

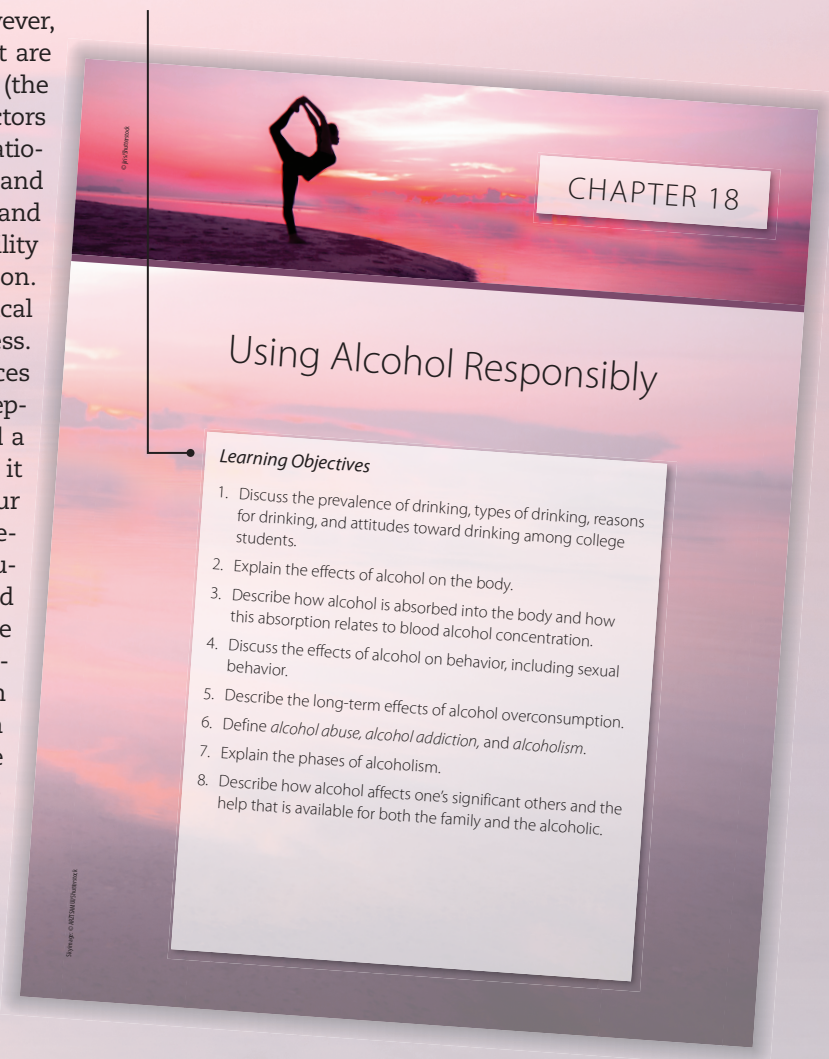
PREFACE

It is with particular pride that we present the twelfth edition of *Health and Wellness*. Publication of this edition in 2015 represents 33 years of continuous use of this textbook by students and instructors since the first edition appeared in 1982. A lot has happened to us (the authors), to book publishing, and to the world since then. We are much older, books are available online in digital format, and the world has changed in ways too numerous to mention. However, the visions we had of health and how to achieve it are as true today as they were 30 years ago. When we (the authors) conceived of writing a textbook that instructors could use to teach health, we chose to present the rationale and scientific evidence for *prevention* of disease and illness and for *individual self-responsibility* for fostering and maintaining one's health. The idea of self-responsibility is now accepted as fundamental in health education. Your behaviors, lifestyle, mental attitudes, and physical activities are what lead to overall health and wellness. Medical science is making truly remarkable advances in curing or alleviating serious conditions such as hepatitis C infections, some cases of cystic fibrosis, and a number of previously untreatable cancers. However, it is even more important today to take charge of your own health. As the pandemics of heart disease, obesity, and diabetes spread around the world, as pollution threatens the livability of the environment and climate change threatens the health of the entire planet, everyone must understand how their behaviors and attitudes contribute to their personal health or illness and the living things that share the Earth with them. The information and guidelines that we set out in previous editions of this book are no less applicable in today's world.

Pedagogical Features

We have developed a number of features to help you learn about health and wellness in this book.

Each chapter of the book begins with a list of **Learning Objectives** to help you focus on the most important concepts in that chapter.



euphoria, increase alertness, combat fatigue, and, in some instances, reduce appetite. They also increase the risk of heart attack, seizures, and psychotic episodes. Because of their harmful effects, amphetamines are legally controlled, and ephedra has been banned for sale in dietary supplements.

Energy drinks generally contain a variety of substances purported to increase alertness and endurance and to combat fatigue, including caffeine (and caffeine-like substances such as theophylline), the herb guarana, which contains caffeine; taurine; ginseng; ginkgo; creatine; carnitine; glucuronolactone; and lots of sugar. There is no doubt that high doses of caffeine are stimulatory; caffeine enhancement of physical performance is moderate at best (Schubert & Astorino, 2013).

Muscle Enlargers

Muscle enlargers include protein and amino acid dietary supplements, androgenic anabolic steroids, and human growth hormone. Although new muscle tissue is made of protein, ingesting protein or certain amino acids will not produce new muscle tissue. Muscles grow in response to work, not food. Anyone consuming a balanced diet obtains sufficient protein and amino acids to meet the demands of nearly any kind of exercise; body builders or athletes who need to build considerable strength are exceptions.

