Chapter 13

Nutrition through the Life Cycle: From Childhood to the Elderly Years

Big Idea

Good nutritional choices reduce the risk of chronic disease during the middle-aged years.

One hundred years ago, when many families sat down to dinner, they might have eaten boiled potatoes or corn, leafy vegetables such as cabbage or collards, fresh-baked bread, and, if they were fortunate, a small amount of beef or chicken. Young and old alike benefitted from a sound diet that packed a real nutritional punch. Times have changed. Many families today fill their dinner plates with fatty foods, such as french fries cooked in vegetable oil, a hamburger that contains several ounces of ground beef, and a white-bread bun, with a single piece of lettuce and a slice or two of tomato as the only vegetables served with the meal.

The emergence of the obesity epidemic not only relates to what we eat and drink, but also how much we consume on a daily basis.

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Our diet has changed drastically as processed foods, which did not exist a century ago, and animal-based foods now account for a large percentage of our calories. Not only has what we eat changed, but the amount of it that we consume has greatly increased as well, as plates and portion size have grown much larger. All of these choices impact our health, with short- and long-term consequences as we age. Possible effects in the short-term include excess weight gain and constipation. The possible long-term effects, primarily related to obesity, include the risk of cardiovascular disease, Type 2 diabetes, hypertension, stroke, osteoarthritis, sleep apenea, respiratory problems, liver and gallbladder disease, and certain cancers (endometrial, breast, and colon) among middle-aged and elderly adults.Centers for Disease Control and Prevention.

"Overweight and Obesity: Health Consequences." Last updated March 3, 2011. http://www.cdc.gov/obesity/causes/health.html.

It is best to start making healthy choices from a young age and maintain them as you mature. However, a recent report published in the *American Journal of Clinical Nutrition*, suggests that adopting good nutritional choices later in life, during the forties, fifties, and even the sixties, may still help to reduce the risk of chronic disease as you grow older.Rivlin, R. S. "Keeping the Young-Elderly Healthy: Is It Too Late to Improve Our Health through Nutrition?" *Am J Clin Nutr* 86, supplement (2007): 1572S–6S. Even if past nutritional and lifestyle choices were not aligned with dietary guidelines, older adults can still do a great deal to reduce their risk of disability and chronic disease. As we age, we tend to lose lean body mass. This loss of muscle and bone can have critical health implications. For example, a decrease in body strength can result in an increased risk for fractures because older adults with weakened muscles are more likely to fall, and to sustain serious injuries when they do. However, improving your diet while increasing physical activity helps to control weight, reduce fat mass, and maintain muscle and bone mass.

There are a number of changes middle-aged adults can implement, even after years of unhealthy choices. Choices include eating more dark, green, leafy vegetables, substituting high-fat proteins with lean meats, poultry, fish, beans, and nuts, and engaging in moderate physical activity for thirty minutes per day, several days per week. The resulting improvements in body composition will go a long way toward providing greater protection against falls and fractures, and helping to ward off cardiovascular disease and hypertension, among other chronic conditions.Rivlin, R. S. "Keeping the Young-Elderly Healthy: Is It Too Late to Improve Our Health through Nutrition?" *Am J Clin Nutr* 86, supplement (2007): 1572S–6S.

You Decide

What is one nutritional choice that you can make today to reduce your risk of chronic disease tomorrow?

In Chapter 12 "Nutrition through the Life Cycle: From Pregnancy to the Toddler Years", we focused on the effects of dietary choices during pregnancy, infancy, and the toddler years. Our examination of nutrition through the human life cycle continues as we study the remainder of childhood into adulthood and the elderly years. Nutritional choices remain critical throughout a person's life and influence

overall health and wellness. The nutritional choices we make today affect not only our present health, but also our future well-being.

Video 13.1

Weight Gain and Body-Composition Changes, Midlife into Older Age

(click to see video)

This video focuses on the consequences of changing body composition from the middle-aged years into old age.

13.1 The Human Life Cycle Continues

LEARNING OBJECTIVES

1. Identify and define the different stages of the human life cycle.
2. Explain how the human body develops from childhood through the elderly years.

As children mature, their friends can exert a strong influence on their nutritional choices.

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As discussed in Chapter 12 "Nutrition through the Life Cycle: From Pregnancy to the Toddler Years", all people need the same basic nutrients—essential amino acids, carbohydrates, essential fatty acids, and twenty-eight vitamins and minerals—to maintain life and health. However, the amounts of needed nutrients change as we pass from one stage of the human life cycle to the next. Young children require a higher caloric intake relative to body size to facilitate physical and mental development. On the other hand, inactive senior citizens need fewer calories than other adults to maintain their weight and stay healthy. Psychological, emotional, and social issues over the span of a human life can also influence diet and nutrition. For example, peer pressure during adolescence can greatly affect the nutritional choices a teenager makes. Therefore, it is important to weigh a number of considerations when examining how nutrient needs change. In this chapter, we will focus on diet, nutrition, and the human life cycle from the remainder of childhood into the elderly years.

Changes during Childhood

Early childhood encompasses infancy and the toddler years, from birth through age three. The remaining part of childhood is the period from ages four through eight and is the time when children enter school. A number of critical physiological and emotional changes take place during this life stage. For example, a child's limbs lengthen steadily, while the growth of other body parts begins to slow down. By age ten, the skull and the brain have grown to near-adult size.Beverly McMillan, *Human Body: A Visual Guide* (Sydney, Australia: Weldon Owen, 2006), 258. Emotional and psychological changes occur as well. Children's attitudes and opinions about food deepen. They not only begin taking their cues about food preferences from family members, but also from peers and the larger culture. All of these factors should

impact the nutritional choices parents make for their children. This time in a child's life provides an opportunity for parents and other caregivers to reinforce good eating habits and to introduce new foods into the diet, while remaining mindful of a child's preferences. Parents should also serve as role models for their children, who will often mimic their behavior and eating habits.

Changes during Puberty

The onset of **puberty**[1] is the beginning of **adolescence**[2], and is the bridge between the childhood years and young adulthood. Medically, adolescence is defined as the period between ages eleven and fourteen for girls and between twelve to fifteen for boys. For the purpose of discussing the influence of nutritional choices during the life cycle, this text will follow the *2010 Dietary Guidelines for Americans*, which divides the adolescent years into two stages: ages nine to thirteen, or puberty, and ages fourteen to eighteen, or late adolescence. We will discuss puberty first. Some of the important physiological changes that take place during this stage include the development of primary sex characteristics, or the reproductive organs, along with the onset of menstruation in females. This life stage is also characterized by the appearance of secondary sex characteristics, such as the growth of facial and body hair, the development of breasts in girls, and the deepening of the voice in boys. Other physical changes include rapid growth and alterations in body proportions.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 170–71. All of these changes, as well as the accompanying mental and emotional adjustments, should be supported with sound nutrition.

Changes in Late Adolescence

The *Dietary Guidelines* defines the next phase of the human life cycle, late adolescence, as the period from ages fourteen to eighteen. After puberty, the rate of physical growth slows down. Girls stop growing taller around age sixteen, while boys continue to grow taller until ages eighteen to twenty. One of the psychological and emotional changes that takes place during this life stage includes the desire for independence as adolescents develop individual identities apart from their families.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 171–76. As teenagers make more and more of their dietary decisions, parents or other caregivers and authority figures should guide them toward appropriate, nutritious choices.

1. The period of the human life cycle between ages nine to thirteen, nutritionally speaking.
2. The period of the human life cycle between ages fourteen to eighteen, nutritionally speaking.

Changes in Young Adulthood

The next phase, young adulthood, is the period from ages nineteen to thirty. It is a stable time compared to childhood and adolescence. Physical growth has been completed and all of the organs and body systems are fully developed. Typically, a young adult who is active has reached his or her physical peak and is in prime health. For example, vital capacity, or the maximum amount of air that the lungs can inhale and exhale, is at its peak between the ages of twenty and forty.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 192–93. Proper nutrition and adequate physical activity at this stage not only promote wellness in the present, but also provide a solid foundation for the future.

Changes in Middle Age

Nutritionally speaking, middle age is defined as the period from age thirty-one to fifty. The early period of this stage is very different from the end. For example, during the early years of middle age, many women experience pregnancy, childbirth, and lactation. In the latter part of this life stage, women face perimenopause, which is a transition period that leads up to menopause, or the end of menstruation. A number of physical changes take place in the middle-aged years, including the loss of bone mass in women due to dropping levels of estrogen during menopause. In both men and women, visual acuity declines, and by age forty there can be a decreased ability to see objects at a close distance, a condition known as presbyopia.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 192–93. All of these are signs of aging, as the human body begins to change in subtle and not-so-subtle ways. However, a middle aged person can remain vital, healthy, and near his or her physical peak with proper diet and adequate exercise.

