Fantasists often consider how growing populations will face a world of limited food supplies. In the 1966 novel Make Room! Make Room!, New York City’s 35 million people subsist on seaweed, oatmeal, rationed water, and soy; meat is a rarity, illegally procured from “meatleggers.” In the 1999 film The Matrix, a character betrays his comrades for a virtual steak dinner.

The 1990s are history, along with the rest of the 20th century, and one may argue that we are not in the dire straits anticipated by these fantasies. Even though disaster has been averted thus far, the production, distribution, safety, consumption, and sustainability of the world’s food and water resources remain matters of great concern to all. A large part of the world’s population faces 504505undernutrition and starvation on a daily basis, leading to a plethora of public health issues, another portion faces problems caused by too rich a diet, leading to overnutrition, obesity, and a different—but equally dangerous and costly—set of public health issues.

Governments have historically concerned themselves with adequate food production and distribution for burgeoning populations, but individual self-interest often defeated more altruistic—and sensible—nutrition objectives. Global and national economic and political interests may alleviate or exacerbate world nutrition conditions.

CHAPTER OUTLINE

The Two Faces of Malnutrition 506 • The Impact of Undernutrition •Overnutrition: A World Issue • Why Do Undernutrition and Overnutrition Exist Side by Side?

Causes of Hunger Around the World 509 • Food Shortages • Poor-Quality Diets

Causes of Hunger in the United States 514 • Poverty and Food Insecurity • Vulnerable Stages of Life

Eliminating Hunger 516 • Providing Short-Term Food Aid • Controlling Population Growth What a Scientist Sees: Education and Birth Rate • Increasing Food Production While Protecting the Environment Thinking It Through: A Case Study on What One Person Can Do • Increasing Food Availability Through Economic Development and Trade • Ensuring a Nutritious Food Supply • Eliminating Food Insecurity in the United States DEBATE: Combating Vitamin A Deficiency with Golden Rice What Should I Eat? Environmental Impact

CHAPTER PLANNER

Stimulate your interest by reading the introduction and looking at the visual. Scan the Learning Objectives in each section: p. 506 p. 509 p. 514 p. 516 Read the text and study all figures and visuals. Answer any questions.

Analyze key features

Nutrition InSight, p. 506 p. 510 What a Scientist Sees, p. 518 Thinking It Through, p. 519 Stop: Answer the Concept Checks before you go on: p. 508 p. 512 p. 516 p. 526

End of chapter

Review the Summary, Key Terms, and Online Resources. Answer the Critical and Creative Thinking Questions. Answer What is happening in this picture? Complete the Self-Test and check your answers. 505506

The Two Faces of Malnutrition

LEARNING OBJECTIVES

1. Compare the problems of under- and overnutrition in the world today. 2. Discuss the impact of undernutrition throughout the life cycle. 3. Explain how nutrition transition affects the incidence of obesity.

For most of us, the image that comes to mind when we think of malnutrition around the world involves undernutrition: hunger and starvation. This image is certainly valid because about 925 million people around the world are chronically undernourished, and more than one-third of all deaths in children under age 5 are due to undernutrition.1,2 At the same time that health organizations are struggling with issues of undernutrition, however, rates of illness related to overnutrition are soaring.3 The overweight and the undernourished both suffer from malnutrition and experience high levels of sickness and disability, shorter life expectancies, and reduced levels of productivity. These two faces of malnutrition complicate the goal of solving the problem of malnutrition worldwide.

hunger

Recurrent involuntary lack of food that over time may lead to malnutrition.

starvation

A severe reduction in nutrient and energy intake that impairs health and eventually causes death.

Nutrition InSight

Figure 14.1 The cycle of malnutrition

a. Malnutrition affects the health and productivity of individuals at every stage of life. It often begins in the womb, continues through infancy and childhood, and extends into adolescence and adulthood. Interruption of this cycle of malnutrition at any point can benefit both the individuals affected and their society. Healthy children can then grow into healthy adults, who produce healthy offspring and can contribute fully to society.

b. Low-birth-weight infants are at increased risk for complications, illness, and early death. Survivors often suffer lifelong physical and cognitive disabilities. A higher number of low-birth-weight infants means a higher infant mortality rate. Every year, more than 20 million low-birth-weight babies are born, 95% of them in developing countries.5

c. Well over half of all deaths in children under 5 years are due to infectious disease. The rate of mortality from infections is increased among malnourished children. It is estimated that 35% of deaths in children under age 5 occur due to the presence of undernutrition.6 Immunizations against infectious disease are less effective in malnourished children because their immune systems cannot respond normally.

d. A nurse checks the growth of this child in Indonesia. In developing countries, more than 30% of children under age 5 suffer from stunting.7 Deficiencies of energy, protein, vitamin A, iodine, iron, and zinc, as well as prolonged infections, have been implicated as causes.

Interpreting Data

Malnutrition increases susceptibility to infections. What percentage of all deaths in children under age 5 is due to infectious diseases?a. 9% b. 17 c. 55% d. 63%

The Impact of Undernutrition

In populations where hunger is a chronic problem, there is a cycle of malnutrition (Figure 14.1a). The cycle begins when women consume a nutrient-deficient diet during pregnancy. These women are more likely than others to give birth to low-birth-weight infants who are susceptible to illness and early death. The infant mortality rate and the number of low-birth-weight infants are indicators of a population’s health and nutritional status 506507(Figure 14.1b). In most industrialized countries, the infant mortality rate is less than 7 per 1000 live births; in developing countries, the rate is often over 100 per 1000 live births.4 Low-birth-weight infants who survive require extra nutrients, which usually are not available. Malnutrition in infancy and childhood has a profound effect on growth and development as well as on susceptibility to infectious disease. Infectious diseases are more common in undernourished children, and undernourished children may die of infectious diseases that would not be life threatening in well-nourished children (Figure 14.1c).

infant mortality rate

The number of deaths during the first year of life per 1000 live births.

Malnutrition in children causes stunting (Figure 14.1d), which is an indicator of undernutrition in a population’s children. Stunting in childhood produces smaller adults who have a reduced work capacity and are unable to contribute optimally to their society’s economic and social development. Stunted, malnourished women are more likely than others to give birth to low-birth-weight babies. In addition, abdominal obesity in adulthood is more common in those who have experienced lower birth weight and early-childhood stunting.8 Abdominal obesity increases the risk of death from cardiovascular disease, hypertension, and diabetes.

stunting

A decrease in linear growth rate.

Overnutrition: A World Issue

For the first time in history, with over 1 billion overweight or obese adults worldwide, the number of overnourished people exceeds the number of undernourished people.9,10 If recent trends continue, by 2030, up to 57.8% of the world’s adult population could be either overweight or obese.11 Because obesity increases the risk of cardiovascular disease, hypertension, stroke, type 2 diabetes, certain cancers, and arthritis, among other conditions, it is a major contributor to the global burden of chronic disease and disability.