Androgenic anabolic steroids (testosterone and similar substances) are used to build muscle strength in women and men. They are legal only by prescription for medical reasons. Androstenedione ("andro") is a "prohormone" that is converted in the body to testosterone. Prior to 2005, androstenedione and similar substances could be purchased legally as dietary supplements. However,

Creatine, a natural substance in muscle tissue required for muscle contraction, can be purchased as a nutritional supplement. Some, but not all, studies show that creatine supplementation might enhance short-burst activity, such as weight lifting or sprinting. It is not helpful for endurance activities. In doses commonly used (three to five grams per day), creatine is apparently not harmful. However, because herbs and other nutritional supplements are unregulated, one cannot be sure of the purity or dose of any such product.

Erythropoietin is a hormone that increases the number of red blood cells, thus increasing the body's ability to carry oxygen to tissues. Erythropoietin is a prescription medication given to people whose bodies cannot produce sufficient blood cells, such as people undergoing cancer

TERMS

androgenic anabolic steroids: synthetic male hormones used to increase muscle size and strength
creatine: a natural substance in skeletal muscle tissue required for muscle contraction, which can also be purchased as a dietary supplement

ergogenic aids: substances used to increase strength and endurance

erythropoietin: a hormone that increases the number of red blood cells, thus increasing the body's ability to carry oxygen to tissues

human growth hormone: a naturally occurring pituitary hormone

Key Terms are defined on or near the page on which they are introduced as well as in the glossary at the end of the book.

Epigrams enliven each chapter with thought-provoking (and often humorous) quotations about health.

The only way to keep your health is to eat what you don't want, drink what you don't like, and do what you'd rather not.
Mark Twain

people that it is healthy to consume five servings of fresh fruits and vegetables each day is insufficient if their community does not have stores or other sources of healthy

Table 1.2

Per Capita Medical Care Spending in Developed Countries

Country	Per capita spending in U.S. Dollars
United States	8,508
Norway	5,669
Switzerland	5,643
Canada	4,552
Germany	4,495
France	4,118
Sweden	3,925
Australia	3,800
United Kingdom	3,405
Japan	3,213
Italy	3,012
Israel	2,239
Mexico	977

Source: Organization for Economic Co-operation and Development (OECD). (2013). *Health at a Glance: OECD Indicators*. Retrieved from http://dx.doi.org/10.1787/health_glance-2013-en

and individual wellness/disease prevention, including smoking cessation and obesity and type 2 diabetes prevention. The law also helps employers and communities institute and strengthen wellness programs.

Healthy People 2020

Each decade, the U.S. government issues health objectives for the nation, the latest of which is *Healthy People 2020* (HealthyPeople.gov, 2014). The main goals of *Healthy People 2020* are (1) to help individuals of all ages live longer and improve their quality of life, and (2) to eliminate health disparities among segments of the U.S. population, including differences by gender, race or ethnicity, education or income, disability, geographic location, or sexual orientation.

Healthy People 2020 recognizes that families, schools, worksites, communities, states, and national organizations must help individuals live healthfully. This means that not only are individuals asked to make healthy lifestyle choices based on sound health knowledge but also that communities strive to provide quality education, housing, and transportation; health-promoting social and physical environments; and access to quality medical care. For example, informing

1. Access to Quality Health Service	21. Heart Disease and Stroke
2. Adolescent Health	22. HIV
3. Arthritis, Osteoporosis, and Chronic Back Conditions	23. Immunizations and Infectious Diseases
4. Blood Disorders and Blood Safety	24. Injury and Violence Prevention
5. Cancer	25. Lesbian, Gay, Bisexual, and Transgender Health
6. Chronic Kidney Disease	26. Maternal, Infant, and Child Health
7. Dementias, Including Alzheimer's Disease	27. Medical Product Safety
8. Diabetes	28. Mental Health and Mental Disorders
9. Disability and Secondary Conditions	29. Nutrition and Weight Status
10. Early and Middle Childhood	30. Occupational Safety and Health
11. Educational and Community-Based Programs	31. Older Adults
12. Environmental Health	32. Oral Health
13. Family Planning and Sexual Health	33. Physical Activity and Fitness
14. Food Safety	34. Preparedness
15. Genomics	35. Public Health Infrastructure
16. Global Health	36. Respiratory Diseases
17. Healthcare-Associated Infections	37. Sexually Transmitted Diseases
18. Health Communication	38. Sleep Health
19. Health-Related Quality of Life and Well-Being	39. Social Determinants of Health
20. Hearing and Other Sensory Communication Disorders	40. Substance Abuse
	41. Tobacco Use
	42. Vision and Hearing Disorders

Figure 1.3

Topic Areas for Healthy People 2020

Source: Modified from U.S. Department of Health and Human Services Office of Disease Prevention and Health Promotion. *Healthy People 2020*. Washington, DC. Retrieved from <http://healthypeople.gov/2020/topics/objectives/2020-default.aspx>

food. Also, advising people to walk more is insufficient if their communities are not safe or lack parks or sidewalks.

Healthy People 2020 consists of nearly 1,500 specific health objectives grouped into 42 topic areas (Figure 1.3), each with a specific goal. Examples of specific goals are the following:

- **Cancer:** Reduce the number of new cancer cases as well as the illness, disability, and death caused by cancer.
- **Disability and Secondary Conditions:** Promote the health of people with disabilities, prevent secondary conditions, and eliminate disparities between people with and without disabilities in the U.S. population.
- **Food Safety:** Reduce foodborne illnesses.

Image Visualization Reduces Stress

Image visualization is telling yourself a story and “seeing” the images in your mind’s eye. An attorney in Los Angeles uses image visualization once in a while during the first few minutes of her lunch break. She closes the door to her office, takes off her shoes, and sits on the floor with her back against a wall. She closes her eyes and takes a few deep breaths. Then she imagines...