Changes in the Older Adult Years

The senior, or elderly, years are the period from age fifty-one until the end of life. A number of physiological and emotional changes take place during this life stage. For example, many elderly adults face serious health challenges, such as cancer, heart disease, diabetes, or dementia. Both men and women experience a loss of muscle mass and strength and undergo changes in body composition. Fat deposits build up in the abdominal area, which increases the risk for Type 2 diabetes and cardiovascular disease. The skin becomes thinner and may take longer to heal after an injury. Around age seventy, men begin to experience bone loss when estrogen and testosterone levels begin to decline.American Medical Association, *Complete Guide to Prevention and Wellness* (Hoboken, NJ: John Wiley & Sons, Inc., 2008), 512.

Healthy nutritional choices can help to prevent or manage disability and chronic conditions.

In addition, disorders of the nervous system can have profound effects. **Dementia**[3] is the umbrella term for changes in the normal activity of the brain. Elderly adults who suffer from dementia may experience memory loss, agitation, and delusions. One in eight people over age sixty-four and almost half of all people over eighty-five suffer from the brain disorder Alzheimer's disease, which is the most common form of dementia.American Medical Association, *Complete Guide to Prevention and Wellness* (Hoboken, NJ: John Wiley & Sons, Inc., 2008), 421. Neurological disorder and psychological conditions, such as depression, can influence attitudes toward food, along with the ability to prepare or ingest food. They might lead some adults to overindulge to compensate for stress or emotions that are difficult to handle. Other adults might eat less or pay less attention to their diet and nutritional needs. Elderly adults may also need guidance from dietitians and health-care professionals to make the best dietary choices for this stage of life.

Changing Needs and Nutrition

Nutritional needs continue to change at each stage of life. It is important to adjust your diet and physical activity to meet these changing needs and ensure health and wellness throughout your life. Parents must continue to help their school-aged children and adolescents establish healthy eating habits and attitudes toward food. Their primary role is to bring a wide variety of health-promoting foods into the home, so that their children can make good choices. As children become adults, they must be mindful of the choices they make and how those choices affect their health, not only in the present but also in the future.

KEY TAKEAWAYS

- The human body constantly changes throughout the life cycle, from childhood into adulthood and old age.
- Proper nutrition and physical activity ensure health and wellness at each stage of the human life cycle.

3. A disorder of the nervous system characterized by changes in the normal activity of the brain.

DISCUSSION STARTER

1. In preparation for this chapter, predict how nutrient needs might change as a healthy young adult matures into old age. Then, after reading the text, discuss if your predictions were correct or incorrect.

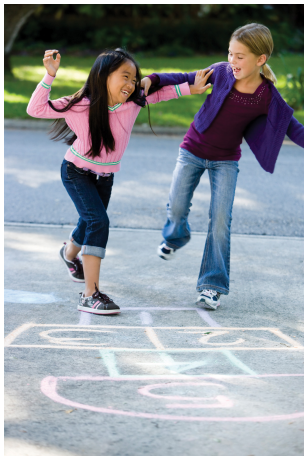
13.2 Childhood and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for school-aged children.
2. Discuss the most important nutrition-related concerns during childhood.

Nutritional needs change as children leave the toddler years. From ages four to eight, school-aged children grow consistently, but at a slower rate than infants and toddlers. They also experience the loss of deciduous, or "baby," teeth and the arrival of permanent teeth, which typically begins at age six or seven. As new teeth come in, many children have some malocclusion, or malposition, of their teeth, which can affect their ability to chew food. Other changes that affect nutrition include the influence of peers on dietary choices and the kinds of foods offered by schools and afterschool programs, which can make up a sizable part of a child's diet. Food-related problems for young children can include tooth decay, food sensitivities, and malnourishment. Also, excessive weight gain early in life can lead to obesity into adolescence and adulthood.

Childhood (Ages Four to Eight): "Growing Pains"



At this life stage, a healthy diet facilitates physical and mental development and helps to maintain health and wellness. School-aged children experience steady, consistent growth, with an average growth rate of 2–3 inches (5–7 centimeters) in height and 4.5–6.5 pounds (2–3 kilograms) in weight per year. In addition, the rate of growth for the extremities is faster than for the trunk, which results in more adult-like proportions. Long-bone growth stretches muscles and ligaments, which results in many children experiencing "growing pains," at nighttime in particular.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 150–51.

Energy

In school-aged children, muscle mass and strength increase and motor skills show improvement.

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Children's energy needs vary, depending on their growth and level of physical activity. Energy requirements also vary according to gender. Girls ages four to eight require 1,200 to 1,800 calories a day, while boys need 1,200 to 2,000 calories daily, and, depending on their activity level, maybe more. Also, recommended intakes of macronutrients and most micronutrients are higher relative to body size, compared with nutrient needs during adulthood. Therefore, children should be provided nutrient-dense food at meal- and snack-time. However, it is important not to overfeed children, as this can lead to childhood obesity, which is discussed in the next section. Parents and other caregivers can turn to the MyPlate website for guidance: http://www.choosemyplate.gov/.

Macronutrients

For carbohydrates, the Acceptable Macronutrient Distribution Range (AMDR) is 45–65 percent of daily calories (which is a recommended daily allowance of 135–195 grams for 1,200 daily calories). Carbohydrates high in fiber should make up the bulk of intake. The AMDR for protein is 10–30 percent of daily calories (30–90 grams for 1,200 daily calories). Children have a high need for protein to support muscle growth and development. High levels of essential fatty acids are needed to support growth (although not as high as in infancy and the toddler years). As a result, the AMDR for fat is 25–35 percent of daily calories (33–47 grams for 1,200 daily calories). Children should get 17–25 grams of fiber per day.

Micronutrients

Micronutrient needs should be met with foods first. Parents and caregivers should select a variety of foods from each food group to ensure that nutritional requirements are met. Because children grow rapidly, they require foods that are high in iron, such as lean meats, legumes, fish, poultry, and iron-enriched cereals. Adequate fluoride is crucial to support strong teeth. One of the most important micronutrient requirements during childhood is adequate calcium and vitamin D intake. Both are needed to build dense bones and a strong skeleton. Children who do not consume adequate vitamin D should be given a supplement of 10 micrograms (400 international units) per day. Table 13.1 "Micronutrient Levels during Childhood" shows the micronutrient recommendations for school-aged children. (Note that the recommendations are the same for boys and girls. As we progress through the different stages of the human life cycle, there will be some differences between males and females regarding micronutrient needs.)

Table 13.1 Micronutrient Levels during Childhood

Nutrient	Children, Ages 4–8
Vitamin A (mcg)	400.0
Vitamin B_6 (mcg)	600.0
Vitamin B_{12} (mcg)	1.2
Vitamin C (mg)	25.0
Vitamin D (mcg)	5.0
Vitamin E (mg)	7.0
Vitamin K (mcg)	55.0
Calcium (mg)	800.0
Folate (mcg)	200.0
Iron (mg)	10.0
Magnesium (mg)	130.0
Niacin (B_3) (mg)	8.0
Phosphorus (mg)	500.0
Riboflavin (B_2) (mcg)	600.0
Selenium (mcg)	30.0
Thiamine (B_1) (mcg)	600.0
Zinc (mg)	5.0

Source: Institute of Medicine. http://www.iom.edu.

Factors Influencing Intake

A number of factors can influence children's eating habits and attitudes toward food. Family environment, societal trends, taste preferences, and messages in the media all impact the emotions that children develop in relation to their diet. Television commercials can entice children to consume sugary products, fatty fast-foods, excess calories, refined ingredients, and sodium. Therefore, it is critical that parents and caregivers direct children toward healthy choices.

One way to encourage children to eat healthy foods is to make meal- and snack-time fun and interesting. Parents should include children in food planning and

preparation, for example selecting items while grocery shopping or helping to prepare part of a meal, such as making a salad. At this time, parents can also educate children about kitchen safety. It might be helpful to cut sandwiches, meats, or pancakes into small or interesting shapes. In addition, parents should offer nutritious desserts, such as fresh fruits, instead of calorie-laden cookies, cakes, salty snacks, and ice cream. Also, studies show that children who eat family meals on a frequent basis consume more nutritious foods.Dakota County, Minnesota. "Research on the Benefits of Family Meals." © 2006. Last revised April 30, 2012. http://www.co.dakota.mn.us/Departments/PublicHealth/Projects/ResearchFamilyMeals.htm.

Children and Malnutrition

Malnutrition is a problem many children face, in both developing nations and the developed world. Even with the wealth of food in North America, many children grow up malnourished, or even hungry. The US Census Bureau characterizes households into the following groups:

- food secure
- food insecure without hunger
- food insecure with moderate hunger
- food insecure with severe hunger

Millions of children grow up in food-insecure households with inadequate diets due to both the amount of available food and the quality of food. In the United States, about 20 percent of households with children are food insecure to some degree. In half of those, only adults experience food insecurity, while in the other half both adults and children are considered to be food insecure, which means that children did not have access to adequate, nutritious meals at times.Coleman-Jensen, A. et al. "Household Food Security in the United States in 2010." US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

Growing up in a food-insecure household can lead to a number of problems. Deficiencies in iron, zinc, protein, and vitamin A can result in stunted growth, illness, and limited development. Federal programs, such as the National School Lunch Program, the School Breakfast Program, and Summer Feeding Programs, work to address the risk of hunger and malnutrition in school-aged children. They help to fill the gaps and provide children living in food-insecure households with greater access to nutritious meals. You will learn more about food insecurity and the consequences for children and adults in Chapter 14 "Nutrition and Society: Food Politics and Perspectives".