The prevalence of overweight and obesity is also growing among children worldwide. According to recent estimates, about 43 million children under age 5 are overweight; 35 million of these children live in developing countries.12 In some countries, a high prevalence of overweight children now exists alongside a high prevalence of undernourished children. Overweight and obese children are likely to stay obese into adulthood and are more likely to develop diseases such as diabetes and cardiovascular diseases at a younger age.507508

Figure 14.2 Nutrition transition

a. This schematic represents the dietary changes that occur with nutrition transition and the health consequences associated with these changes.12 The traditional rural diet is often inadequate in energy, protein, or micronutrients. The affluent Western diet meets nutrient needs but is high in fat and sugar and low in fiber. A diet that falls somewhere between these extremes is optimal for health.

b. As countries develop economically, they face many of the problems that are common in industrialized countries, including obesity.10 In Argentina, Colombia, Mexico, Paraguay, Peru, and Uruguay, more than half of the population is overweight or obese.13 Countries such as China and India, which have historically been plagued by undernutrition, must now also contend with overnutrition.14 And in parts of Africa, obesity is now considered a major disease, along with AIDS and malnutrition.

Ask Yourself

Infectious disease is the leading cause of death in developing countries. After a country has undergone nutrition transition, what types of diseases are the leading causes of death?

Why Do Undernutrition and Overnutrition Exist Side by Side?

We see the problems of undernutrition and overnutrition existing side by side because diets and lifestyles change as economic conditions improve. Traditional diets in developing countries are based on a limited number of foods—primarily starchy grains and root vegetables. As incomes increase and food availability improves, the diet becomes more varied, and energy intake increases with the addition of meat, milk, and other more calorie-dense foods. Along with these dietary changes, there is a decrease in activity due to occupations being less physically demanding, greater access to transportation, more labor-saving technology, and more passive leisure time (Figure 14.2a).

Some of the effects of this nutrition transition are positive: Life expectancy increases, and the frequencies of low birth weight, infectious diseases, and nutrient deficiencies decrease. However, at the same time, rates of heart disease, cancer, diabetes, obesity, and childhood obesity increase (Figure 14.2b).10 Transition to a diet high in animal protein and refined foods also increases the use of natural resources and in the long term may deplete nonrenewable resources.

nutrition transition

A series of changes in diet, physical activity, health, and nutrition that occurs as poor countries become more prosperous.

CONCEPT CHECK

1. How prevalent are undernutrition and overnutrition around the world? 2. What is the impact of stunting on the health and productivity of a population? 3. How does nutrition transition affect a population’s health? 508509

Causes of Hunger Around the World

LEARNING OBJECTIVES

1. Explain the concept of food insecurity. 2. Discuss the factors that cause food shortages for populations and individuals. 3. Describe the consequences of three nutrient deficiencies that are common worldwide.

The specific reasons for hunger and food insecurity vary with time and location, but the underlying cause is that the available food is not distributed equitably. This inequitable distribution results in either a shortage of food or the wrong combination of foods to meet nutrient needs. This situation, in turn, results in protein-energy malnutrition and individual nutrient deficiencies.

food insecurity

A situation in which people lack adequate physical, social, or economic access to sufficient, safe, nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Food Shortages

The most obvious example of a food shortage is famine. Drought, floods, earthquakes, and crop destruction due to diseases or pests are natural causes of famines. Human causes include wars and civil conflicts (Figure 14.3).

famine

A widespread lack of access to food due to a disaster that causes a collapse in food production and marketing systems.

Food shortages due to famine are very visible because they cause many deaths in an area during a short period, but chronic food shortages take a greater toll. Chronic shortages occur when economic inequities result in lack of money, health care, and education for individuals or populations; when the population outgrows the food supply; when cultural and religious practices limit food choices; or when environmental damage limits the amount of food that can be produced.

Figure 14.3 Famine

Many survivors of the earthquakes in Haiti live in makeshift camps such as this one. This natural disaster destroyed the infrastructure that once distributed food throughout the country. Regions that have barely enough food to survive under normal conditions are vulnerable to famine. This situation is analogous to a man standing in water up to his nostrils: If all is calm, he can breathe, but if there is a ripple, he will drown. A ripple such as a natural or civil disaster reduces the margin of survival and creates famine.

Poverty

Almost 1.4 billion people around the world live below the international poverty line, earning less than $1.25 per day.15 Poverty is central to the problem of hunger and undernutrition (Figure 14.4). In addition to creating food insecurity, poverty reduces access to health care, increasing the prevalence of disease and disability. When diseases go untreated, nutrient needs are increased, a situation that further limits the ability to obtain an adequate diet and contributes to malnutrition. Those who are poor also have less access to education, and this lack of access contributes to undernutrition and disease and reduces opportunities to escape poverty. Lack of education about food preparation and storage can affect food safety and the health of the household: Unsanitary food preparation increases the incidence of gastrointestinal diseases, which contribute to malnutrition.509510

Nutrition InSight

Figure 14.4 The impact of poverty

The regions of the world where poverty is the most prevalent (see map) correspond to the regions where there are the greatest number of undernourished people (see chart). Developing countries, where one in four people subsists on less than $1.25 a day, account for 98% of the world’s undernourished people.1,15 In wealthy countries, hungry people can usually obtain help to get food or money to buy food, but in poor countries, a family that cannot grow enough food or earn enough money to buy food may have nowhere to turn for help.

Interpreting Data

What percentage of the world’s undernourished people live in sub-Saharan Africa?a. 25.8% b. 50% c. 62.5.% d. 4%

Clinics, such as this one in Ghana, are not accessible to many people in the developing world. Lack of immunizations and treatment for infections and other illnesses results in an increase in infectious disease and a decrease in survival rates from chronic diseases such as cancer. Lack of health care also increases infant mortality and the incidence of low-birth-weight births.

These young Indonesian girls are working in a textile factory rather than going to school. Lack of education prevents people from escaping poverty and contributes to undernutrition and disease because it leads to inadequate care for infants, children, and pregnant women.

Ask Yourself

How can lack of health care increase the incidence of undernutrition?510511

Overpopulation

Overpopulation exists when a region has more people than its natural resources can support. A fertile river valley can support more people per acre than can a desert environment. But even in fertile regions of the world, if the number of people increases excessively, resources are overwhelmed, and food shortages occur. At present, enough food is produced throughout the world to prevent hunger if that food is distributed equitably, but demand is rising. The human population is currently growing at a rate of more than 83 million persons per year (Figure 14.5).16 This rate of growth could eventually outstrip the planet’s ability to produce enough food to nourish the world’s population.

In addition, the demand for grain is increasing as a result of increased consumption of more grain-intensive livestock products and the recent sharp acceleration in the use of grain to produce ethanol to fuel cars.17 The increased demand has contributed to dramatic increases in food prices, which have made it even more challenging for low- and middle-income families worldwide to obtain enough food. The rising price of grain and fuel oil has also reduced the amount of food aid, widening the gap between the amount of food available and the amount needed to meet nutritional needs.18

Cultural practices

In some cultures, access to food may be limited for certain individuals in households. For example, because they are viewed as less important, women and girls may receive less food than men and boys. How much food is available to an individual within a household depends on gender, control of income, education, age, birth order, and genetic endowments.