...that she is standing at the edge of a meadow that is filled with golden wildflowers. The sun is shining and the air is a very pleasant temperature. On the far side of the meadow is a hill. She imagines herself slowly walking across the meadow toward the hill on a path that has been worn down by previous walks through the flowers. When she reaches the hill, she begins to walk on a gently winding path toward the top. As she walks, she hears the sounds of birds and a nearby stream. Along the side of the path she sees bushes, small trees, a few flowers, and a few stones. Finally, she reaches the top of the hill, where there is a lovely stand of tall trees. There’s a clearing in the trees, and on one side of the clearing there’s a fallen log. She sits on the log and enjoys the warm sun filtering through the branches of the tall trees. She closes her eyes, and rests. After a few minutes, it’s time to return, so she opens her eyes, rises, and walks across the clearing to a very large, smooth, white boulder. She looks on the top of the boulder and there’s a private message written just for her. She reads the message and then begins to walk down the ready path to the meadow, still hearing the sounds of the birds and the stream, and still feeling the warm sun. Eventually she reaches the meadow, retraces her path through the golden flowers, and then...

...she opens her eyes and embarks on the rest of her work day.

performance in sports; change smoking, drinking, or eating behaviors; and help control compulsive urges to gamble. At one time or another in our lives, we all daydream or run an “internal movie,” fantasizing our hopes and fears. During such fantasies we visualize experiences and create feelings. Image visualization can change body temperature, blood flow, heartbeat, breathing rate, production of hormones, and other body processes regulated by the brain.

Most psychologists who work with athletes to improve physical performance use image visualization. The so-called inner games of tennis, golf, skiing, and baseball are based on image visualization. Baseball players in a batting slump use relaxation and visualization to “see” themselves getting hits. Basketball players use the technique to “see” their free throws going cleanly through the hoop.

Image visualization also can improve sexual responses and enjoyment. Sexual arousal begins in the mind, and negative thoughts or fears can stifle the

sexual responses. The sex organs are particularly sensitive to images generated in the mind. Most sex therapists use relaxation techniques and image visualization to help clients improve their sexual experiences. Tension related to sexual performance is usually the main reason for not experiencing the desired sexual sensations. In all areas of your life, begin to use your mental powers more to enhance health and improve performance in daily tasks.

Guided imagery is another application of suggestion to promote health and well-being and to relieve stress. Unlike image visualization, in which the image is created by oneself, in guided imagery, another’s verbal suggestions help guide you to create a particular physical response such as reducing stress, lowering blood pressure, or reducing pain. Often, a guided imagery experience begins with the guide suggesting that you take a few moments to settle from the day’s usual “busyness” by sitting or lying comfortably, closing your eyes, and taking some deep breaths. Then the guide may suggest images of you being in a peaceful locale, such as beside a mountain stream or at an isolated beach. The guide will describe in great detail the scene and remind you how peaceful and serene you feel. In the mountains you may be guided to see flowers in a meadow or birds flying overhead and to be soothed by the imagined sound of water flowing in a stream. You might be guided to imagine the water carrying away your worries and tension. At the beach you may be guided to sense the warm sun on your skin and hear the sound of waves coming ashore. As the water retreats to the sea it carries away some of your worry, tension, or pain. After a few minutes, your guide will suggest that it is time to leave your serene place and you are guided back to your normal environment. As you return, your guide reminds you how relaxed and good you feel and encourages you to carry that feeling with you as you move through the rest of your day.

Virtual Reality Therapies

It has been known for many centuries that distraction is a very effective treatment for pain. That is why meditation, hypnotherapy, prayer, and other methods that focus the mind’s attention on something other than pain or other

TERMS

guided imagery: using verbal suggestions to create one’s own mental images that produce relaxation, and feelings of harmony, and reduce stress

image visualization: use of mental images to promote healing and change behaviors

Current topics are highlighted in boxes to give a complete perspective in your study of health and wellness. **Global Wellness** boxes explore health and wellness topics as they affect different countries and cultures.

Ebola – A Deadly Virus Emerges

Ebola is a deadly virus named for a small river in the People’s Republic of Congo where it was first detected by Western scientists in 1976. Since the initial discovery in a remote village in the Congo, it has resurfaced numerous times in villages in the Congo as well as in other remote locations in Sub-Saharan Africa. Each outbreak was contained by being confined to a small region where people could not easily move in or out. That all changed in 2014 when a single infected person showed up in a populated area of West Africa. Many people became infected and the epidemic quickly spread through Sierra Leone, Guinea, and Liberia. By the end of 2014, it had spread into Mali. Because the disease erupted in urban areas where people lived in close contact and moved about freely, Ebola infections spread rapidly in West Africa.

Ebola viruses are among the smallest viruses. Each virus particle contains only seven genes whose genetic information is carried in a tiny RNA molecule. The seven genes produce seven proteins that allow the virus to attach to human cells, penetrate the cells, and produce new virus particles. Ebola belongs to a class of viruses called hemorrhagic viruses because they cause infected cells to rupture producing extensive bleeding. The death rate from Ebola varies widely but averages more than 50% of people infected. Ebola was first transmitted to people when people ate or came in contact with fruit bats in Africa. The bats serve as a reservoir for Ebola but are not harmed by the virus. Testing of

thousands of animals in Africa over the years showed that only certain species of bats normally carry the Ebola virus without being harmed by it.