The National School Lunch Program

Beginning with preschool, children consume at least one of their meals in a school setting. Many children receive both breakfast and lunch outside of the home. Therefore, it is important for schools to provide meals that are nutritionally sound. In the United States, more than thirty-one million children from low-income families are given meals provided by the National School Lunch Program. This federally-funded program offers low-cost or free lunches to schools, and also snacks to afterschool facilities. School districts that take part receive subsidies from the US Department of Agriculture (USDA) for every meal they serve. School lunches must meet the *2010 Dietary Guidelines for Americans* and need to provide one-third of the RDAs for protein, vitamin A, vitamin C, iron, and calcium. However, local authorities make the decisions about what foods to serve and how they are prepared.US Department of Agriculture. "National School Lunch Program Fact Sheet." 2011. Accessed March 5, 2012. http://www.fns.usda.gov/cnd/lunch/AboutLunch/NSLPFactSheet.pdf. The Healthy School Lunch Campaign works to improve the food served to children in school and to promote children's short- and long-term health by educating government officials, school officials, food-service workers, and parents. Sponsored by the Physicians Committee for Responsible Medicine, this organization encourages schools to offer more low-fat, cholesterol-free options in school cafeterias and in vending machines.Physicians Committee for Responsible Medicine. "Healthy School Lunches." Accessed March 5, 2012. http://healthyschoollunches.org/.

Video 13.2

The USDA Introduces New School Lunch Standards

(click to see video)

This video focuses on changes to the National School Lunch Program in the United States.

Children and Vegetarianism

Another issue that some parents face with school-aged children is the decision to encourage a child to become a vegetarian or a vegan. Some parents and caregivers decide to raise their children as vegetarians for health, cultural, or other reasons. Preteens and teens may make the choice to pursue vegetarianism on their own, due to concerns about animals or the environment. No matter the reason, parents with

vegetarian children must take care to ensure vegetarian children get healthy, nutritious foods that provide all the necessary nutrients.

Types of Vegetarian Diets

There are several types of vegetarians, each with certain restrictions in terms of diet:

- **Ovo-vegetarians.** Ovo-vegetarians eat eggs, but do not eat any other animal products.
- **Lacto-ovo-vegetarians.** Lacto-ovo-vegetarians eat eggs and dairy products, but do not eat any meat.
- **Lacto-vegetarians.** Lacto-vegetarians eat dairy products, but do not eat any other animal products.
- **Vegans.** Vegans eat food only from plant sources, no animal products at all.

Children who consume some animal products, such as eggs, cheese, or other forms of dairy, can meet their nutritional needs. For a child following a strict vegan diet, planning is needed to ensure adequate intake of protein, iron, calcium, vitamin B_{12}, and vitamin D. Legumes and nuts can be eaten in place of meat, soy milk fortified with calcium and vitamins D and B_{12} can replace cow's milk.

Food Allergies and Food Intolerance

As discussed in Chapter 12 "Nutrition through the Life Cycle: From Pregnancy to the Toddler Years", the development of food allergies is a concern during the toddler years. This remains an issue for school-aged children. Recent studies show that three million children under age eighteen are allergic to at least one type of food.American Academy of Allergy, Asthma and Immunology. "Allergy Statistics." Accessed on March 5, 2012. http://www.aaaai.org/about-the-aaaai/newsroom/allergy-statistics.aspx. Some of the most common allergenic foods include peanuts, milk, eggs, soy, wheat, and shellfish. An allergy occurs when a protein in food triggers an immune response, which results in the release of antibodies, histamine, and other defenders that attack foreign bodies. Possible symptoms include itchy skin, hives, abdominal pain, vomiting, diarrhea, and nausea. Symptoms usually develop within minutes to hours after consuming a food allergen. Children can outgrow a food allergy, especially allergies to wheat, milk, eggs, or soy.

Anaphylaxis[4] is a life-threatening reaction that results in difficulty breathing, swelling in the mouth and throat, decreased blood pressure, shock, or even death.

4. A life-threatening, extreme immune response to a food allergen. Anaphylaxis can result in difficulty breathing, swelling in the mouth and throat, decreased blood pressure, shock, and death.

Milk, eggs, wheat, soybeans, fish, shellfish, peanuts, and tree nuts are the most likely to trigger this type of response. A dose of the drug epinephrine is often administered via a "pen" to treat a person who goes into anaphylactic shock.National Institutes of Health, US Department of Health and Human Services. "Food Allergy Quick Facts." Accessed March 5, 2012. http://www.niaid.nih.gov/topics/foodallergy/understanding/pages/quickfacts.aspx.

Some children experience a food intolerance, which does not involve an immune response. A food intolerance is marked by unpleasant symptoms that occur after consuming certain foods. Lactose intolerance, though rare in very young children, is one example. Children who suffer from this condition experience an adverse reaction to the lactose in milk products. It is a result of the small intestine's inability to produce enough of the enzyme lactase, which is produced by the small intestine. Symptoms of lactose intolerance usually affect the GI tract and can include bloating, abdominal pain, gas, nausea, and diarrhea. An intolerance is best managed by making dietary changes and avoiding any foods that trigger the reaction.National Digestive Disease Information Clearinghouse, a service of National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health. "Lactose Intolerance." *NIH Publication No. 09–2751* (June 2009). Last updated April 23, 2012. http://digestive.niddk.nih.gov/ddiseases/pubs/lactoseintolerance/.

The Threat of Lead Toxicity

There is a danger of lead toxicity, or lead poisoning, among school-aged children. Lead is found in plumbing in old homes, in lead-based paint, and occasionally in the soil. Contaminated food and water can increase exposure and result in hazardous lead levels in the blood. Children under age six are especially vulnerable. They may consume items tainted with lead, such as chipped, lead-based paint. Another common exposure is lead dust in carpets, with the dust flaking off of paint on walls. When children play or roll around on carpets coated with lead, they are in jeopardy. Lead is indestructible, and once it has been ingested it is difficult for the human body to alter or remove it. It can quietly build up in the body for months, or even years, before the onset of symptoms. Lead toxicity can damage the brain and central nervous system, resulting in impaired thinking, reasoning, and perception.

Treatment for lead poisoning includes removing the child from the source of contamination and extracting lead from the body. Extraction may involve chelation therapy, which binds with lead so it can be excreted in urine. Another treatment protocol, EDTA therapy, involves administering a drug called ethylenediaminetetraacetic acid to remove lead from the bloodstream of patients with levels greater than 45 mcg/dL.Mayo Foundation for Medical Education and Research. "Lead poisoning." ©1998–2012 Accessed March 5, 2012. http://www.mayoclinic.com/health/lead-poisoning/FL00068. Fortunately, lead

toxicity is highly preventable. It involves identifying potential hazards, such as lead paint and pipes, and removing them before children are exposed to them.

KEY TAKEAWAYS

- The recommended intakes of macronutrients and micronutrients for children are higher relative to body size compared with nutrient needs during adulthood. Also, children's daily energy needs vary depending on their level of physical activity and their gender. Girls ages four to eight require 1,200 to 1,800 calories, while boys ages four to eight need 1,200 to 2,000 calories.
- Some food- and nutrition-related problems that can affect school-aged children include malnutrition, food allergies, food intolerances, and lead toxicity.

DISCUSSION STARTER

1. Which nutritional issues should parents who raise their children as vegans consider? Examine the vegan lifestyle and its impact on childhood development. Visit the following websites for more information on veganism:

   http://www.vrg.org/nutshell/kids.htm

   http://kidshealth.org/parent/nutrition_center/healthy_eating/vegan.html

   http://www.fcs.uga.edu/ext/pubs/html/FDNS-E-18.html

13.3 Puberty and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for preteens.
2. Discuss the most important nutrition-related concerns at the onset of puberty.
3. Discuss the growing rates of childhood obesity and the long-term consequences of it.

Puberty is the beginning of adolescence. The onset of puberty brings a number of changes, including the development of primary and secondary sex characteristics, growth spurts, an increase in body fat, and an increase in bone and muscle development. All of these changes must be supported with adequate intake and healthy food choices.

The Onset of Puberty (Ages Nine to Thirteen)

This period of physical development is divided into two phases. The first phase involves height increases from 20 to 25 percent. Puberty is second to the prenatal period in terms of rapid growth as the long bones stretch to their final, adult size. Girls grow 2–8 inches (5–20 centimeters) taller, while boys grow 4–12 inches (10–30 centimeters) taller. The second phase involves weight gain related to the development of bone, muscle, and fat tissue. Also in the midst of puberty, the sex hormones trigger the development of reproductive organs and secondary sexual characteristics, such as pubic hair. Girls also develop "curves," while boys become broader and more muscular.Beverly McMillan, *Illustrated Atlas of the Human Body* (Sydney, Australia: Weldon Owen, 2008), 258.