The cultural acceptability or unacceptability of foods also contributes to food shortages and malnutrition. If available foods are culturally unacceptable, a food shortage exists unless the population can be educated to accept the new food. For example, insects are eaten in some cultures and are an excellent source of protein, but in other cultures they are unacceptable as food.

Figure 14.5 World population growth

About 90% of the world’s population growth is occurring in less-developed countries. Developing countries cannot escape poverty because their economies cannot keep pace with such rapid population growth. Efforts to produce enough food can damage the soil and deplete environmental resources, further reducing the capacity to produce food in the future.

Limited environmental resources

The land and other resources available to produce food are limited. Some resources, such as minerals and fossil fuels, are present in finite amounts and are nonrenewable—that is, once they have been used, they cannot be replaced within a reasonable amount of time. Others, such as soil and water, are renewable resources because they will be available indefinitely if they are used at a rate at which the Earth can restore them. For example, when agricultural land is used wisely—that is, when crops are rotated, erosion is prevented, and contamination is limited—it can be reused almost endlessly. However, if land is not used carefully, damage caused by soil erosion, nutrient depletion, and accumulation of pollutants may reduce the amount of usable land over the long term.

renewable resource

A resource that is restored and replaced by natural processes and can therefore be used forever.511512

Figure 14.6 Environmental impact on the oceans

Overfishing has severely reduced the numbers of many marine species. Pollution also threatens the world’s fishing grounds. Oil spills and deliberate dumping occur offshore, and sewage, pesticides, organic pollutants, and sediments from erosion wash into coastal waters, where most fish spend at least part of their lives. Even aquaculture, designed to increase fish production, produces wastes that can pollute ocean water and harm other marine organisms.

Modern mechanized agricultural methods have increased food production but use more energy and resources than more traditional labor-intensive farming. Large-scale farming can erode the soil and deplete its nutrients. Fertilizers and pesticides can contaminate groundwater and eventually pollute waterways. And if a product is shipped over long distances, requires refrigeration or freezing, or needs other types of processing, the environmental costs are increased even more.

As more countries undergo nutrition transition, the demand for meat-based diets will increase, as will the use of natural resources and energy. In general, the environmental cost of producing plant-based foods is lower than that of producing animal products.24 Raising cattle creates both air and water pollution. The animals themselves produce methane, a greenhouse gas, in their gastrointestinal tracts. Large-scale “factory farming” makes the problem worse because more methane is produced when animal sewage is stored in ponds and heaps. In fact, livestock is responsible for a larger percentage of greenhouse gas emissions than all the cars in the world combined. Livestock production also accounts for over 8% of global human water use and releases nutrients, pathogens, and other pollutants into waterways.20 It is not only the resources of the land that are at risk. Population growth has increased the demand for fish to the point that the Earth’s oceans are being depleted (Figure 14.6).

Poor-Quality Diets

Even when there is enough food, malnutrition can occur if the quality of the diet is poor. The typical diet in developing countries is based on high-fiber grain products or root vegetables and has little variety. Adults who are able to consume a relatively large amount of this diet may be able to meet their nutrient needs. But individuals with high nutrient needs because they are ill or pregnant and those with limited capacity to consume this bulky grain diet, such as children and elderly individuals, are at risk for nutrient deficiencies. Deficiencies of protein, iron, iodine, and vitamin A are common with poor-quality diets.21 The images in Figure 14.7 will help you recall these common deficiencies that were discussed in greater detail in earlier chapters.

Several other vitamin and mineral deficiencies have recently emerged or reemerged as problems throughout the world. Beriberi, pellagra, and scurvy—diseases caused by deficiencies of thiamin, niacin, and vitamin C, respectively—are rare in the developed world but still occur among extremely poor and underprivileged people and in large refugee populations.21 In many parts of the world, folate deficiency causes megaloblastic anemia during pregnancy and often compounds existing iron deficiency anemia. Deficiencies of the minerals zinc, selenium, and calcium are also of concern. Zinc deficiency affects about one-third of the world’s population and is believed to cause as many deaths as vitamin A deficiency or iron deficiency.22 Selenium deficiency has been identified in population groups in China, New Zealand, and the Russian Federation. Inadequate calcium intake is a worldwide concern due to its association with osteoporosis.

CONCEPT CHECK

1. What causes food insecurity? 2. How can environmental damage lead to food shortages? 3. Why do children develop protein and micronutrient deficiencies more often than adults? 512513

Figure 14.7 Protein and micronutrient deficiencies

Protein-energy malnutrition is most common in children. When there is a general lack of food, the wasting associated with marasmus results, and when the diet is limited to starchy grains and vegetables, kwashiorkor, characterized by a bloated belly, can predominate (see Chapter 6). Other factors, such as metabolic changes caused by infection, may also play a role in the development of kwashiorkor.

Think Critically

Why are children who consume a starchy, low-protein diet more likely to develop kwashiorkor than adults consuming the same diet?

More than 2 billion people worldwide suffer from iron deficiency anemia, which is characterized by small, pale red blood cells (see Chapter 8).23 The lack of iron reduces the amount of hemoglobin produced, and the lack of hemoglobin lowers the blood’s ability to deliver oxygen. In developing countries, intestinal parasites, which cause gastrointestinal blood loss, and acute and chronic infections, such as malaria, increase the risk and severity of dietary iron deficiency. Iron deficiency can have a major impact on the health and productivity of a population.

Although goiter, seen here, is a more visible manifestation of iodine deficiency, the more subtle effects of deficiency on mental performance and work capacity may have a greater impact on the population as a whole. Iodine-deficient children have lower IQs and impaired school performance.24 Iodine deficiency in children and adults is associated with apathy and decreased initiative and decision-making capabilities (see Chapter 8).

It is estimated that more than 250 million preschool children worldwide suffer from vitamin A deficiency.25 Vitamin A deficiency leads to xerophthalmia, shown here. Vitamin A deficiency is the leading cause of preventable blindness among children. It also depresses immune function, thus increasing the risk of illness and death from infections, particularly measles and diarrheal disease (see Chapter 7).513514

Causes of Hunger in the United States

LEARNING OBJECTIVES

1. Discuss the causes of food insecurity in the United States. 2. Describe how lack of access to health care, education, and transportation prevent people from escaping poverty. 3. List the population groups that are at greatest risk for undernutrition in the United States.

Most of the nutritional problems in the United States are related to overnutrition.26 However, about 15% of households in the United States experience food insecurity (Figure 14.8).27 This situation is caused not by a general food shortage but by an inequitable distribution of food and money. The incidence of hunger and food insecurity is highest among women, infants, children, elderly individuals, and those who are poor, homeless, ill, or disabled. However, a sudden decrease in income or increase in living expenses can put anyone at risk for food insecurity.