After becoming infected with Ebola, a person may develop symptoms within a few days or as long as 21 days or more in a few instances. The symptoms are similar to most viral infections—fever, headache, and body pain. Vomiting and diarrhea follow. As of 2014, there were no specific medicines for treating Ebola; patients received supportive therapy, primarily fluids to replace the body fluids that were lost. Death occurs from failure of the kidneys, liver, or loss of blood. All body fluids of an Ebola patient carry infectious viruses including tears, sweat, and semen. Caring for Ebola patients is extremely hazardous as evidenced by the high rate of healthcare workers who were flown to specially outfitted U.S. hospitals were successfully treated and recovered. By the end of 2014, more than 5000 Ebola deaths were recorded in West Africa.

Several anti-Ebola drugs and at least two vaccines are in development. These first will be used to protect and treat healthcare workers who are at high risk because of close contact with infected patients. When drugs and a vaccine are found to be safe and effective, they then will be used to treat and vaccinate susceptible populations. Authorities hope to bring the Ebola epidemic under control by 2015–2016. However, now that the virus has migrated from extreme rural regions to massive cities, outbreaks will likely occur from time to time.

stage called plasma cells) synthesize vast amounts of one specific kind of antibody that attaches to all of the specific pathogens in the body. Once the antibodies have recognized and inactivated them, other white blood cells finish the job of destruction. To produce the correct antibodies in large amounts takes about a week after an infection, which is why other quicker-acting immune system defense mechanisms are also needed.

The B cells and T cells interact among themselves in complex ways to produce a full-fledged immune response. Small molecules called **cytokines** coordinate the activities of the B cells and T cells. Many of the natural cytokines, such as interferons and interleukins, that regulate functions of the immune system are now also manufactured by biotechnology companies. Some of these products are used in the treatment of cancer and other diseases in which the functions of the immune system are impaired. T cells are also divided into different classes according to their specific functions. Helper T cells increase the proliferation of B cells, killer T cells destroy cancer cells and other pathogenic organisms, and suppressor T cells retard the growth of other immune system cells. A special class of T cells called CD4 cells are important indicators in the diagnosis and development of AIDS. When the level of CD4 cells in the blood falls, a person becomes extremely susceptible to infection by many different microorganisms, causing one of the more than two dozen infectious diseases that characterize AIDS.

TERMS

antibodies: proteins that recognize and inactivate viruses, bacteria, and other organisms and toxic substances that enter the body

antigens: foreign proteins on infectious organisms that stimulate an antibody response

B cells: cells of the immune system that produce antibodies

cell-mediated immunity: the response of T cells to infections

Cytokines: small molecules that coordinate the activities of B cells and T cells

humoral immunity: the response of B cells to infections

lymph nodes: nodules spaced along the lymphatic vessels that trap infectious organisms or foreign particles

lymphatic system: a system of vessels in the body that trap foreign organisms and particles; the immune system is part of the lymphatic system

T cells: cells of the immune system that attack foreign organisms that infect the body

Wellness Guides offer tips, techniques, and steps toward a healthy lifestyle and self-responsibility.

College Athletes Opt for Health

Most college students (and their families) expect their college education to provide knowledge and skills that will facilitate attaining a satisfying job and a healthy future. Students do not expect to graduate from college with a brain injury that causes cognitive, emotional, and health deficits that will persist throughout life. Unfortunately, many of the 500,000 U.S. college students who are active in intercollegiate athletics are at risk of brain injury from a concussion while participating in their sports. A concussion is a type of traumatic brain injury (TBI) caused by a bump, blow, or jolt from a fall or a collision that causes the head and brain to move back and forth abruptly. Concussions are usually not life-threatening, but they can result in serious intellectual impairment. Common symptoms of concussion are difficulty thinking clearly, headache, irritability, anxiety, and sleep disturbance. Most people with a concussion recover quickly; however, others may have symptoms that persist. Also, sustaining one concussion increases the likelihood of others.

In 2014, athletes from major universities formed the National College Players Association to protect their health, academic progress, and well-being from concussions and other injuries. Among the NCPA's goals are to minimize college athletes' risks for brain trauma and to prevent players from having to pay for their sports-related medical expenses. They also want to prohibit colleges from revoking an injured player's scholarship and establish and enforce uniform safety guidelines in all sports to prevent serious injuries and avoidable deaths (NCPA, 2014).

As an anonymous football player posted on Reddit (2014): "This isn't about getting paid. What it is about is protection. Many of us will have numerous injuries throughout our playing careers. A group of those players will continue to feel the effects of those injuries long after their playing days are over. The goal is to have some sort of medical protection if we need surgeries stemming from injuries sustained while playing for our university." Prompted by concern for athletes' long-term health, the Pac-12, Ivy League, and the National Collegiate Athletic

Association (the governing body for collegiate sports) developed rules to minimize head injuries. For example, before, during, and after football season, practices that involve live tackling to the ground and/or full-speed blocking are to be limited to two per week. Also, to avoid pressure from football coaches to return a player with a suspected concussion to the field sooner than is medically responsible, medical personnel should be hired and paid for by the student health service instead of the athletic department. Furthermore, schools should make public their protocols for diagnosing and managing concussions and should conform to guidelines set by the American Academy of Neurology and the American College of Sports Medicine. Although originally focused on safety in football, the data on the prevalence of concussions and other head trauma among college athletes indicate that attention should be given to other concussion-prone sports (see the accompanying table).

Collegiate Athletes' Concussion Rates by Sport

Sport	Concussion Rate per 1,000 Athletic Exposures
Women's ice hockey	0.91
Men's spring football	0.54
Men's ice hockey	0.41
Women's soccer	0.41
Men's football	0.37
Men's soccer	0.28
Women's lacrosse	0.25
Women's wrestling	0.25
Women's basketball	0.22
Men's basketball	0.16
Softball	0.14
Baseball	0.09

Source: Data from Hootman, J. M., et al. (2007). Epidemiology of collegiate injuries from 15 sports. *Journal of Athletic Training*, 42, 311-319.