Puberty typically begins slightly earlier in girls than in boys. For girls, puberty often begins around age eleven, while for boys it begins around age twelve.

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Energy

The energy requirements for preteens differ according to gender, growth, and activity level. For ages nine to thirteen, girls should consume about 1,400 to 2,200

calories per day and boys should consume 1,600 to 2,600 calories per day. Physically active preteens who regularly participate in sports or exercise need to eat a greater number of calories to account for increased energy expenditures.

Macronutrients

For carbohydrates, the AMDR is 45 to 65 percent of daily calories (which is a recommended daily allowance of 158–228 grams for 1,400–1,600 daily calories). Carbohydrates that are high in fiber should make up the bulk of intake. The AMDR for protein is 10 to 30 percent of daily calories (35–105 grams for 1,400 daily calories for girls and 40–120 grams for 1,600 daily calories for boys). The AMDR for fat is 25 to 35 percent of daily calories (39–54 grams for 1,400 daily calories for girls and 44–62 grams for 1,600 daily calories for boys), depending on caloric intake and activity level.

Micronutrients

Key vitamins needed during puberty include vitamins D, K, and B_{12}. Adequate calcium intake is essential for building bone and preventing osteoporosis later in life. Young females need more iron at the onset of menstruation, while young males need additional iron for the development of lean body mass. Almost all of these needs should be met with dietary choices, not supplements (iron is an exception). Table 13.2 "Micronutrient Levels during Puberty" shows the micronutrient recommendations for young adolescents.

Table 13.2 Micronutrient Levels during Puberty

Nutrient	Preteens, Ages 9–13
Vitamin A (mcg)	600.0
Vitamin B_6 (mg)	1.0
Vitamin B_{12} (mcg)	1.8
Vitamin C (mg)	45.0
Vitamin D (mcg)	5.0
Vitamin E (mg)	11.0
Vitamin K (mcg)	60.0
Calcium (mg)	1,300.0
Folate (mcg)	300.0

Nutrient	Preteens, Ages 9–13
Iron (mg)	8.0
Magnesium (mg)	240.0
Niacin (B_3) (mg)	12.0
Phosphorus (mg)	1,250.0
Riboflavin (B_2) (mcg)	900.0
Selenium (mcg)	40.0
Thiamine (B_1) (mcg)	900.0
Zinc (mg)	8.0

Source: Institute of Medicine. http://www.iom.edu.

Childhood Obesity

Children need adequate caloric intake for growth, and it is important not to impose very restrictive diets. However, exceeding caloric requirements on a regular basis can lead to childhood obesity, which has become a major problem in North America. Nearly one of three US children and adolescents are overweight or obese.Let's Move. "Learn the Facts." Accessed March 5, 2012. http://www.letsmove.gov/learn-facts/epidemic-childhood-obesity. In Canada, approximately 26 percent of children and adolescents are overweight or obese.Childhood Obesity Foundation. "Statistics." Accessed March 5, 2012. http://www.childhoodobesityfoundation.ca/statistics.

Frequent television, computer, and video game usage leads to a sedentary lifestyle, which, along with poor diet, contributes to childhood obesity.

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There are a number of reasons behind this problem, including:

- larger portion sizes
- limited access to nutrient-rich foods
- increased access to fast foods and vending machines
- lack of breastfeeding support
- declining physical education programs in schools
- insufficient physical activity and a sedentary lifestyle

- media messages encouraging the consumption of unhealthy foods

Children who suffer from obesity are more likely to become overweight or obese adults. Obesity has a profound effect on self-esteem, energy, and activity level. Even more importantly, it is a major risk factor for a number of diseases later in life, including cardiovascular disease, Type 2 diabetes, stroke, hypertension, and certain cancers.World Health Organization. "Obesity and Overweight Fact Sheet." Last revised March 2011. http://www.who.int/mediacentre/factsheets/fs311/en/.

A percentile for body mass index (BMI) specific to age and sex is used to determine if a child is overweight or obese. This is more appropriate than the BMI categories used for adults because the body composition of children varies as they develop, and differs between boys and girls. If a child gains weight inappropriate to growth, parents and caregivers should limit energy-dense, nutrient-poor snack foods. Also, children ages three and older can follow the National Cholesterol Education Program guidelines of no more than 35 percent of calories from fat (10 percent or less from saturated fat), and no more than 300 milligrams of cholesterol per day. In addition, it is extremely beneficial to increase a child's physical activity and limit sedentary activities, such as watching television, playing video games, or surfing the Internet.

Programs to address childhood obesity can include behavior modification, exercise counseling, psychological support or therapy, family counseling, and family meal-planning advice. For most, the goal is not weight loss, but rather allowing height to catch up with weight as the child continues to grow. Rapid weight loss is not recommended for preteens or younger children due to the risk of deficiencies and stunted growth.

Video 13.3

Voice of America: Adolescent Obesity Raises Risk of Severe Obesity in Adulthood

(click to see video)

This video provides information about the link between adolescent obesity and adult obesity.

Avoiding Added Sugars

5. Sugars and other sweeteners (such as high-fructose corn syrup, honey, maple syrup, and molasses), that are added to food at the table, and are also ingredients in food products.

One major contributing factor to childhood obesity is the consumption of **added sugars**[5]. Added sugars include not only sugar added to food at the table, but also are ingredients in items such as bread, cookies, cakes, pies, jams, and soft drinks. The added sugar in store-bought items may be listed as white sugar, brown sugar, high-

fructose corn syrup, honey, malt syrup, maple syrup, molasses, anhydrous dextrose, crystal dextrose, and concentrated fruit juice. (Not included are sugars that occur naturally in foods, such as the lactose in milk or the fructose in fruits.) In addition, sugars are often "hidden" in items added to foods after they're prepared, such as ketchup, salad dressing, and other condiments. According to the National Center for Health Statistics, young children and adolescents consume an average of 322 calories per day from added sugars, or about 16 percent of daily calories.National Center for Health Statistics. "Consumption of Added Sugar among US Children and Adolescents, 2005–2008." *NCHS Data Brief*, no. 87, (March 2012). http://www.cdc.gov/nchs/data/databriefs/db87.pdf. The primary offenders are processed and packaged foods, along with soda and other beverages. These foods are not only high in sugar, they are also light in terms of nutrients and often take the place of healthier options. Intake of added sugar should be limited to 100–150 calories per day to discourage poor eating habits.

Tools for Change

The *2008 Physical Activity Guidelines for Americans* call for sixty minutes of moderate to vigorous physical activity daily for preteens and teens. This includes aerobic activity, along with bone- and muscle-strengthening exercises.US Department of Health and Human Services. "2008 Physical Activity Guidelines for Americans." Accessed March 5, 2012. http://www.health.gov/paguidelines/pdf/paguide.pdf. However, many young people fall far short of this goal. Preteens must be encouraged to lead more active lifestyles to prevent or treat childhood obesity. In the United States, the Let's Move! campaign inspires kids to start exercising. This program, launched in 2010 by First Lady Michelle Obama, works to solve the problem of rising obesity rates among children, preteens, and teens. It offers information to parents and educators, works to provide healthier food choices in schools and afterschool programs, and helps children become more active. One way the program promotes physical activity is by encouraging preteens and teens to find something they love to do. When kids find an activity they enjoy, whether riding a bike, playing football, joining a soccer team, or participating in a dance crew, they are more likely to get moving and stay healthy. You can learn more about Let's Move! and efforts to encourage physical activity among adolescents at this website: http://www.letsmove.gov/.

KEY TAKEAWAYS

- During puberty, preteens experience growth spurts, along with the development of primary and secondary sex characteristics.
- The daily energy requirements for preteens differ according to gender, growth, and activity level. Girls ages nine to thirteen should consume 1,400 to 2,200 calories per day, and boys should consume 1,600 to 2,600 calories per day.
- Nutritional concerns for older children include malnutrition and obesity.
- Preteens should be encouraged to develop good habits, including consuming a healthy diet and regularly participating in sports or an exercise program.

DISCUSSION STARTER

1. What would you recommend to help families prevent obesity among their children? What tips would you provide? What lifestyle changes might help? Use the dietary guidelines at this website to discuss suggestions.

   http://www.choosemyplate.gov/.

13.4 Older Adolescence and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for teens.
2. Discuss the most important nutrition-related concerns during adolescence.
3. Discuss the effect of eating disorders on health and wellness.

In this section, we will discuss the nutritional requirements for young people ages fourteen to eighteen. One way that teenagers assert their independence is by choosing what to eat. They have their own money to purchase food and tend to eat more meals away from home. Older adolescents also can be curious and open to new ideas, which includes trying new kinds of food and experimenting with their diet. For example, teens will sometimes skip a main meal and snack instead. That is not necessarily problematic. Their choice of food is more important than the time or place.

However, too many poor choices can make young people nutritionally vulnerable. Teens should be discouraged from eating fast food, which has a high fat and sugar content, or frequenting convenience stores and using vending machines, which typically offer poor nutritional selections. Other challenges that teens may face include obesity and eating disorders. At this life stage, young people still need guidance from parents and other caregivers about nutrition-related matters. It can be helpful to explain to young people how healthy eating habits can support activities they enjoy, such as skateboarding or dancing, or connect to their desires or interests, such as a lean figure, athletic performance, or improved cognition.