Poverty and Food Insecurity

In the United States, as elsewhere in the world, poverty is the main cause of food insecurity. Poverty reduces access to food, education, and health care. About 14.3% of Americans (43.6 million people) live at or below the poverty level.28 These individuals have little money to spend on food and often have limited access to affordable food. Inadequate income also reduces the chances that healthier foods will be consumed. Choosing leaner meats and dairy products and whole grains costs more—about 35 to 40% of low-income consumers’ food budgets.29

The high price of real estate in cities has driven supermarkets into the suburbs, and because many low-income city families do not own cars, they must shop at small, expensive corner stores or pay cab fares if they wish to take advantage of lower prices at more distant, larger stores. The rural poor may have limited access to food because they live far from grocery stores. High poverty and unemployment rates among Native Americans and Alaska Natives contribute to food insecurity.30 Migrant workers also have limited access to food because labor camps are in remote locations, and transportation is often unavailable. Low incomes and difficult working and living conditions among migrant workers further limit their ability to purchase food and prepare adequate meals. These conditions have created what is called a food desert.31

food desert

An area that lacks access to affordable fruits, vegetables, whole grains, low-fat milk, and other foods that make up a healthy diet.

Figure 14.8 Food insecurity in the United States

Current data show that approximately 85% of U.S. households are food secure; the other 15% experienced food insecurity at some point during the year.27

Poverty also limits access to health care, leading to poorer health status. Iron deficiency is more than twice as frequent in low-income children as in children in higher-income families, and the incidence of heart disease, cancer, hypertension, and obesity increases with decreasing income.32 As in developing nations, poverty is reflected in infant mortality rates. The average infant mortality in the U.S. population is about 6.8 per 1000 live births. However, there are groups within the population that have infant mortality rates as high as those in impoverished nations. Among African Americans, the infant mortality rate is 13.6 per 1000 live births—more than twice that of the general population. This difference may reflect 514515differences in infant mortality risk factors, such as poverty and lack of access to medical care.33

Lack of education, which is both a cause and a consequence of poverty, also contributes to food insecurity. For people at or below the poverty level, educational opportunities are fewer and lower in quality than those for people with higher incomes. In the short term, lack of knowledge about food selection, food safety, and home economics can contribute to malnutrition. Too little food may cause the diet to be deficient in energy or particular nutrients, but poor food choices also allow food insecurity to coexist with obesity. Lack of education about food safety can also increase the incidence of food-borne illness. In the long term, lack of education prevents people from getting the higher-paying jobs that could allow them to escape poverty (Figure 14.9).

Figure 14.9 Education and poverty

a. Income level in the United States is directly correlated with level of education.34

Interpreting Data

On average, someone with a bachelor’s degree will earn about \_\_\_\_\_\_\_\_\_\_\_\_ dollars more per year than someone with just a high school diploma.a. 20,000 b. 37,000 c. 77,000 d. 90,000

b. People with little education or work experience are typically unable to find high-paying jobs. To support themselves and their families, they must work longer hours at low-paying jobs. Low incomes reduce access to transportation and child care, which can also limit access to better jobs. Long work hours reduce the amount of time available to pursue the additional education or training necessary to find higher-paying jobs. Limited income and transportation prohibit relocation to areas where better jobs are available.515516

Poor families must use most of their income to pay for shelter, a situation that seriously reduces the chances that they will be adequately fed. The high cost of housing not only limits food budgets but also contributes to the growing problem of homelessness in the United States. During the course of a year, over 1.5 million Americans rely on an emergency shelter or emergency housing; one-third of these people are members of a homeless family.35 Homeless people are at high risk of food insecurity because they lack not only money but also cooking and food storage facilities.

Vulnerable Stages of Life

The high nutrient needs of pregnant and lactating women and small children put them at particular risk for undernutrition. Almost one-third of households with children headed by single women live below the poverty line. Poverty and food insecurity place these women and children at risk for malnutrition, and their special nutritional needs magnify this risk. Because of their increased need for some nutrients, malnutrition may occur in pregnant women, infants, and children even when the rest of the household is adequately fed. For example, the amount of iron in the family’s diet may be enough to prevent anemia in all the family’s members except a pregnant teenager.

Elderly individuals are vulnerable to food insecurity and undernutrition due to the higher frequency of diseases and disabilities in this population group. Disease and disability may limit their ability to purchase, prepare, and consume food. Greater nutritional risk among older adults is associated with more hospital admissions and hence higher health-care costs. The number of individuals over age 85 is expected to triple by 2050; as the number of elderly people increases, so will the number of people at risk for food insecurity.36

CONCEPT CHECK

1. Why are some Americans hungry in a land of plenty? 2. How are education and poverty related? 3. Who is at risk for undernutrition in the United States?

Eliminating Hunger

LEARNING OBJECTIVES

1. Discuss two strategies that can help reduce population growth. 2. Discuss the role of sustainable agriculture in maintaining the food supply. 3. Explain how international trade can help eliminate hunger. 4. Describe five federal programs designed to alleviate hunger in the United States.

Solving the problem of world hunger is a daunting task. In 1996, the World Food Summit set a goal of cutting world hunger in half by 2015. Unfortunately, despite advances toward this goal in some countries, little progress has been made worldwide. Current estimates put the number of undernourished people in the world at 925 million—82 million more than in the early 1990s.1

Figure 14.10 Millennium development goals

These eight goals, to be achieved by 2015, were adopted by 189 nations during the United Nations (UN) Millennium Summit in September 2000. They correspond to the world’s main development challenges. In order to achieve the first goal, stamping out hunger, most of the others must also be addressed.37

Solutions to world hunger need to address population growth, ensure that the nutrient needs of a large and diverse population are met with culturally acceptable foods, and increase food production without damaging the global ecosystem (Figure 14.10). Meeting these goals will require input from politicians, nutrition scientists, economists, and the food industry. Economic policies, technical advances, education, and legislative measures must put in 516517place programs and policies to provide food in the short term, and in the long term they must establish sustainable programs to allow the continued production and distribution of acceptable foods.

Figure 14.11 Emergency food relief

Many organizations are working to combat world hunger. The American Red Cross and High Commissioner for Refugees of the UN concentrate on famine relief. The Food and Agriculture Organization (FAO) works to improve the production, intake, and distribution of food worldwide. The World Health Organization (WHO) focuses on international health and emphasizes the prevention of nutrition problems, and the UN Children’s Fund (UNICEF) targets education and vaccination and responds to crisis situations to improve the lives of children.

Providing Short-Term Food Aid

When people are starving, short-term food and medical aid must be provided right away. The standard approach has been to bring food into stricken areas (Figure 14.11). This food generally consists of agricultural surpluses from other countries and often is not well planned in terms of its nutrient content. Although this type of relief is necessary for a population to survive an immediate crisis such as famine, it does little to prevent future hunger.

Controlling Population Growth

In the long term, solving the problem of world hunger requires balancing the number of people and the amount of food that can be produced. The world’s population has increased dramatically since the middle of the 20th century, but population growth has recently begun to slow. The birth rate worldwide has declined—from 5 children per woman in 1950 to 2.5 in 2010.38 This downward trend in population growth must continue to ensure that food production and natural resources can support the population. Changes in cultural and economic factors as well as family planning and government policies can be used to influence the birth rate.