Many retired professional football players have serious brain damage. The National Football League (NFL) and other sports organizations now stress the need to reduce head injuries in sports. In 2010, the NFL placed a poster in every team's locker room warning players of the possible long-term effects of concussions. In 2013, the NFL agreed to set up a fund to pay for concussion-related health problems of approximately 18,000 retired NFL players. The original fund of \$765 million was later found to be insufficient, and a court ordered that more money be set aside to compensate past and future NFL players who suffer health problems from repeated concussions.

Recently, attention has turned to soccer players who also suffer concussions; these may occur from falls, head-to-head collisions, being hit by a kicked ball, or, more commonly, by repeated "headers" (using the head to intercept the ball in order to score or pass). Although an individual header may not cause any observable problem such as

a concussion, brain damage from headers may accumulate over time. A professional soccer player may execute thousands of headers in practice and games over a career. Studies of professional soccer players show that some do exhibit signs of brain injury, loss of cognitive function, on both. Because of the growing concern over long-term brain damage from headers, it is recommended that children younger than age 14 who play soccer should not be allowed to use their heads to intercept a soccer ball at any time.

TERMS

concussion: a blow to the head that causes injury, temporary loss of consciousness, and possibly a period of amnesia upon awakening

Focusing Attention

A wise teacher said that you could read thousands of books about meditation, but none is as good as a demonstration. So, do this: Right now, notice the sensation of the bottoms of your feet touching the insides of the bottoms of your shoes. That sensation is caused by the nerves in the bottoms of your feet signaling your brain that your feet are touching your shoes. That signaling has been going on the entire time you've been reading this page, but you were unlikely to have noticed because your attention was focused on what you were reading—or perhaps on other thoughts—until you were asked to change the focus of your attention to

the bottoms of your feet. This shows that you can choose to focus your attention (also called your conscious awareness) on what you want to: your feet, signals of discomfort from your body, worries, your to-do list, or memories of a nice time you had with someone special. Meditation is being aware of what your mind is doing on a moment-to-moment basis and shifting your focus of your awareness if you wish to, for example, to your breathing, a repeating sound or prayer, or an image. Instead of breathing, a repeating sound or prayer, and that by the business of your life, meditation allows you to notice that your mind is overly busy—perhaps distressingly so—and to shift your mental process to something that facilitates feeling stable, in control, flexible, and adaptive.

Table 2.3

Myths About What Happens During Hypnosis

Myth: While under hypnosis you lose control of your mind and the hypnotist can make you do anything that he or she wants.
Fact: Despite what is portrayed in movies, a hypnotist cannot control your mind or make you do something against your will or beliefs. A hypnotized person can decide to become "unhypnotized" at any time. Ultimately, all hypnosis is self-hypnosis. The stage hypnotist selects people from the audience who want to be hypnotized and be part of the act. People do funny things on the stage because they agree to do them. No one can control your mind if you do not agree to. Similarly, a prison follows a therapist's suggestions because of trust and a desire to be helped.

Myth: Hypnosis is like falling asleep. You become unconscious and are unaware of what is happening around you. When you wake up you do not remember what was going on around you while you were hypnotized.
Fact: In hypnosis you do not lose consciousness, and most hypnotized subjects report that they feel very aware. Hypnosis is like focused attention in which you are aware of specific thoughts to the exclusion of others. Just as with deep meditation, you are always in touch with reality and choose to remain in the meditative state or "wake up."

Myth: Hypnotists have special psychic or occult powers, which explains why they can control other people's minds.
Fact: Hypnotists have trained their powers of observation and are skillful at giving suggestions. Those who claim to have special powers should be avoided because they harbor hidden motives and should not be trusted.

Myth: Only people with "weak minds" or of low intelligence can be hypnotized.
Fact: Everyone can be hypnotized, although people vary in their ability as they do in all abilities. People with above average intelligence usually enter a state of hypnosis more easily than others. Consider what happens in a movie theater. People laugh, cry, or are terrified by what is happening on the screen. But the images that affect them so powerfully are, in reality, light on the screen. Most moviegoers are in a state of hypnosis and, by adopting the role of "moviegoers," have agreed to allow their emotions to be manipulated by the images. Nevertheless, everyone is in control of their minds. Witness the sudden "unhypnotizing" if someone yells "fire" or if the lights are turned on abruptly. Again, it is worth emphasizing that all hypnosis is self-hypnosis.

Myth: Hypnosis is not useful or effective in improving health or harmful behaviors.
Fact: Hypnosis, or hypnotherapy as it is called when used by trained health professionals, may be very useful in treating a wide range of symptoms. In 1957, the American Medical Association approved hypnotherapy as a valid therapeutic technique. Many physicians and clinical psychologists use hypnotherapy to treat a wide range of physical, emotional, and behavioral problems such as pain, panic attacks, smoking, alcoholism, and posttraumatic stress disorder.

everything. Physicians have to take time to develop a rapport with patients and be willing to take as much time as necessary to answer all questions and make sure the patient is comfortable with being hypnotized. Modern medical practice does not allow for this in an age of managed care and HMOs (see Chapter 19). Time is money in modern medical practice.

Meditation

Meditation is a long-standing religious and spiritual practice of focused awareness, trance, induction, and relaxation that is increasingly used to promote health

and healing. Contrary to what some people think, meditation is not a cult, religion, or giving up control over one's mind. It isn't being "zoned out" without thoughts or used to escape reality. Instead, meditation is focusing

TERMS

Meditation: Focusing awareness on a self-produced inner sound ("mantra") or an external sound, or image, or one's breathing to lessen attentiveness to external stimuli

Managing Stress boxes give you practical strategies for coping with stress.

of choice for pregnant women experiencing "morning sickness." The drug was thought to be extremely safe and had been tested in pregnant animals, where it did not act as a teratogen.