Adolescence (Ages Fourteen to Eighteen): Transitioning into Adulthood

As during puberty, growth and development during adolescence differs in males than in females. In teenage girls, fat assumes a larger percentage of body weight, while teenage boys experience greater muscle and bone increases. For both, primary and secondary sex characteristics have fully developed and the rate of growth slows with the end of puberty. Also, the motor functions of an older adolescent are comparable to those of an adult.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health*

Promotion (Philadelphia: F. A. Davis Company, 2003), 171–173. Again, adequate nutrition and healthy choices support this stage of growth and development.

Energy

Adolescents have increased appetites due to increased nutritional requirements. Nutrient needs are greater in adolescence than at any other time in the life cycle, except during pregnancy. The energy requirements for ages fourteen to eighteen are 1,800 to 2,400 calories for girls and 2,000 to 3,200 calories for boys, depending on activity level. The extra energy required for physical development during the teenaged years should be obtained from foods that provide nutrients instead of "empty calories." Also, teens who participate in sports must make sure to meet their increased energy needs.

Macronutrients

Older adolescents are more responsible for their dietary choices than younger children, but parents and caregivers must make sure that teens continue to meet their nutrient needs. For carbohydrates, the AMDR is 45 to 65 percent of daily calories (203–293 grams for 1,800 daily calories). Adolescents require more servings of grain than younger children, and should eat whole grains, such as wheat, oats, barley, and brown rice. The Institute of Medicine recommends higher intakes of protein for growth in the adolescent population. The AMDR for protein is 10 to 30 percent of daily calories (45–135 grams for 1,800 daily calories), and lean proteins, such as meat, poultry, fish, beans, nuts, and seeds are excellent ways to meet those nutritional needs.

The AMDR for fat is 25 to 35 percent of daily calories (50–70 grams for 1,800 daily calories), and the AMDR for fiber is 25–34 grams per day, depending on daily calories and activity level. It is essential for young athletes and other physically active teens to intake enough fluids, because they are at a higher risk for becoming dehydrated.

Micronutrients

Micronutrient recommendations for adolescents are mostly the same as for adults, though children this age need more of certain minerals to promote bone growth (e.g., calcium and phosphorus, along with iron and zinc for girls). Again, vitamins and minerals should be obtained from food first, with supplementation for certain micronutrients only (such as iron).

The most important micronutrients for adolescents are calcium, vitamin D, vitamin A, and iron. Adequate calcium and vitamin D are essential for building bone mass. The recommendation for calcium is 1,300 milligrams for both boys and girls. Low-fat milk and cheeses are excellent sources of calcium and help young people avoid saturated fat and cholesterol. It can also be helpful for adolescents to consume products fortified with calcium, such as breakfast cereals and orange juice. Iron supports the growth of muscle and lean body mass. Adolescent girls also need to ensure sufficient iron intake as they start to menstruate. Girls ages twelve to eighteen require 15 milligrams of iron per day. Increased amounts of vitamin C from orange juice and other sources can aid in iron absorption. Also, adequate fruit and vegetable intake allows for meeting vitamin A needs. Table 13.3 "Micronutrient Levels during Older Adolescence" shows the micronutrient recommendations for older adolescents, which differ slightly for males and females, unlike the recommendations for puberty.

Table 13.3 Micronutrient Levels during Older Adolescence

Nutrient	Males, Ages 14–18	Females, Ages 14–18
Vitamin A (mcg)	900.0	700.0
Vitamin B_6 (mg)	1.3	1.2
Vitamin B_{12} (mcg)	2.4	2.4
Vitamin C (mg)	75.0	65.0
Vitamin D (mcg)	5.0	5.0
Vitamin E (mg)	15.0	15.0
Vitamin K (mcg)	75.0	75.0
Calcium (mg)	1,300.0	1,300.0
Folate mcg)	400.0	400.0
Iron (mg)	11.0	15.0
Magnesium (mg)	410.0	360.0
Niacin (B_3) (mg)	16.0	14.0
Phosphorus (mg)	1,250.0	1,250.0
Riboflavin (B_2) (mg)	1.3	1.0
Selenium (mcg)	55.0	55.0
Thiamine (B_1) (mg)	1.2	1.0
Zinc (mg)	11.0	9.0

Source: Institute of Medicine. http://www.iom.edu.

Eating Disorders

Many teens struggle with an **eating disorder**[6], which can have a detrimental effect on diet and health. A study published by North Dakota State University estimates that these conditions impact twenty-four million people in the United States and seventy million worldwide.North Dakota State University. "Eating Disorder Statistics." Accessed March 5, 2012. http://www.ndsu.edu/fileadmin/counseling/Eating_Disorder_Statistics.pdf. These disorders are more prevalent among adolescent girls, but have been increasing among adolescent boys in recent years. Because eating disorders oftenlead to malnourishment, adolescents with an eating disorder are deprived of the crucial nutrients their still-growing bodies need.

Eating disorders involve extreme behavior related to food and exercise. Sometimes referred to as "starving or stuffing," they encompass a group of conditions marked by undereating or overeating. Some of these conditions include:

- **Anorexia Nervosa.** Anorexia nervosa is a potentially fatal condition characterized by undereating and excessive weight loss. People with this disorder are preoccupied with dieting, calories, and food intake to an unhealthy degree. Anorexics have a poor body image, which leads to anxiety, avoidance of food, a rigid exercise regimen, fasting, and a denial of hunger. The condition predominantly affects females. Between 0.5 and 1 percent of American women and girls suffer from this eating disorder.
- **Binge-Eating Disorder.** People who suffer from binge-eating disorder experience regular episodes of eating an extremely large amount of food in a short period of time. Binge eating is a compulsive behavior, and people who suffer from it typically feel it is beyond their control. This behavior often causes feelings of shame and embarrassment, and leads to obesity, high blood pressure, high cholesterol levels, Type 2 diabetes, and other health problems. Both males and females suffer from binge-eating disorder. It affects 1 to 5 percent of the population.
- **Bulimia Nervosa.** Bulimia nervosa is characterized by alternating cycles of overeating and undereating. People who suffer from it partake in binge eating, followed by compensatory behavior, such as self-induced vomiting, laxative use, and compulsive exercise. As with anorexia, most people with this condition are female. Approximately 1 to 2 percent of American women and girls have this eating disorder.National Eating Disorders Association. "Learn Basic Terms and Information on a Variety of Eating Disorder Topics." Accessed March 5,

6. A behavioral condition that involves extreme attitudes and behaviors toward food and nutrition. These disorders are characterized by overeating or undereating, and include anorexia nervosa, binge-eating disorder, and bulimia nervosa.

2012. http://www.nationaleatingdisorders.org/information-resources/general -information.php.

Eating disorders stem from stress, low self-esteem, and other psychological and emotional issues. It is important for parents to watch for signs and symptoms of these disorders, including sudden weight loss, lethargy, vomiting after meals, and the use of appetite suppressants. Eating disorders can lead to serious complications or even be fatal if left untreated. Treatment includes cognitive, behavioral, and nutritional therapy.

Video 13.4

Eating Disorders: Anorexia

(click to see video)

This video provides more information about the eating disorder anorexia nervosa.

KEY TAKEAWAYS

- Older adolescents experience numerous physical changes and must increase their energy intake to support these changes and meet nutrient needs.
- Nutrient needs are greater during adolescence than at any other time in the life cycle, except during pregnancy.
- The daily energy requirements for ages fourteen to eighteen are 1,800 to 2,400 calories for girls, and 2,000 to 3,200 calories for boys, depending on activity level.
- Nutritional concerns for older adolescents include eating disorders.

DISCUSSION STARTER

1. Research the biological, social, and psychological aspects of eating disorders at this website. Then, brainstorm a list of risk factors and warning signs for parents, teachers, and physicians.

   http://www.nationaleatingdisorders.org/

13.5 Young Adulthood and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for young adults.
2. Discuss the most important nutrition-related concerns during young adulthood.
3. Explain how nutritional and lifestyle choices can affect current and future health.

With the onset of adulthood, good nutrition can help young adults enjoy an active lifestyle. For most people, this is the time when their bodies are in the best condition. The body of an adult does not need to devote its energy and resources to support the rapid growth and development that characterizes youth. However, the choices made during those formative years can have a lasting impact. Eating habits and preferences developed during childhood and adolescence influence health and fitness into adulthood. Some adults have gotten a healthy start and have established a sound diet and regular activity program, which helps them remain in good condition from young adulthood into the later years. Others carry childhood obesity into adulthood, which adversely affects their health. However, it is not too late to change course and develop healthier habits and lifestyle choices. Therefore, adults must monitor their dietary decisions and make sure their caloric intake provides the energy that they require, without going into excess.