Economic and cultural factors that affect birth rate

In many cultures, a large family is expected. A major reason for this expectation is high infant and child mortality rates. When infant mortality rates are high, people choose to have many children in order to ensure that some will survive. Higher birth rates in some developing countries are also due to the economic and societal roles of children. Children are needed to work farms, support the elders, and otherwise contribute to the economic survival of families. Programs that foster economic development and ensure access to food, shelter, and medical care have been shown to cause a decline in birth rates because people feel secure having fewer children. Economic development also reduces the need for children as workers.517518

Another cultural factor that influences birth rate is gender inequality. Girls are often kept at home to work rather than being sent to school. In most developing countries, the literacy rate is lower for women than for men, and fewer women attend primary and secondary school. This lack of education leaves women few options other than remaining home and having children. Providing education for girls has been shown to reduce birth rates (see What a Scientist Sees).47

WHAT A SCIENTIST SEES: Education and Birth Rate

The large number of children in this impoverished Indonesian family is indicative of the uneven burden of population growth in the developing world. A scientist sees that one of the reasons for the many children in this family is lack of education for women. Education increases the likelihood that women will have control over their fertility and gives them knowledge that can be used to improve the family’s health and economic situation. Education builds job skills that allow women to join the workforce, marry later in life, and have fewer children. The graph shows that higher literacy among women is associated with lower birth rates.40 Women who are better educated have options other than having numerous children.

Think Critically

How do you think the birth rate for high school dropouts in the United States compares to the birth rate for college graduates?

Figure 14.12 Access to birth control

a. A birth control vendor explains condoms to women at a market in the Ivory Coast. The birth rate in this West African country declined from nearly 7 children per woman in 1988 to 4 in 2010,41 due in part to increased use of modern methods of birth control. Increased knowledge and availability of contraceptives is linked to a decrease in birth rate.

b. As seen in the graph, the percentage of women in the least developed countries who are using contraception has been increasing. The availability of contraceptives gives women more control over the number of children they have to support.42

Family planning and government policies

Changes in cultural and economic factors may reduce the desire for large families, but reducing birth rate also requires the availability of health and family-planning 518519services. To be successful, family-planning efforts must be acceptable to the population and compatible with cultural and religious beliefs. Governments around the world have used a number of approaches, such as provision of contraceptives, education, and economic incentives, to decrease population growth (Figure 14.12).

Increasing Food Production While Protecting the Environment

Advances in agricultural technology have allowed food production to keep pace with population growth. However, the use of energy-intensive modern agricultural techniques has contributed to serious environmental problems. Commercial inorganic fertilizers and pesticides and modern farm machinery increase food production but at the same time pollute the air and water. Overuse of land causes deterioration of soil quality, which will limit food production in the future. For food production to continue to meet the needs of future generations, we must figure out how to continue to increase food yields and availability while conserving the world’s natural resources (see Thinking It Through).

THINKING IT THROUGH: A Case Study on What One Person Can Do

Keesha is concerned about the problems of hunger and malnutrition and the impact her choices have on the environment. Although she is a college student who cannot afford to make monetary contributions to relief organizations, she would like her everyday choices to have a minimal impact on the environment.

What are the advantages and disadvantages of the salad options above in terms of convenience, food safety, and environmental impact?

Your answer:

Keesha likes fish but has heard that some fish are endangered.

Go to the National Geographic Web site http://ocean.nationalgeographic.com/ocean/take-action/seafood-substitutions/ to find some ocean-friendly substitutes for her seafood choices.

Fish

Substitute variety

Atlantic cod

Chilean sea bass

Orange roughy

The following are some inexpensive changes Keesha can make to reduce her impact on the environment.

What are the advantages and disadvantages of each?

Action

Advantages

Disadvantages

Bike instead of drive on short trips around town.

Buy a canvas bag for carrying groceries.

Bring juice in a thermos instead of buying a nonrecyclable bottle.

Compost vegetable scraps.

Buy locally grown produce.

Buy organically grown produce.

(Check your answers in Appendix J.)519520

Figure 14.13 A sustainable farm

A sustainable farm consists of a total agricultural ecosystem rather than a single crop. It may include field crops, fruit- and nut-bearing trees, herds of livestock, and forests.

Sustainable agriculture uses food production methods that prevent damage to the environment and allow the land to restore itself so that food can be produced indefinitely. For example, contour plowing and terracing help prevent erosion, keeping the soil available for future crops. Rotating the crops grown in a field prevents the depletion of nutrients in the soil, reducing the need for fertilizers. Sustainable agriculture uses environmentally friendly chemicals that degrade quickly and do not persist as residues in the environment. It also relies on diversification. This approach to farming maximizes natural methods of pest control and fertilization and protects farmers from changes in the marketplace (Figure 14.13)

sustainable agriculture

Agricultural methods that maintain soil productivity and a healthy ecological balance while having minimal long-term impacts.

Sustainable agriculture is not a single program but involves choosing options that mesh well with local soil, climate, and farming techniques. In some cases, organic farming, which does not use synthetic pesticides, herbicides, and fertilizers (see Chapter 13), may be a more sustainable option. Organic techniques have a smaller environmental impact because they reduce the use of agricultural chemicals and the release of pollutants into the environment. Organic farming is also advantageous in terms of soil quality and biodiversity, but it has a disadvantage in terms of land use because crop yields are often lower. A combination of organic and conventional techniques, as is used with integrated pest management (see Chapter 13), might improve land use and protect the environment.

Other sustainable programs include agroforestry, in which techniques from forestry and agriculture are used together to restore degraded areas; natural systems agriculture, which attempts to develop agricultural systems that include many types of plants and therefore function like natural ecosystems; and the technique of reducing fertilizer use by matching nutrient resources with the demands of the particular crop being grown. One modern technology that may be integrated with sustainable systems is genetic engineering. As discussed in Chapter 13, genetic engineering can increase crop yields by inserting genes that improve the efficiency with which plants convert sunlight into food or genes that make plants resistant to herbicides, insects, and plant diseases.

Increasing Food Availability Through Economic Development and Trade

Hunger will exist as long as there is poverty. Even when food is plentiful, the poor do not have access to enough of the right foods to maintain their nutritional health. Economic development that leads to safe and sanitary housing, access to health care and education, and the resources to acquire enough food are essential if hunger is to be eliminated. Government policies can help reduce poverty and improve food security by increasing 520521the population’s income, lowering food prices, or funding food programs for those who are poor.

Economic development in the form of industrialization can also help provide food for a county’s population by increasing access to international trade. The newly industrialized countries of Asia, such as South Korea, rely on imported food to provide a varied food supply for their populations. In general, countries around the world are becoming more dependent on food imports and on exports of food and other goods to pay for the food they import. This trade can increase the availability of food for the world’s population as a whole.

Whether a country’s agricultural emphasis is on producing subsistence crops or cash crops influences the availability of food for its people. Shifting to cash crops improves the country’s cash flow but uses local resources to produce crops for export and limits the ability of its people to produce enough food to feed their families. For example, if a large portion of the arable land in a country is used to grow cash crops such as coffee and tea, little agricultural land remains for growing grains and vegetables that nourish the local population. If, however, the cash from the crop is used to purchase nutritious foods from other countries, this decision may help alleviate undernutrition.

subsistence crop

A crop that is grown as food for a farmer’s family, with little or nothing leftover to sell.

cash crop

A crop that is grown to be sold for monetary return rather than as food for the local population.