However, thalidomide is not safe for any woman who is pregnant. Thalidomide interferes with normal development of the bones of the arms and legs of a fetus and causes other developmental abnormalities. Between 1956 and 1961, when the teratogenic effects of the drug were finally recognized, thousands of babies in Europe and elsewhere in the world had been born with severe deformities of the arms and legs. Many thousands more were stillborn, but no one knows for sure how many pregnant women lost their fetuses or gave birth to deformed babies. The drug was never approved for sale in the United States largely because of Francis Kelsey, a physician at the Food and Drug Administration (FDA) who was responsible for new drug applications. She was concerned about the drug's side effects and delayed its approval until the devastating effects of the drug were discovered in other countries. Most countries had banned the use of thalidomide by 1961.

However, interest in the therapeutic potential of thalidomide and related drugs has not subsided. Research has continued and, in an ironic twist of fate, thalidomide (trade name, Thalomid) was approved by the FDA in 1998 for use in treating skin lesions associated with leprosy. The drug now comes with a strong warning leprosy. In others, the desire to improve their skin condition may have caused them to disregard the warning. This situation may have caused them to disregard the warning. This situation may have caused them to disregard the warning.

any drug—prescription, over-the-counter, or illegal—in order to protect a fetus should they become pregnant.

DES

In the 1950s and 1960s, the synthetic hormone DES (diethylstilbestrol) was prescribed to help prevent miscarriage. DES was not identified as a teratogen until the 1970s. Many daughters of women who took DES before or during pregnancy discovered that they had abnormalities in their reproductive organs when they tried to become pregnant. These daughters also have a higher risk of developing vaginal cancer. Although the drug did not cause abnormalities in all children of DES mothers, the risk is sufficiently great that most DES women carry the psychological burden of their potential for reproductive problems and cancer.

Accutane

Accutane (isotretinoin) is an analogue of vitamin A and is sold as a drug called Accutane that is used to treat severe acne and other skin disorders. Accutane was tested in laboratory animals and labeled a teratogen because it caused birth defects when administered to pregnant mice and rats. The drug was finally released with the warning that it should not be used during pregnancy. However, during the 1980s, hundreds of babies with congenital defects were born to women who became pregnant while taking Accutane for skin problems. In some cases, the women may have become pregnant by accident while taking the drug. In others, the desire to improve their skin condition may have caused them to disregard the warning. This situation may have caused them to disregard the warning.

The Cost of Treating Cystic Fibrosis

Each year in the United States about 30,000 babies are born with cystic fibrosis, a disease that causes severe lung and breathing problems (Kaiser, 2012). This inherited (genetic) disease occurs because an affected child inherits a defective gene from each parent. Modern medical treatments enable babies born with cystic fibrosis to survive to about age 40. Despite the improved care and therapies, there still is no cure for every patient; prevention by genetic testing of prospective parents is the best strategy.

In 2012 the U.S. Food and Drug Administration (FDA) and other health programs in Canada, the European Union, and other countries approved the drug Kalydeco (ivacaftor), which can restore lung function in a specific subtype of cystic fibrosis patients—about 4 of 100 individuals with cystic fibrosis. Vertex Pharmaceuticals, the company that manufactures Kalydeco, charges \$300,000 for a year's supply of pills (taken twice daily). Most cystic fibrosis patients who respond to the drug will need to take it for decades to stay alive.

Many doctors, patients and their families, and insurers, including the U.S. government, which pays for the drug through

Medicare Disability and Medicaid, object to the high cost. They point out that the scientific research that discovered the drug was paid for by taxpayers and that Vertex received considerable help from the Cystic Fibrosis Association and hence spent less than the typical \$1 billion to \$2 billion to develop the new drug. Without some adjustment in the price, as is being demanded by the U.S. and European governments, each patient receiving the drug will produce a multi-billion-dollar profit for Vertex. In the for-profit model of drug development and sale, Vertex is doing nothing illegal to price its product as it sees fit. And patients and their families are relieved to have a medicine that can save a life, no matter the cost.

The cost of Kalydeco and other new drugs approved for serious diseases—especially cancers—which is almost always more than \$100,000 per treatment or annually if the drug must be given continuously, is a pressing problem facing the healthcare system. With modern genetic technologies to help produce more drugs to treat small numbers of patients, industry and drug developers will be tempted to exploit their advantage financially. Detecting and treating genetic and other serious diseases are rife with ethical and economic concerns that are going to become urgent in the coming years.

Dollars & Health Sense boxes focus on the influence of economic forces on individual and community health; for example, the marketing of worthless and sometimes dangerous supplements and devices for weight management, fitness, and stress relief; direct-to-consumer advertising in the marketing of minimally effective and sometimes dangerous pharmaceuticals; and cigarette advertising to encourage youths to start smoking.

Chapters conclude with **Critical Thinking About Health**—a set of questions that present controversial or thought-provoking situations and ask you to examine your opinions and explore your biases.

