and charitable emergency food shelters provide basic nutritional needs

- Food distribution programs use food obtained through **food recovery**, which involves collecting food wasted in fields, commercial kitchens, restaurants, and grocery stores and distributing it to those in need

- Feeding America: leading US hunger-relief charity; network of food banks
Food gleaning

© Damian Dovarganes/© AP/Wide World Photos
Nutrition education

- People who have more nutrition information and greater awareness of the relationship between diet and health consume healthier diets.

- Healthy diets improve current health by optimizing growth, productivity, and well-being and preventing chronic diseases.

- Increasing nutrition knowledge can reduce medical costs and improve quality of life.
Nutrition education

- Helps stretch limited food dollars by making wise choices and reducing food waste
- Promotes community gardens to increase the availability of seasonal vegetables
- Teaches how to prepare foods from commodity distribution programs and food banks
- Explains safe food handling and preparation
- *Dietary Guidelines for Americans, MyPlate*, and food labels educate about wise food choices
What should I eat?

- “Eat food, not too much, mostly plants”
- Cut down on pollution
Concept check

- How does educating women help control population growth?

- What impact does sustainable agriculture have on the world’s food supply?

- How can growing cash crops improve a nation’s food supply?

- What is the nutrition safety net?
What is happening in this picture
What are similarities and differences between:

- Hunger and starvation?
- Reasons for world and US hunger and food insecurity?
- Ways to decrease world and US hunger?
Nutrition in the news

- Famine in other countries
- US droughts
- US water shortages
- US aid programs
- Unemployment
- Homelessness
- Recession
Checking student learning outcomes

- What are the similarities and differences between the causes and effects of undernutrition and overnutrition?
- What are the causes of malnutrition in the world and US?
- What steps can be taken to help eliminate/decrease hunger and food insecurity?
- What can YOU do?