Ensuring a Nutritious Food Supply

To ensure the nutritional health of a population, the foods that are grown or imported must supply both sufficient energy and adequate amounts of all essential nutrients. If the diet does not provide enough of all the essential nutrients, either the dietary pattern must be changed, commonly consumed foods must be fortified, or supplements containing deficient nutrients must be provided. For these changes to be beneficial, consumers must know how to choose foods that provide the needed nutrients and how to handle them safely.

Nutrition education

Education can help improve nutrient intake by teaching consumers what foods to grow, which foods to choose, and how to prepare foods safely.

Education is particularly important when introducing a new crop. No matter how nutritious it may be, a new plant variety is not beneficial unless local farmers know how to grow it and the population accepts it as a food source and knows how to prepare it for consumption. For instance, white-fleshed yams are common in some regions but are a poor source of β-carotene, which the body can use to make vitamin A. If the orange-fleshed yam, which is rich in β-carotene, became an acceptable choice, the amount of vitamin A available to the population would increase.

Food safety is also a concern when changing traditional dietary practices. For example, introducing papaya to the diet as a source of vitamin A will not improve nutritional status if it is washed in unsanitary water and causes dysentery among the people it is meant to nourish.

Education to encourage breast-feeding can also improve nutritional status and health (Figure 14.14). To achieve optimal growth, development, and health, WHO recommends that infants be exclusively breast fed for the first six months of life. After that, other foods should be offered, while breast-feeding continues for up to two years of age or beyond.43

Figure 14.14 Nutritional and health benefits of breast-feeding

Breast milk provides infants with optimal nutrition and immune factors that reduce the risk of infectious diseases. In developing nations, where infant mortality from infectious disease is high, breast-feeding is even recommended for women who are HIV positive if HIV treatment for the mother and a nutritious alternative to breast milk for the infant are not available. In such cases, the risk of the baby dying of malnutrition and other infections outweighs the risk of transmitting the virus in the milk.44521522

Fortifying the food supply

Although food fortification will not provide energy for a hungry population, it can increase the protein quality of the diet and eliminate micronutrient deficiencies. In order to solve a nutritional problem in a population, fortification must be implemented wisely. Fortification works only if vulnerable groups consume centrally processed foods. The foods selected for fortification should be among those that are consistently consumed by the majority of the population so that extensive promotion and reeducation are not needed to encourage their consumption. The nutrient should be added uniformly and in a form that optimizes its utilization.

Fortification has been used successfully in preventing health problems in the United States. Fortification of cow’s milk to increase vitamin D intake was a major factor in the elimination of infantile rickets, and enrichment of grains with niacin helped eliminate pellagra. Fortification of salt with iodine is successfully eliminating iodine deficiency diseases in countries around the world (Figure 14.15).

Figure 14.15 Iodized salt

Over the past decade, the number of countries with salt iodization programs has increased dramatically. It is estimated that 70% of households worldwide now have access to iodized salt.45

This logo is used around the world as an indicator of iodized salt.

Think Critically

The Eastern Mediterranean has the lowest percentage of households with access to iodized salt of any region in the world. Based on your knowledge of dietary sources of iodine, why might this region not have a high incidence of iodine deficiency?

An alternative to traditional fortification is biofortification, which uses plant breeding to increase the nutrient content of staple foods. For example, breeders have developed corn that provides higher levels of β-carotene than traditional varieties.46 The challenge is to get local farmers and consumers to accept biofortified crops. (See Debate: Combating Vitamin A Deficiency with Golden Rice.)

Providing supplements

Supplementing specific nutrients for at-risk segments of the population can help reduce the prevalence of malnutrition. Of countries where vitamin A deficiency is a public health problem, about three-quarters have policies supporting regular vitamin A supplementation in children. Many have also adopted the WHO’s recommendation to provide all breast-feeding women with a high-dose supplement of vitamin A within eight weeks of delivery. This improves maternal vitamin A status and raises the amount of vitamin A that is present in breast milk and is therefore passed to the infant.

Many countries have adopted programs to supplement children older than 6 months with iron and pregnant women with iron and folate.

Eliminating Food Insecurity in the United States

As with world hunger, eliminating hunger in the United States involves improving economic security, keeping food affordable, providing food aid to the hungry, and offering education about healthy diets that will meet nutrient needs and reduce diseases related to overconsumption.522523

Debate: Combating Vitamin A Deficiency with Golden Rice

The Issue: Golden Rice is a genetically modified (GM) variety of rice developed to provide vitamin A to populations in which this deficiency is prevalent. Its development has stimulated debate about whether genetic modification is an effective and safe way to help alleviate malnutrition in the developing world.

Each year vitamin A deficiency takes the sight and lives of hundreds of thousands of children worldwide. The deficiency is most common in impoverished populations where the dietary staple is deficient in vitamin A. Currently this deficiency is addressed using vitamin A supplementation, fortification of the food supply, and interventions that increase the variety of the diet to include foods that are rich in vitamin A. A more controversial solution is growing rice that has been genetically engineered to synthesize β-carotene, a yellow-orange pigment that is a precursor to vitamin A. If it replaced white rice as a staple, Golden Rice could alleviate vitamin A deficiency. However, the controversy that ensued after it was developed has kept the preventive potential of Golden Rice from even being tested.

Initial concerns about Golden Rice focused on whether it would provide enough vitamin A to alleviate deficiency. The original variety provided so little β-carotene that a 2-year-old child would need to eat 3 kilograms of it each day to get enough vitamin A.47 A newer variety now provides more than half of the RDA for children in a reasonable serving of ½ cup of rice.48 But even if children eat Golden Rice, many argue that it may not be a solution to malnutrition. The rice will increase vitamin A intake, but deficient populations typically suffer from other nutrient deficiencies; when protein, fat, or zinc is deficient, the body can’t efficiently use vitamin A.49,50

So should we continue to spend resources developing Golden Rice? Opponents argue that in the decade since Golden Rice was developed, it has done nothing to prevent vitamin A deficiency, and it has diverted resources from proven programs that address multiple nutrient deficiencies. Proponents contend that the problem is not the rice but rather the regulatory climate that has prevented it from being introduced; Golden Rice was developed in 1999 but will probably not be commercialized until 2012.51,52 The development costs of Golden Rice have been high, but it is predicted to be cost-effective in the long term because once it is introduced, recurrent costs should be low.53

There is also concern that introducing GM rice is not safe for the environment. The worry is that its use will decrease the diversity of rice varieties grown. Reducing diversity increases the risk of crop destruction due to insects and disease.49 Proponents of GM crops argue that this concern occurs whenever a new crop that is preferred by farmers is introduced.

GM crops such as Golden Rice are not substitutes for traditional solutions to malnutrition but can be used to complement them. Supplementation may be necessary for those in immediate need. Fortification and supplementation may work better in urban settings; Golden Rice may be better at reaching isolated rural populations. In the long term, the goal is to use whatever means are available to solve the problem of vitamin A deficiency and other types of malnutrition.