Critical Thinking About Health

1. A friend who is about 25 years old has just learned that she is pregnant. The woman smokes cigarettes and likes to party on weekends. Based on what you have learned about the causes of congenital defects in this chapter, make a list of all the behavioral, dietary, and lifestyle changes you would recommend to your friend to help ensure that she gives birth to a healthy child. Discuss the rationale for each of your recommendations.
2. Abortion is one of the most controversial issues in American society. At one end of the spectrum of views are people who think that all abortions should be prohibited for any reason whatsoever, even if the life of the pregnant woman is in jeopardy. At the other extreme are people who believe that each pregnant woman should have complete freedom to do whatever she chooses with respect to her pregnancy because it is her body. Evaluate these two views of abortion and present your own views in as much detail as possible. Substantiate each of your views.
3. Are scientists obliged to inform nonscientists of results of their research that might bear on susceptibility to a serious disease? Here is an example.
A scientist is studying the DNA from patients who have died from cancer of the pancreas. She is trying to discover any genes that may be involved in the development of the disease. She finds that the DNA of many patients with pancreatic cancer carry mutations that are known to cause other cancers. One such mutation is BRCA2, which is a well-established risk factor for breast and ovarian cancer in women. Should the scientist inform relatives of pancreatic cancer patients of her discovery so they can be tested for BRCA2? Even though most cancer

susceptibility genes increase risk, they do not make cancer inevitable (see Chapter 13). If you agree they should be informed, how should relatives be notified and what support should be offered? On the other hand, should relatives not be told since there is no certainty they will develop pancreatic cancer and there is no established rule or law that says relatives should be informed of harmful mutations found in a relative's DNA?

4. A few years ago, the U.S. military ordered all service personnel to have a blood sample taken so that the DNA of each individual's cells could be analyzed and the patterns placed on file, much as the FBI keeps files of fingerprints of criminals and others. The reason the military wants each person's DNA analyzed is so that remains can be positively identified in case that person dies in a future conflict. One soldier refused to give a blood sample in violation of a direct order and was ordered to stand before a court martial. The soldier argued that he had no assurance that his DNA information would be kept private and would not be used for purposes of discrimination or to his detriment in other ways.
 - a. Do you think the military is justified in wanting each person's DNA on file?
 - b. In what ways might the DNA information be used to the detriment of the soldier either in the military or after his release from military service?
 - c. Discuss the pros and cons of having the DNA profile of every person in the United States on file in a federal agency so that any person could be positively identified by law enforcement authorities, government agencies, or other organizations, should the need arise.

Chapter Summary and Highlights

Chapter Summary

The hereditary information in every human being is contained in long, chainlike molecules of DNA. The molecules of DNA, in turn, are packaged into 46 chromosomes, 23 of which come from each parent. All of the information needed to construct a human being is contained in about 3 billion pairs of four different chemical letters: A, G, C, and T. Every human trait, from skin color to the propensity for athletic and intellectual ability, is contained in this massive "Book of Life." In the 1990s, scientists decided to decipher the exact sequence of the 3 billion elements in one person's DNA. The U.S. government funded the idea and established the Human Genome Project. The goal of sequencing a complete human genome was reached in 2003 when the entire sequence was published online. The cost of this project was \$2.7 billion. In the years

following this amazing accomplishment, the complete DNA sequences of some viruses, bacteria, yeast, plants, and animals were obtained. This became possible because the cost of sequencing DNA dropped dramatically as the process became automated and computerized. Today, the cost of sequencing all of the DNA in a person is only a few thousand dollars.

Because of these advances in sequencing DNA, a revolution has occurred in our understanding of inherited (genetic) diseases. A defect in a single gene can cause a genetic disease such as sickle cell, anemia, muscular dystrophy, cystic fibrosis, hemophilia, and thousands of others. Genetic defects can be identified in prospective parents, and new genetic and reproductive technologies help prevent the defective genes from being passed on to children. Diseases such as cancer, heart disease, diabetes,

End-of-chapter material includes **Chapter Summary and Highlights** (a brief review of the chapter), **For Your Health** (new self-evaluation exercises), **References**, **Suggested Readings**, and **Recommended Websites** where you can find additional health information.

Critical Thinking About Health

1. "Hmmm," muttered Dr. Johnson, the hospital's new chief of medicine, as he pored over the hospital's recent birthing statistics. Dr. Johnson's curiosity and concern were piqued by data showing a wide variation in the rates of labor induction among the medical practitioners at the hospital: Dr. Smith, 7%; Dr. Anderson, 12%; Dr. Tompkins, 45%; and Dr. Hastings, 74%. Dr. Johnson knew that the U.S. national rate was 20%, and at the hospital he managed prior to this assignment the rate was 12%.
Following a hunch, Dr. Johnson checked the hospital's computerized records to determine the days and times of the births at the hospital for the previous four months. He discovered that Dr. Tompkins had only one weekend delivery during that time period, and Dr. Hastings had no weekend deliveries and only two after 2 A.M.
Dr. Johnson investigated the medical records further and discovered that Dr. Hastings had noted in several patients' medical records that the women had requested labor induction for reasons of personal convenience. Although Dr. Johnson personally

disagreed with the practice of inducing labor for reasons of convenience, he nevertheless believed that if something went wrong, compared to nights and weekends when the hospital was not fully staffed, weekday births were financially less risky for the hospital.

Should Dr. Johnson do anything to change the labor induction practices at the hospital? If so, what should he do? If not, why not?

2. We know that drugs, alcohol, and smoking are dangerous to a developing fetus. Imagine that you are working as a server in a restaurant.
 - a. What would you say or do if a customer who was pregnant ordered a glass of wine?
 - b. What would you say or do if a customer who was pregnant was smoking a cigarette?
3. Comment on this point of view: People have been having babies for thousands of years. Nowadays, the entire process is way too medicalized with birthing classes, hospital delivery rooms, anesthesia, fetal monitoring, episiotomy, labor induction, cesareans, circumcision of male infants, and bottlefeeding.

couples want to give birth to a healthy child. The more couples learn about how to maintain a healthy pregnancy and the birthing process, the more likely the outcome will be joyful for all involved.