Young Adulthood (Ages Nineteen to Thirty): At Your Peak

At this time, growth is completed and people reach their physical peak. Major organs and body systems have fully matured by this stage of the life cycle. For example, the human body reaches maximum cardiac output between ages twenty and thirty. Also, bone and muscle mass are at optimal levels, and physical activity helps to improve muscle strength, endurance, and tone.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 192–193. In order to maintain health and fitness at this age, it is important to continue to practice good nutrition. Healthy eating habits promote metabolic functioning, assist repair and regeneration, and prevent the development of chronic conditions. In addition, the goals of a young adult, such as beginning a career or seeking out romantic relationships, can be supported with good habits.

Energy

Young men typically have higher nutrient needs than young women. For ages nineteen to thirty, the energy requirements for women are 1,800 to 2,400 calories, and 2,400 to 3,000 calories for men, depending on activity level. These estimates do not include women who are pregnant or breastfeeding, who require a higher energy intake (see Chapter 12 "Nutrition through the Life Cycle: From Pregnancy to the Toddler Years").

Macronutrients

For carbohydrates, the AMDR is 45 to 65 percent of daily calories. All adults, young and old, should eat fewer energy-dense carbohydrates, especially refined, sugar-dense sources, particularly for those who lead a more sedentary lifestyle. The AMDR for protein is 10 to 35 percent of total daily calories, and should include a variety of lean meat and poultry, eggs, beans, peas, nuts, and seeds. The guidelines also recommend that adults eat two 4-ounce servings (or one 8-ounce serving) of seafood per week.

It is also important to replace proteins that are high in trans fats and saturated fat with ones that are lower in solid fats and calories. All adults should limit total fat to 20 to 35 percent of their daily calories and keep saturated fatty acids to less than 10 percent of total calories by replacing them with monounsaturated and polyunsaturated fatty acids. Avoid trans fats by limiting foods that contain synthetic sources, such as partially hydrogenated oils. The AMDR for fiber is 22 to 28 grams per day for women and 28 to 34 grams per day for men. Soluble fiber may help improve cholesterol and blood sugar levels, while insoluble fiber can help prevent constipation.

Tools for Change

A healthy diet of nutrient-rich meals incorporates a variety of whole foods. Whole foods are unprocessed or unrefined, or have been created with as little processing as possible. They do not include a lot of added ingredients, such as sugar, sodium, or fat, and are free of preservatives or other chemicals that are often added to food products. Examples of whole foods with no processing include legumes and fresh fruits and vegetables. Examples of whole foods with minimal processing include whole-grain breads and cereals. Dietitians recommend consuming whole foods for a variety of reasons. Whole foods provide nutrients in their natural state, with all of the vitamins and minerals intact. Food processing can remove some nutrients during manufacturing. Also, diets rich in whole foods contain high concentrations of fiber and antioxidants, and can protect against chronic disease.

Micronutrients

Micronutrient needs in adults differ slightly according to sex. Young men and women who are very athletic and perspire a great deal also require extra sodium, potassium, and magnesium. Males require more of vitamins C and K, along with thiamine, riboflavin, and niacin. Females require extra iron due to menstruation. Therefore, it can be beneficial for some young adults to follow a daily multivitamin regimen to help meet nutrient needs. But as always, it is important to remember "food first, supplements second." Table 13.4 "Micronutrient Levels during Adulthood" shows the micronutrient recommendations for adult men and women.

Table 13.4 Micronutrient Levels during Adulthood

Nutrient	Adult Males	Adult Females
Vitamin A (mcg)	900.0	700.0
Vitamin B_6 (mg)	1.3	1.3
Vitamin B_{12} (mcg)	2.4	2.4
Vitamin C (mg)	90.0	75.0
Vitamin D (mcg)	5.0	5.0
Vitamin E (mg)	15.0	15.0
Vitamin K (mcg)	120.0	90.0

Nutrient	Adult Males	Adult Females
Calcium (mg)	1,000.0	1,000.0
Folate (mcg)	400.0	400.0
Iron (mg)	8.0	18.0
Magnesium (mg)	400.0	310.0
Niacin (B_3) (mg)	16.0	14.0
Phosphorus (mg)	700.0	700.0
Riboflavin (B_2) (mg)	1.3	1.1
Selenium (mcg)	55.0	55.0
Thiamine (B_1) (mg)	1.2	1.1
Zinc (mg)	11.0	8.0

Source: Institute of Medicine. http://www.iom.edu.

Nutritional Concerns in Young Adulthood

There are a number of intake recommendations for young adults. According to the IOM, an adequate intake (AI) of fluids for men is 3.7 liters per day, from both food and liquids. The AI for women is 2.7 liters per day, from food and liquids.Institute of Medicine. "Dietary Reference Intakes: Water, Potassium, Sodium, Chloride, and Sulfate." Accessed March 5, 2012. http://www.iom.edu/Reports/2004/Dietary-Reference-Intakes-Water-Potassium-Sodium-Chloride-and-Sulfate.aspx.

It is best when fluid intake is from water, instead of sugary beverages, such as soda. Fresh fruits and vegetables, including watermelon and cucumbers, are excellent food sources of fluid.

In addition, young adults should avoid consuming excessive amounts of sodium. The health consequences of high sodium intake include high blood pressure and its complications. Therefore, it is best to limit sodium to less than 2,300 milligrams per day.

Gastrointestinal Integrity

Good nutrition during the young adult years can help to support gastrointestinal integrity and prevent digestive disorders, such as constipation and diarrhea. Dietary fiber helps bind indigestible food together and normalize bowel

movements. It also holds more water in the stool to make it softer for those who suffer from constipation. Excellent sources of fiber include oats, barley, rye, wheat, brown rice, celery, carrots, nuts, seeds, dried beans, oranges, and apples. In addition, healthy intestinal microflora can be supported by prebiotics, which stimulate the growth of beneficial bacteria already in the colon and are found in fruits and vegetables, and probiotics, which change or improve the bacterial balance in the gut and are found in yogurt.

Obesity during Adulthood

Obesity remains a major concern into young adulthood. For adults, a BMI above 25 is considered overweight, and a BMI of 30 or higher is obese. By that measurement, about two-thirds of all adults in the United States are overweight or obese, with 35.7 percent considered to be obese.Centers for Disease Control, National Center for Health Statistics. "Prevalence of Obesity in the United States, 2009–2010." *NCHS Data Brief*, No. 82, January 2012, accessed on March 5, 2012. http://www.cdc.gov/nchs/data/databriefs/db82.pdf. As during childhood and adolescence, physical inactivity and poor dietary choices are major contributors to obesity in adulthood. Solid fats, alcohol, and added sugars (SoFAAS) make up 35 percent of total calories for most people, leading to high levels of saturated fat and cholesterol and insufficient dietary fiber. Therefore, it is important to limit unrefined carbohydrates and processed foods.

KEY TAKEAWAYS

- Young adults typically have reached their physical peak and can support health and wellness with adequate nutrition and exercise.
- For ages nineteen to thirty, the daily energy requirements are 1,800 to 2,400 calories for women and 2,400 to 3,000 calories for men, depending on activity level.
- Nutritional concerns for young adults include adequate energy and fluid intake, sodium intake, and the consumption of fiber.
- Young adults should avoid consuming solid fats, added sugars, and alcohol in excess.

DISCUSSION STARTER

1. How does your intake of carbohydrates, proteins, and fats compare to the AMDR? What can you do to make changes and meet the nutritional recommendations?

13.6 Middle Age and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for middle-aged adults.
2. Discuss the most important nutrition-related concerns during middle age.
3. Define "preventive nutrition" and give an applied example.

During this stage of the human life cycle, adults begin to experience the first outward signs of aging. Wrinkles begin to appear, joints ache after a highly active day, and body fat accumulates. There is also a loss of muscle tone and elasticity in the connective tissue.Elaine U. Polan, RNC, MS and Daphne R. Taylor, RN, MS, *Journey Across the Life Span: Human Development and Health Promotion* (Philadelphia: F. A. Davis Company, 2003), 212–213. Throughout the aging process, good nutrition can help middle-aged adults maintain their health and recover from any medical problems or issues they may experience.

Middle Age (Ages Thirty-One to Fifty): Aging Well

Many people in their late thirties and in their forties notice a decline in endurance, the onset of wear-and-tear injuries (such as osteoarthritis), and changes in the digestive system. Wounds and other injuries also take longer to heal. Body composition changes due to fat deposits in the trunk. To maintain health and wellness during the middle-aged years and beyond, it is important to:

- maintain a healthy body weight
- consume nutrient-dense foods
- drink alcohol moderately or not at all
- be a nonsmoker
- engage in moderate physical activity at least 150 minutes per week

Energy

The energy requirements for ages thirty-one to fifty are 1,800 to 2,200 calories for women and 2,200 to 3,000 calories for men, depending on activity level. These estimates do not include women who are pregnant or breastfeeding (see Chapter 12 "Nutrition through the Life Cycle: From Pregnancy to the Toddler Years"). Middle-

aged adults must rely on healthy food sources to meet these needs. In many parts of North America, typical dietary patterns do not match the recommended guidelines. For example, five foods—iceberg lettuce, frozen potatoes, fresh potatoes, potato chips, and canned tomatoes—account for over half of all vegetable intake.Adam Drewnowski and Nicole Darmon. "Food Choices and Diet Cost: an Economic Analysis." *The Journal of Nutrition*. © 2005 The American Society for Nutritional Sciences. Accessed March 5, 2012. http://jn.nutrition.org/content/135/4/900.full. Following the dietary guidelines in the middle-aged years provides adequate but not excessive energy, macronutrients, vitamins, and minerals.