Think critically: Why is it important to preserve all the varieties of rice that currently exist, even if we do not rely on them as dietary staples?523524

Table 14.1: Programs to prevent undernutrition in the United States

Program

Target population

Goals and methods

Supplemental Nutrition Assistance Program (SNAP)

Low-income individuals

Increases access to food by providing coupons or debit cards that can be used to purchase food at a grocery store

Commodity Supplemental Food Program (CSFP)

Low-income pregnant women, breast-feeding and non-breast-feeding postpartum women, infants and children under age 6, and elderly people

Provides food by distributing U.S. Department of Agriculture (USDA) commodity foods

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)

Low-income pregnant women, breast-feeding and non-breast-feeding postpartum women, and infants and children under age 5

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

WIC Farmers’ Market Nutrition Program

WIC participants

Increases access to fresh produce by providing vouchers that can be used to purchase produce at authorized local farmers’ markets

National School Breakfast Program

Low-income children

Provides free or low-cost breakfasts at school to improve the nutritional status of children

National School Lunch Program

Low-income children

Provides free or low-cost lunches at school to improve the nutritional status of children

Special Milk Program

Low-income children

Provides milk for children in schools, camps, and child-care institutions with no federally supported meal program

Summer Food Service Program

Low-income children

Provides free meals and snacks for children when school is not in session

Child and Adult Care Food Program

Children up to age 12 and elderly and disabled adults

Provides nutritious meals to children and adults in day-care settings

Team Nutrition

School-age children

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

Head Start

Low-income preschool children and their families

Provides meals and education, including nutrition education

Nutrition Program for the Elderly

Individuals age 60 and over and their spouses

Provides free congregate meals in churches, schools, senior centers, or other facilities and delivers food to homebound people

Senior Farmers’ Market Program

Low-income seniors

Provides coupons that can be exchanged for eligible foods at farmers’ markets, roadside stands, and community-supported agricultural programs

Homeless Children Nutrition Program

Preschoolers living in shelters

Reimburses providers for meals served

Emergency Food Assistance Program

Low-income people

Provides commodities to soup kitchens, food banks, and individuals for home use

Healthy People 2020

U.S. population

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

Expanded Food and Nutrition Education Program (EFNEP)

Low-income families

Provides education in all aspects of food preparation and nutrition

Temporary Assistance for Needy Families (TANF)

Low-income households

Provides assistance and work opportunities to needy families by granting states federal funds to implement welfare programs

Food Distribution Program on Indian Reservations

Low-income households living on reservations and Native Americans living near reservations

Provides food by distributing USDA commodity foods524525

The nutrition safety net

Federal programs that provide access to affordable food and promote healthy eating have been referred to as a “nutrition safety net” for the American population (Table 14.1). The nutrition assistance programs include a combination of general nutrition assistance and specialized programs targeted to groups with particular nutritional risks: children, seniors, infants, women during and after pregnancy, Native Americans living on reservations, people with disabilities, and homeless people.54 One of every four Americans receives some kind of food assistance, at a total cost of about $79 billion per year.55

The largest USDA program designed to make sure that all people have access to an adequate diet is the Supplemental Nutrition Assistance Program (SNAP) (previously known as the Food Stamp Program). SNAP provides monthly benefits in the form of coupons or debit cards that can be used to purchase food, thereby supplementing the food budgets of low-income individuals. Together with SNAP, four other programs that target high-risk populations—the National School Lunch Program; the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); the Child and Adult Care Food Program; and the National School Breakfast Program—account for 95% of the USDA’s expenditure for food assistance.55

In addition to federal nutrition assistance programs, church, community, and charitable emergency food shelters provide for the basic nutritional needs of many Americans. In the United States, about 150,000 nonprofit food distribution programs help direct food to those in need.56 The leading hunger-relief charity in the United States is Feeding America, which provides food assistance to more than 25 million low-income people per year. It includes a network of food banks across the country and supports thousands of local charitable organizations, such as food pantries and soup kitchens, which distribute food directly to hungry Americans.

Virtually all these food distribution programs use food obtained through food recovery, which involves collecting food that is wasted in fields, commercial kitchens, restaurants, and grocery stores and distributing it to those in need (Figure 14.16). It is estimated that over 25% of America’s food—enough to feed 49 million people—goes to waste each year.57

Nutrition education

People who have more nutrition information and greater awareness of the relationship between diet and health consume healthier diets. Healthy diets not only improve current health by optimizing growth, productivity, and well-being but are essential for preventing chronic diseases. Increasing knowledge about nutrition can reduce medical costs and improve the quality of life.

Figure 14.16 Field gleaning

These oranges were harvested in California as part of a local gleaning program. Field gleaning is a type of food recovery that involves collecting crops that are not harvested because it is not economically profitable to harvest them or that remain in fields after mechanical harvesting. The word gleaning means “gathering after the harvest” and dates back at least as far as biblical times.525526

WHAT SHOULD I EAT?: Environmental Impact: Make Your Meals Green

Eat more plants • Reduce the amount of meat in your meal. • Eat vegetarian at least some of the time. • Eat lower on the food chain—more plant foods and small fish. • Grow and eat some of your own vegetables.

Cut down on pollution • Buy in bulk in order to cut down on packaging. • Use reusable bags to take your groceries home. • Choose locally grown and organically produced foods. • Cook from scratch—use fewer processed foods.

Use iProfile to compare the nutrients in a vegetarian versus a meat-based meal.

Education can help individuals with lower incomes stretch their limited food dollars by making wise choices at the store and reducing food waste at home. It can promote community gardens to increase the availability of seasonal vegetables. It can teach people how to prepare foods received from commodity distribution programs and food banks. It can explain safe food handling and preparation methods. Knowing which foods to choose and how to handle them safely is as important in preventing malnutrition as having the money to buy enough food. In addition to the programs described in Table 14.1, the Dietary Guidelines for Americans, MyPlate, and food labels educate the general public about making wise food choices (see What Should I Eat?).

CONCEPT CHECK

1. How does educating women help control population growth? 2. What impact does sustainable agriculture have on the world’s food supply? 3. How can growing cash crops improve a nation’s food supply? 4. What is the nutrition safety net?

Summary

1 The Two Faces of Malnutrition 506

• In poorly nourished populations, a cycle of malnutrition exists in which poorly nourished women give birth to low-birth-weight infants at risk for disease and early death. If these children survive, they grow into adults who are physically unable to fully contribute to society. In populations where malnutrition is prevalent, low birth weight, a high infant mortality rate, stunting, and infections are more common. • A shown in the graph, overnutrition coexists with hunger and starvation in both developed and developing nations around the world. As economic conditions improve, nutrition transition to more Western diet and lifestyle patterns contribute to the growing problem of overnutrition.

Figure 14.2b Nutrition transition

526527

2 Causes of Hunger Around the World 509

• The underlying cause of hunger and food insecurity is that the food available in the world is not distributed equitably. Famine results from natural and human-caused disasters that temporarily disrupt food production and distribution. Chronic food shortage is most common in the developing world, as shown in the chart. It occurs when economic inequities result in lack of money, health care, and education; when overpopulation and limited natural resources create a situation in which there are more people than food; when cultural practices limit food choices; and when renewable resources are misused, limiting the ability to continue to produce food.