Highlights

- Conception, pregnancy, and childbirth are important and meaningful life experiences. The decision to become a parent requires psychological and physical preparation so every child can have parents prepared to meet its needs.
- Fertilization is followed by cleavages of the embryo as it moves into the uterus. About the sixth day after fertilization, the embryo implants in the lining of the uterus, and for the next 266 days or so the fetus develops. After 40 weeks of pregnancy a baby is born.
- Healthy habits during pregnancy such as good nutrition, seeking prenatal care, exercise and physical activity, and emotional well-being contribute to a successful pregnancy.
- Taking drugs, consuming alcohol, and smoking cigarettes during pregnancy can cause fetal damage or birth defects. Tests, such as amniocentesis or chorionic villus sampling, are available to determine whether birth defects are present.
- Optimal childbirth can be achieved by attending childbirth preparation classes, ensuring emotional support for the mother during childbirth, and

making wise choices about medical interventions, such as episiotomy and pain management.

- Childbirth is divided into three stages. The first stage starts with the beginning of labor and lasts until the cervix is fully dilated. The second stage is the birth of the baby. The third stage is the delivery of the placenta.
- The period after childbirth may involve breastfeeding and resumption of sexual activities.

- Approximately 20% of American married couples are infertile. Some of these couples can be medically assisted to become pregnant; pregnancy also may occur with in vitro fertilization or artificial insemination.
- Adoption is an alternative for couples. Children can be adopted through a private or public adoption agency, in an independent or private adoption, or an international adoption.

For Your Health

Perhaps not now but some day you may consider becoming a parent. Use the "Parenthood and Me" questionnaire

(Exercise 9.1, page 000) to help clarify your motivations for possibly becoming a parent.

References

- American College of Obstetricians and Gynecologists. (2011). Exercise during pregnancy. Retrieved from <http://www.acog.org/-/media/For%20Patients/faq119.pdf?dmc=1&ts=20120322T1318236528>
- Carroll, G., & Mignini, L. (2009, January 21). Episiotomy for vaginal birth. *Cochrane Database of Systematic Reviews*, Issue 1. Art. No.: CD000081. doi:10.1002/14651858.CD000081.pub2
- Food and Nutrition Board, Institute of Medicine. (2004). *Dietary Reference Intakes (DRIs)*. Washington, DC: National Academies. Retrieved from [http://www.iom.edu/-/media/Files/Activity%20Files/Nutrition/DRIs/Summary Table Tables 1-4.pdf](http://www.iom.edu/-/media/Files/Activity%20Files/Nutrition/DRIs/Summary%20Table%201-4.pdf)
- Kuczkowski, K. M. (2010). A review of obstetric anesthesia in the new millennium: Where we are and where is it heading? *Current Opinions in Obstetrics and Gynecology*, 22, 482-486.
- Swan, S. H. (2008). Environmental phthalate exposure in relation to reproductive outcomes and other health endpoints in humans. *Environmental Research*, 108, 177-186.
- U.S. Central Intelligence Agency. (2011). Country comparison: Infant mortality rate. *World Fact Book*. Retrieved January 21, 2015 from <https://www.cia.gov/library/publications/the-world-fact-book/rankorder/2091rank.html>
- Yonkers, K. A., Vigod, S., & Ross, L. E. (2011). Diagnosis, pathophysiology, and management of mood disorders in pregnant and postpartum women. *Obstetrics and Gynecology*, 117, 961-977.

Suggested Readings

- Boston Women's Health Book Collective. (2011). *Our bodies, ourselves: Pregnancy and birth*. New York: Touchstone. A comprehensive, accessible, up-to-date book for expectant mothers.
- Murkoff, H., & Mazel, S. (2008). *What to expect when you're expecting*. New York: Workman Publishing. This popular guide to pregnancy covers every aspect of the prenatal period, from developmental stages to nutrition.

Recommended Websites

- American Academy of Family Physicians**
Provides information on a variety of topics related to pregnancy, childbirth, and caring for a newborn.
- American Academy of Pediatrics**
Information about immunizations, childhood illnesses, and child safety.
- KidsHealth**
Provides doctor-approved health information about children, from before birth to adolescence.
- Motherisk Program at the Hospital for Sick Children, Toronto, Canada**
Up-to-date information on the risk of medications on fetal development.
- Parenthood.com**
Tons of information about becoming pregnant, pregnancy, and parenthood.
- ParentsPlace.com**
Lots of information about pregnancy, including a detailed week-by-week pregnancy guide.

The text also includes appendixes on relaxation exercises and stress management techniques (including guides for yoga and t'ai chi).

A workbook has been included at the end of the text to provide you with self-assessments and activities to explore your own health.

Below are some examples of topics that are new to this edition or have been expanded upon from prior editions:

- Chapter 2 provides an expanded discussion of spirituality and health.
- Chapter 8 includes new coverage on the right to marry for gay couples as well as updated information on the LGBT community and gender identity.
- Chapter 12 includes new information on ebola and worldwide efforts on controlling infectious diseases.

- Chapter 16 includes new coverage on changes in marijuana laws.
- Chapter 17 includes new coverage on e-cigarettes.
- Chapter 19 includes new coverage and a more detailed discussion of the Affordable Care Act (ACA).
- Chapter 24 includes expanded coverage of the predicted health effects of climate change.
- Updated **Chapter Summary and Highlights** sections, at the end of each chapter, highlight key points and emphasize the essential health message in each chapter.
- New **For Your Health** sections are included at the end of each chapter, featuring self-evaluation exercises that ask readers to look at their own health and fitness lifestyle.