Video 13.5

Caloric Restriction

(click to see video)

This video focuses on the possible connection between caloric restriction and longevity.

Macronutrients and Micronutrients

The AMDRs for carbohydrates, protein, fat, fiber, and fluids remain the same from young adulthood into middle age (see Section 13.5 "Young Adulthood and Nutrition" of this chapter). It is important to avoid putting on excess pounds and limiting an intake of SoFAAS to help avoid cardiovascular disease, diabetes, and other chronic conditions.

There are some differences, however, regarding micronutrients. For men, the recommendation for magnesium increases to 420 milligrams daily, while middle-aged women should increase their intake of magnesium to 320 milligrams per day. Other key vitamins needed during the middle-aged years include folate and vitamins B_6 and B_{12} to prevent elevation of homocysteine, a byproduct of metabolism that can damage arterial walls and lead to atherosclerosis, a cardiovascular condition. Again, it is important to meet nutrient needs with food first, then supplementation, such as a daily multivitamin, if you can't meet your needs through food.

Preventive/Defensive Nutrition

Brightly colored tomatoes are another example of foods that are high in antioxidants.

© Thinkstock

During the middle-aged years, **preventive nutrition**[7] can promote wellness and help organ systems to function optimally throughout aging. Preventive nutrition is defined as dietary practices directed toward reducing disease and promoting health and well-being. Healthy eating in general—such as eating unrefined carbohydrates instead of refined carbohydrates and avoiding trans fats and saturated fats—helps to promote wellness. However, there are also some things that people can do to target specific concerns. One example is consuming foods high in antioxidants, such as strawberries, blueberries, and other colorful fruits and vegetables, to reduce the risk of cancer.

Phytochemicals are compounds in fruits and vegetables that act as defense systems for plants. Different phytochemicals are beneficial in different ways. For example, carotenoids, which are found in carrots, cantaloupes, sweet potatoes, and butternut squash, may protect against cardiovascular disease by helping to prevent the oxidation of cholesterol in the arteries, although research is ongoing.Sari Voutilainen, Tarja Nurmi, Jaakko Mursu, and Tiina H. Rissanen. "Carotenoids and Cardiovascular Health." *Am J Clin Nutr* 83 (2006): 1265–71. http://www.ajcn.org/content/83/6/1265.full.pdf. According to the American Cancer Society, some studies suggest that a phytochemical found in watermelons and tomatoes called lycopene may protect against stomach, lung, and prostate cancer, although more research is needed.American Cancer Society. "Lycopene." Last revised May 13, 2010. http://www.cancer.org/Treatment/TreatmentsandSideEffects/ComplementaryandAlternativeMedicine/DietandNutrition/lycopene.

Omega-3 fatty acids can help to prevent coronary artery disease. These crucial nutrients are found in oily fish, including salmon, mackerel, tuna, herring, cod, and halibut. Other beneficial fats that are vital for healthy functioning include monounsaturated fats, which are found in plant oils, avocados, peanuts, and pecans.

Menopause

In the middle-aged years, women undergo a specific change that has a major effect on their health. They begin the process of menopause, typically in their late forties or early fifties. The ovaries slowly cease to produce estrogen and progesterone, which results in the end of menstruation. Menopausal symptoms can vary, but

7. The use of dietary practices to reduce disease and promote health and well-being.

often include hot flashes, night sweats, and mood changes. The hormonal changes that occur during menopause can lead to a number of physiological changes as well, including alterations in body composition, such as weight gain in the abdominal area. Bone loss is another common condition related to menopause due to the loss of female reproductive hormones. Bone thinning increases the risk of fractures, which can affect mobility and the ability to complete everyday tasks, such as cooking, bathing, and dressing.Academy of Nutrition and Dietetics. "Eating Right During Menopause." © 1995–2012. Accessed March 5, 2012. http://www.eatright.org/Public/content.aspx?id=6809. Recommendations for women experiencing menopause or perimenopause (the stage just prior to the end of the menstruation) include:

- consuming a variety of whole grains, and other nutrient-dense foods
- maintaining a diet high in fiber, low in fat, and low in sodium
- avoiding caffeine, spicy foods, and alcohol to help prevent hot flashes
- eating foods rich in calcium, or taking physician-prescribed calcium supplements and vitamin D
- doing stretching exercises to improve balance and flexibility and reduce the risk of falls and fractures

KEY TAKEAWAYS

- Middle-aged adults begin to experience signs of aging and must continue to support their health and wellness with nutrition and exercise.
- The daily energy requirements for ages thirty-one to fifty are 1,800 to 2,200 calories for women and 2,200 to 3,000 calories for men, depending on activity level.
- Nutritional concerns for middle-aged adults relate to menopause and the prevention of chronic disease.

DISCUSSION STARTER

1. Visit the following websites to learn more about nutrition during the years of perimenopause and menopause. Discuss with classmates what you believe to be the three most important nutritional concerns for women during this phase of life.

   http://www.medicinenet.com/script/main/art.asp?articlekey=59895

   http://www.webmd.com/menopause/guide/staying-healthy-through-good-nuitrition

13.7 Old Age and Nutrition

LEARNING OBJECTIVES

1. Summarize nutritional requirements and dietary recommendations for elderly adults.
2. Discuss the most important nutrition-related concerns during the senior years.
3. Discuss the influence of diet on health and wellness in old age.

Beginning at age fifty-one, requirements change once again and relate to the nutritional issues and health challenges that older people face. After age sixty, blood pressure rises and the immune system may have more difficulty battling invaders and infections. The skin becomes more wrinkled and hair has turned gray or white or fallen out, resulting in hair thinning. Older adults may gradually lose an inch or two in height. Also, short-term memory might not be as keen as it once was.Beverly McMillan, *Illustrated Atlas of the Human Body* (Sydney, Australia: Weldon Owen, 2008), 260.

In addition, many people suffer from serious health conditions, such as cardiovascular disease and cancer. Being either underweight or overweight is also a major concern for the elderly. However, many older adults remain in relatively good health and continue to be active into their golden years. Good nutrition is often the key to maintaining health later in life. In addition, the fitness and nutritional choices made earlier in life set the stage for continued health and happiness.

Older Adulthood (Ages Fifty-One and Older): The Golden Years

An adult's body changes during old age in many ways, including a decline in hormone production, muscle mass, and strength. Also in the later years, the heart has to work harder because each pump is not as efficient as it used to be. Kidneys are not as effective in excreting metabolic products such as sodium, acid, and potassium, which can alter water balance and increase the risk for over- or underhydration. In addition, immune function decreases and there is lower efficiency in the absorption of vitamins and minerals.

Older adults should continue to consume nutrient-dense foods and remain physically active. However, deficiencies are more common after age sixty, primarily due to reduced intake or malabsorption. The loss of mobility among frail, homebound elderly adults also impacts their access to healthy, diverse foods.

Regular exercise, along with a nutritious diet, can help older adults maintain their health.

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Energy

Due to reductions in lean body mass and metabolic rate, older adults require less energy than younger adults. The energy requirements for people ages fifty-one and over are 1,600 to 2,200 calories for women and 2,000 to 2,800 calories for men, depending on activity level. The decrease in physical activity that is typical of older adults also influences nutritional requirements.

Macronutrients

The AMDRs for carbohydrates, protein, and fat remain the same from middle age into old age (see Section 13.5 "Young Adulthood and Nutrition" of this chapter for specifics). Older adults should substitute more unrefined carbohydrates for refined ones, such as whole grains and brown rice. Fiber is especially important in preventing constipation and diverticulitis, and may also reduce the risk of colon cancer. Protein should be lean, and healthy fats, such as omega-3 fatty acids, are part of any good diet.

Micronutrients

An increase in certain micronutrients can help maintain health during this life stage. The recommendations for calcium increase to 1,200 milligrams per day for both men and women to slow bone loss. Also to help protect bones, vitamin D recommendations increase to 10–15 micrograms per day for men and women. Vitamin B_6 recommendations rise to 1.7 milligrams per day for older men and 1.5 milligrams per day for older women to help lower levels of homocysteine and protect against cardiovascular disease. As adults age, the production of stomach acid can decrease and lead to an overgrowth of bacteria in the small intestine. This can affect the absorption of vitamin B_{12} and cause a deficiency. As a result, older adults need more B_{12} than younger adults, and require an intake of 2.4 micrograms per day, which helps promote healthy brain functioning. For elderly women, higher iron levels are no longer needed postmenopause and recommendations decrease to 8 milligrams per day. People over age fifty should eat foods rich with all of these micronutrients.