Figure 14.4 The impact of poverty

• Deficiencies of protein, iron, iodine, and vitamin A are common worldwide when the quality of the diet is poor. Pregnant women, children, elderly individuals, and those who are ill may not be able to meet their nutrient needs with the available diet.

3 Causes of Hunger in the United States 514

• Both undernutrition and overnutrition are problems in the United States. As in developing nations, in the United States undernutrition and food insecurity are associated with poverty, which limits education and access to health care and adequate housing, as depicted here.

Figure 14.9b Education and poverty

• High nutrient needs increase the risk of malnutrition in women and children, and disease and disability increase risk in elderly individuals.

4 Eliminating Hunger 516

• Short-term solutions to eliminating hunger provide food through relief at local, national, and international levels, as shown here.

Figure 14.11 Emergency food relief

• Eliminating world hunger in the long term requires controlling population growth. This can be addressed by improving economic conditions, providing education, particularly for women, and ensuring access to family planning services. • Sustainable agriculture helps eliminate hunger by allowing food to be produced without damaging the environment. • Economic development helps prevent hunger by eliminating poverty and ensuring access to health care and education. It also increases access to international trade, which can be used to import food or to export cash crops to bring more money into the country. • Food fortification and dietary supplementation can be used to increase protein quality and eliminate micronutrient deficiencies, improving the overall quality of the diet. • Nutrition programs in the United States focus on maintaining a nutrition safety net that provides access to affordable food and education to promote healthy eating. 527528

Key Terms

• cash crop 521 cycle of malnutrition 506 • famine 509 • food desert 514 • food insecurity 509 food recovery 525 • hunger 506 • infant mortality rate 506 • nutrition transition 508 • renewable resource 511 • starvation 506 • stunting 507 • subsistence crop 521 • sustainable agriculture 520

Online Resources

For more information on micronutrient deficiencies that are world health issues, go to www.who.int/nutrition/topics/micronutrients/en/. For more information on solving world hunger, go to http://usa.wfp.org/advocate/solving-global-hunger. For more about food insecurity in the United States, go to www.ers.usda.gov/Briefing/FoodSecurity/. For more information on the nutrition safety net in the United States, go to www.fns.usda.gov/fsec/FILES/SafetyNet.pdf. Visit your WileyPLUS site for videos, animations, podcasts, self-study, and other media that will aid you in studying and understanding this chapter.

Critical and Creative Thinking Questions

1.

Keep a record of how much money you spend on food in a day and use this information to estimate your monthly food costs. Would you be able to meet the recommendations of your MyPlate Daily Food Plan on a budget of $3 a day? Which food groups contain the most expensive choices?

2.

Compare the cost of a single-serving bottle of orange juice with the same size serving poured from a half-gallon container. Compare the cost of these two products from a large supermarket and from a small corner convenience store. Explain why someone might be forced to buy the higher priced orange juice.

3.

Describe the living conditions of people and regions of the world most likely to be affected by undernutrition and the living conditions of people and regions of the world most likely to be affected by overnutrition.

4.

The graph below shows the number of bushels of the U.S. corn crop that was used for ethanol (biofuel) production from 1990 to 2010. Why might this impact food insecurity in the United States and around the world?

Source: USDA Agricultural Productions to 2018, February 2009.

USDA Economic Research Service.528529

5.

Discuss which food assistance programs listed in Table 14.1 would benefit homeless people and which would not.

6.

The diet in a developing country is deficient in iodine. To solve the problem, the government imports iodized salt, but iodine deficiency continues to be a problem. Why might this be the case?

7.

Research one area of the world where hunger and undernutrition are major problems. What are the causes of undernutrition in this area? What solutions are in place or proposed to solve this problem?

What is happening in this picture?

This 250-fold magnification shows the mouth of a hookworm, which it uses to attach to the lining of the small intestine and feed on blood. Hookworm larvae penetrate the skin, infecting people when they walk barefoot in contaminated soil. Hookworm infection affects 740 million people in tropical developing countries.58

Think Critically

1.

Why is this infection more common in poor tropical and subtropical regions than elsewhere?

2.

How would hookworm infection affect iron status? Why?

3.

How would hookworm infection affect a population’s productivity? Why?529530

Self-Test

(Check your answers in Appendix K.)

1.

The cycle of malnutrition can be broken by \_\_\_\_\_\_\_\_\_\_\_\_.a. improving health care for children b. increasing the availability of nutritious foods for adults c. improving health care and nutrition for women during pregnancy d. all of the above

2.

Which of the following statements about overweight and underweight is supported by the graph?a. Underweight is more of a problem in developed countries than in developing countries. b. Overweight occurs only in developed countries. c. In developed countries, underweight is a problem only among children. d. As a country develops economically, the incidence of overweight increases.

3.

Which of the following statements is true of stunting?a. It is an indicator of the health and well-being of populations of children. b. It is an indicator of the health and well-being of adults. c. It is measured with body mass index. d. It is highest in well-nourished populations.

4.

Which of the following dietary changes is associated with nutrition transition?a. consumption of a wider variety of foods b. a decrease in the fat and sugar content of the diet c. a decrease in the consumption of animal products d. an increase in the fiber content of the diet

5.

What proportion of the world’s undernourished people live in the developing world?a. one-half b. one-third c. more than nine-tenths d. less than one-quarter

6.

The yellow section of this graph of population growth most likely represents population growth in \_\_\_\_\_\_\_\_\_\_\_\_.a. developed countries b. the entire world c. less-developed countries d. North America

7.

What is the largest federal program designed to make sure that all Americans have access to an adequate diet?a. Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) b. National School Lunch Program c. National School Breakfast Program d. Supplemental Nutrition Assistance Program (SNAP)

8.

Deficiencies of \_\_\_\_\_\_\_\_\_\_\_\_ are major world health problems.a. vitamins A, K, and C b. iodine, vitamin A, and iron c. iodine, iron, and chromium d. iron, biotin, and vitamin E

9.

Crops that are grown to be sold rather than consumed are \_\_\_\_\_\_\_\_\_\_\_\_.a. sustainable crops b. cash crops c. subsistence crops d. renewable crops 530531

10.

Which product is not made from a renewable resource?a. paper towels b. plastic bags c. bread d. wooden crates

11.

Fortifying \_\_\_\_\_\_\_\_\_\_\_\_ will be most likely to eliminate a nutrient deficiency in a country’s population.a. commonly eaten foods b. locally grown foods c. foods eaten seasonally d. expensive foods

12.

Which of the following statements is supported by the information in the pie chart?a. In 5.7% of households, food intake was reduced at times during the year. b. Food insecurity is highest among women and children. c. Food insecurity is a problem for more than 85% of U.S. households. d. Food insecurity is high among the homeless.

13.

Which group in the U.S. population is at risk for undernutrition?a. homeless people b. children c. women d. all of the above

14.

Which of the following statements about population growth is illustrated in the graphs shown below?a. Population growth parallels economic growth. b. Education and economic growth increase population growth. c. Education decreases population growth. d. Economic growth and education do not affect population growth.

15.

Which of the following statements about breast-feeding is true?a. It decreases risk of malnutrition in infants. b. It is important only for the first 6 months of life. c. It is not recommended in poor countries. d. It is never recommended for women with HIV

THE PLANNER