Nutritional Concerns for Older Adults

Dietary choices can help improve health during this life stage and address some of the nutritional concerns that many older adults face. In addition, there are specific concerns related to nutrition that affect adults in their later years. They include medical problems, such as disability and disease, which can impact diet and activity level. For example, dental problems can lead to difficulties with chewing and swallowing, which in turn can make it hard to maintain a healthy diet. The use of dentures or the preparation of pureed or chopped foods can help solve this problem. There also is a decreased thirst response in the elderly, and the kidneys have a decreased ability to concentrate urine, both of which can lead to dehydration.

Sensory Issues

At about age sixty, taste buds begin to decrease in size and number. As a result, the **taste threshold**[8] is higher in older adults, meaning that more of the same flavor must be present to detect the taste. Many elderly people lose the ability to distinguish between salty, sour, sweet, and bitter flavors. This can make food seem less appealing and decrease the appetite. An intake of foods high in sugar and sodium can increase due to an inability to discern those tastes. The sense of smell also decreases, which impacts attitudes toward food. Sensory issues may also affect the digestion because the taste and smell of food stimulates the secretion of digestive enzymes in the mouth, stomach, and pancreas.

Gastrointestinal Problems

A number of gastrointestinal issues can affect food intake and digestion among the elderly. Saliva production decreases with age, which affects chewing, swallowing, and taste. Digestive secretions decline later in life as well, which can lead to atrophic gastritis (inflammation of the lining of the stomach). This interferes with the absorption of some vitamins and minerals. Reduction of the digestive enzyme lactase results in a decreased tolerance for dairy products. Slower gastrointestinal motility can result in more constipation, gas, and bloating, and can also be tied to low fluid intake, decreased physical activity, and a diet low in fiber, fruits, and vegetables.

Dysphagia

Some older adults have difficulty getting adequate nutrition because of the disorder dysphagia, which impairs the ability to swallow. Any damage to the parts of the brain that control swallowing can result in dysphagia, therefore stroke is a common cause. Dysphagia is also associated with advanced dementia because of overall brain

8. Minimum concentration at which taste sensitivity to a food or substance can be perceived.

function impairment. To assist older adults suffering from dysphagia, it can be helpful to alter food consistency. For example, solid foods can be pureed, ground, or chopped to allow more successful and safe swallow. This decreases the risk of aspiration, which occurs when food flows into the respiratory tract and can result in pneumonia. Typically, speech therapists, physicians, and dietitians work together to determine the appropriate diet for dysphagia patients.

Video 13.6

Dysphagia

(click to see video)

This video provides information about the symptoms and complications of dysphagia.

Obesity in Old Age

Similar to other life stages, obesity is a concern for the elderly. Adults over age sixty are more likely to be obese than young or middle-aged adults. As explained throughout this chapter, excess body weight has severe consequences. Being overweight or obese increases the risk for potentially fatal conditions that can afflict the elderly. They include cardiovascular disease, which is the leading cause of death in the United States, and Type 2 diabetes, which causes about seventy thousand deaths in the United States annually.Centers for Disease Control, National Center for Health Statistics. "Deaths and Mortality." Last updated January 27, 2012. http://www.cdc.gov/nchs/fastats/deaths.htm. Obesity is also a contributing factor for a number of other conditions, including arthritis.

For older adults who are overweight or obese, dietary changes to promote weight loss should be combined with an exercise program to protect muscle mass. This is because dieting reduces muscle as well as fat, which can exacerbate the loss of muscle mass due to aging. Although weight loss among the elderly can be beneficial, it is best to be cautious and consult with a health-care professional before beginning a weight-loss program.

The Anorexia of Aging

In addition to concerns about obesity among senior citizens, being underweight can be a major problem. A condition known as the **anorexia of aging**[9] is characterized by poor food intake, which results in dangerous weight loss. This major health problem among the elderly leads to a higher risk for immune deficiency, frequent falls, muscle loss, and cognitive deficits. Reduced muscle mass and physical activity

9. A condition that affects the elderly and is characterized by poor food intake.

mean that older adults need fewer calories per day to maintain a normal weight. It is important for health care providers to examine the causes for anorexia of aging among their patients, which can vary from one individual to another. Understanding why some elderly people eat less as they age can help health-care professionals assess the risk factors associated with this condition. Decreased intake may be due to disability or the lack of a motivation to eat. Also, many older adults skip at least one meal each day. As a result, some elderly people are unable to meet even reduced energy needs.

Nutritional interventions should focus primarily on a healthy diet. Remedies can include increasing the frequency of meals and adding healthy, high-calorie foods (such as nuts, potatoes, whole-grain pasta, and avocados) to the diet. Liquid supplements between meals may help to improve caloric intake.Morley, J. E. "Anorexia of Aging: Physiologic and Pathologic." *Am J Clin Nutr* 66 (1997): 760–73. http://www.ajcn.org/content/66/4/760.full.pdf. Health care professionals should consider a patient's habits and preferences when developing a nutritional treatment plan. After a plan is in place, patients should be weighed on a weekly basis until they show improvement.

Vision Problems

Many older people suffer from vision problems and a loss of vision. Age-related macular degeneration is the leading cause of blindness in Americans over age sixty.American Medical Association, *Complete Guide to Prevention and Wellness* (Hoboken, NJ: John Wiley & Sons, Inc., 2008), 413. This disorder can make food planning and preparation extremely difficult and people who suffer from it often must depend on caregivers for their meals. Self-feeding also may be difficult if an elderly person cannot see his or her food clearly. Friends and family members can help older adults with shopping and cooking. Food-assistance programs for older adults (such as Meals on Wheels) can also be helpful.

Diet may help to prevent macular degeneration. Consuming colorful fruits and vegetables increases the intake of lutein and zeaxanthin. Several studies have shown that these antioxidants provide protection for the eyes. Lutein and zeaxanthin are found in green, leafy vegetables such as spinach, kale, and collard greens, and also corn, peaches, squash, broccoli, Brussels sprouts, orange juice, and honeydew melon.American Medical Association, *Complete Guide to Prevention and Wellness* (Hoboken, NJ: John Wiley & Sons, Inc., 2008), 415.

Neurological Conditions

Elderly adults who suffer from dementia may experience memory loss, agitation, and delusions. One in eight people over the age sixty-four and almost half of all people over eighty-five suffer from Alzheimer's, which is the most common form of dementia. These conditions can have serious effects on diet and nutrition as a person increasingly becomes incapable of caring for himself or herself, which includes the ability to buy and prepare food, and to self-feed.

Longevity and Nutrition

The foods you consume in your younger years influence your health as you age. Good nutrition and regular physical activity can help you live longer and healthier. Conversely, poor nutrition and a lack of exercise can shorten your life and lead to medical problems. The right foods provide numerous benefits at every stage of life. They help an infant grow, an adolescent develop mentally and physically, a young adult achieve his or her physical peak, and an older adult cope with aging. Nutritious foods form the foundation of a healthy life at every age.

KEY TAKEAWAYS

- As adults age, physical changes impact nutrient needs and can result in deficiencies.
- The daily energy requirements for adults ages fifty-one and over are 1,600 to 2,200 calories for women and 2,000 to 2,800 calories for men, depending on activity level.
- Older adults are more susceptible to medical problems, such as disability and disease, which can impact appetite, the ability to plan and prepare food, chewing and swallowing, self-feeding, and general nutrient intake.
- A nutrient-dense, plant-based diet can help prevent or support the healing of a number of disorders that impact the elderly, including macular degeneration and arthritis.

DISCUSSION STARTER

1. Revisit the predictions you made at the beginning of this chapter about how nutrient needs might change as a healthy young adult matures into old age. Which predictions were correct? Which were incorrect? What have you learned?

13.8 End-of-Chapter Exercises

IT'S YOUR TURN

1. Visit http://www.choosemyplate.gov/ to research suggestions to help kids eat healthier foods. Create a list of tips for parents.
2. Visit http://www.webmd.com/diet/food-fitness-planner/default.htm to create a food and fitness plan that fits your current height, weight, and lifestyle.
3. Create a list of nutritional tips for adults who are caring for their elderly parents after watching the following video:

   Nutrition for Senior Citizens

   (click to see video)

APPLY IT

1. Visit http://www.health.gov/paguidelines/guidelines/default.aspx to study the *2008 Physical Activity Guidelines for Americans*. Then create a chart that suggests physical activities for teens, young adults, and middle-aged adults, and includes the amount of physical activity recommended for each group per week.
2. How do the physical changes that a preteen experiences during puberty relate to changing nutrient needs? Hold a small group discussion to talk about puberty and nutrition.
3. Research ways to help an older adult who suffers from poor intake to get enough nutrients at the following website: http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/preventive-medicine/aging-preventive-health/. Then create a brochure for patients to explain your findings.

EXPAND YOUR KNOWLEDGE

1. Write a short speech that you would give to a group of school children between ages nine and thirteen. Explain to them how their sugar intake impacts their bodies and overall well-being.
2. Consider the changing needs of an older adolescent, along with a teen's access to food and desire to make dietary choices. Then create a three-day meal plan for a teenage boy or girl.
3. After watching the video, hold a small group discussion to discuss the influence of environment, economics, culture, and lifestyle on dietary choices.

The Obesity Epidemic

(click to see video)